

VOLUME 45, No. 3

JULY-SEPTEMBER 2023

CIRUJANO GENERAL

2023



Internet: <http://www.amcg.org.mx>
www.medigraphic.com/cirujanogeneral

Official Scientific Publication of the
ASOCIACIÓN MEXICANA DE CIRUGÍA GENERAL, A.C.
E-mail: revista@amcg.org.mx



Indexed at LILACS, BIREME-OPS



CIRUJANO GENERAL

Official Scientific Organ of the Mexican Association of
General Surgery, A.C.

Editorial Board

Elena López Gavito, MD
Héctor Noyola Villalobos, MD
Luis Manuel García Núñez, MD
Miguel F. Herrera Hernández, MD
Saúl Ocampo González, MD
Luis Mauricio Hurtado López, MD

Editor-in Chief

Abilene C. Escamilla Ortiz, MD

Co-Editor

María Eugenia Ordoñez Gutiérrez, MD

International Committee

Miguel A. Carbajo Caballero, MD
Carlos Fernández del Castillo, MD
Guillermo Foncerrada, MD
Julio García Aguilar, MD

Sheyla Moret Vara, MD
Aurelio Rodríguez Vitela, MD
Hugo Villar Valdez, MD

National Committee

Carlos Belmonte Montes, MD
Carmen Barradas, MD
Tomás Barrientos Forte, MD
Susana Calva Limón, MD
Luis Eduardo Cárdenas Lailson, MD
Luis Eduardo Casasola Sánchez, MD
Diana Chávez Garrido, MD
Héctor Armando Cisneros Muñoz, MD
Jorge Cueto García, MD
Juan de Dios Díaz Rosales, MD
Ismael Domínguez Rosado, MD
Fernando Espinoza Mercado, MD
Clotilde Fuentes Orozco, MD
Daniel Garay Lechuga, MD
María del Sol García Ortégón, MD
Luis Manuel García Núñez, MD
Alejandro González Ojeda, MD
Angélica H. González Muñoz, MD
Leopoldo Guzmán Navarro, MD
Sahara Hurtado Gómez, MD
Enrique Jiménez Chavarría, MD
Sergio Arturo Lee Rojo, MD
Adriana Elizabeth Liceaga Fuentes, MD
Sandra Cecilia López Romero, MD
Elena López Gavito, MD
Luis Alfonso Martín del Campo, MD

Juan Carlos Mayagoitía González, MD
Carlos Melgoza Ortiz, MD
José G. Montes-Castañeda, MD
Álvaro José Montiel Jarquín, MSc
Éfraín Moreno Gutiérrez, MD
Antonio Moreno Guzmán, MD
Héctor Noyola Villalobos, MD
Vanessa Ortiz Higuera, MD
Fernando Palacio Pizano, MD
Armando Pereyra Talamantes, MD
Guillermo Ponce de León Ballesteros, MD
Emilio Prieto Díaz Chávez, MD
Carlos Agustín Rodríguez Paz, MD
Eric Romero Arredondo, MD
Miguel Ángel Rosado Martínez, MD
Alexandra Rueda de León Aguirre, MD
Germán Esteban Sánchez Morales, MD
Juan Roberto Torres Cisneros, MD
Sergio Uthoff Brito, MD
Jorge Alejandro Vázquez Carpizo, MD
Marco Antonio Vázquez Rosales, MD
David Velázquez Fernández, MD
J. Dolores Velázquez Mendoza, MD
Felipe Rafael Zaldívar Ramírez, MD
Eduardo Zazueta Quirarte, MD


Editorial Assistant

Karina Tovar Hernández, MD

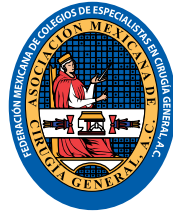
Translator

Víctor de la Garza Estrada, MD

Cirujano General is the scientific communication organ of the Mexican Association of General Surgery, published quarterly. The rights of translation, typographical and production features, including electronic media, are reserved in accordance with the law governing the signatory countries of the Pan-American and International Conventions on copyright. Postage paid. Periodical publication; Registration No. 0540593. Characteristics 220251118. All rights reserved, 1986 Asociación Mexicana de Cirugía General, with certificate number 5687, file 1/432*91*77570 issued on April 23, 1991, and certificate number 4389, file 1/432*91*77570 issued on April 23, 1991, by the certifying commission of publications and illustrated magazines of the Secretaría de Gobernación (Secretary of the Interior). The intellectual property and responsibility of the signed articles and photographs revert to the authors; however, only the Mexican Association of General Surgery, through its editor, may authorize any type of total or partial reproduction that may be required. Cirujano General is indexed in Medigraphic Literatura Biomédica, PERIODICA, Índice de Revistas Latinoamericanas en Ciencias y Salud; Ciencia (Sociedad Iberoamericana de Información Científica).

Designed, produced and printed in Mexico by:  graphimedic S.A. de C.V. Tels: 55-85-89-85-27 to 32. E-mail: emyc@medigraphic.com Printed in Mexico.

Available in full version at: www.medigraphic.com/cirujanogeneral



CIRUJANO GENERAL

Mexican Association of General Surgery, A.C.

Directive Board 2022-2023

President

Jordán Zamora Godínez, MD

Vice-president

Marco Antonio Loera Torres, MD

Second Vice-president

Javier Carrillo Silva, MD

General Secretary

Enrique Jiménez Chavarría, MD

Second Secretary AMCG

María del Carmen Barradas Guevara, MD

Treasurer

Armando Pereyra Talamantes, MD

Executive Director FMCECG

Miguel Francisco Herrera Hernández, MD

Executive Manager AMCG

Antonio Moreno Guzmán, MD

Administrative Director AMCG

Alejandro Cuellar Ramírez, M.R.

Committee of Quality Management

Jacobo Choy Gómez, MD

Committee of Female Surgeons

María Norma Gómez Herrera, MD

Rafael Humberto Pérez Soto, MD

Gabriela Alejandra Buerba, MD

Romero Valdés, MD

Irma Sánchez Montes, MD

Clotilde Fuentes Orozco, MD

Gloria González Uribe, MD

Estephania Milagros Nava Cruz, MD

Ma. Guadalupe Hernández Torres, MD

Rey de J. Romero González, MD

Celina Cuellar Aguirre, MD

María del Carmen Barradas Guevara, MD

Julio César Viñas Dozal, MD

Committee of Safety for Surgical Patient

María Enriqueta Baridó Murguía, MD

María Fernanda Torres Ruiz, MD

Gabriela Alejandra Buerba Romero Valdés, MD

Norma Gómez Herrera, MD

Local Committee for the 47th Congress 2023

Miguel Magdaleno García, MD

José Raúl Hernández Centeno, MD

Juan Carlos Mayagoitia González, Academician

Daniel Alberto Díaz Martínez, MD

Enrique Jiménez Chavarría, MD

Legal Medical Committee

Jorge Luis Mariñelarena Mariñelarena, MD

Carlos Manuel Díaz Salazar, MD

Sub-committee of Certified Experts

Noé Núñez Jasso, MD

Luis Alfonso Hernández Higuera, MD

Coordinators of Editorial Committee

Abilene C. Escamilla Ortiz, MD

Ma. Eugenia Ordoñez Gutiérrez, MD

Coordinator of Virtual Academy

Rosa María Guzmán Aguilar, MD

Sub-coordinators of Virtual Academy

Irma Sánchez Montes, MD

Mónica Stella Castillo Méndez, MD

Diana Chávez Garrido, MD

Carlos Enrique Herrejón Alvarado, MD

Coordinator of CECMI

Víctor Manuel Pinto Angulo, MD

Coordinators of CECMI Monterrey

José Arturo Vázquez Vázquez, MD

Marco Antonio López Reyna, MD

Coordinator of the Scientific Committee

David Velázquez Fernández, MD

Sub-coordinators of the Scientific Committee

Rafael Humberto Pérez Soto, MD

Ma. Eugenia Ordoñez Gutiérrez, MD

Coordinator of Courses PG1

Héctor Leonardo Pimentel Mestre, MD

Coordinator of Courses PG1 (Practical)

Víctor Manuel Pinto Angulo, MD

Miguel Magdaleno García, MD

Coordinators of Courses PG2

Juan Francisco Molina López, MD

David Nadab Mitre Reyes, MD

Coordinators of ECOS International

Rafael Humberto Pérez Soto, MD

Ismael Domínguez Rosado, MD

Coordinators of Social Networks

Tanya G. Reyes Herrera, MD

Víctor Pinto Angulo, MD

Armando Pereyra Talamantes, MD

Itzel Vela Sarmiento, MD

Coordinator of Regional Meetings

Antonio Chalita Manzur, MD

Coordinator of Symposia

Raúl Hernández Centeno, MD

Coordinator of Virtual International Symposia

Eduardo Prado Orozco, MD

Luis A. Martín del Campo González, MD

Coordinators of Incorporated Societies

Elena López Gavito, MD

Rigoberto Zamora Godínez, MD

Coordinators of Free Papers

Edgar Fernando Hernández García, MD

Gabriela Elaine Gutiérrez Uvalle, MD

Coordinator of Clinical Films

Hugo Alejandro Sánchez Aguilar, MD

Samuel Kleinfinger Marcuschamer, MD

Jesús Montoya Ramírez

Coordinators of the Committee of Attention to Associates

Enrique Stoopen Margain, MD

Manuel Wilfrido Hidalgo Barraza, MD

Enrique Ricardo Jean Silver, MD

Vicente Jongitud Bulos, MD

Coordinators of the Committee of Continuing Medical Education

M. Patricia Sánchez Muñoz, MD

Armando Hernández Cendejas, MD

Marco Antonio Carreño Lomelí, MD

Coordinator of the Committee of Clinical Simulation

José Arturo Vázquez Vázquez, MD

Sub-coordinators of the Committee of Clinical Simulation

Jorge Ruiz Lizárraga, MD

Mauro Eduardo Ramírez Solís, MD

Coordinators of the Committee of Scientific Research

Gerardo Enrique Muñoz Maldonado, MD

Fernando Azcoitia Moraila, MD

Coordinators of Surgeon Encounter

Claudia Beatriz Domínguez Fonseca, MD

Abraham Pulido Cejudo, MD

Héctor F. Noyola Villalobos, MD

EDITORIAL**Reducing the risks of nuclear war: the role of health professionals** 129

Kamran Abbasi, Parveen Ali, Virginia Barbour, Kirsten Bibbins-Domingo, Marcel GM Olde Rikkert, Andy Haines, Ira Helfand, Richard Horton, Bob Mash, Arun Mitra, Carlos Monteiro, Elena N Naumova, Eric J Rubin, Tilman Ruff, Peush Sahni, James Tumwine, Paul Yonga, Chris Zielinski

ORIGINAL ARTICLES**Prevalence of complicated cholecystitis during COVID-19 pandemic time in a second level hospital** 132

Mauricio Muñoz-Muñoz, Michelle G Macías-Rodríguez, Sergio I Castañeda-Rocha, Mariana A Torres-Ramírez

Mexican Association of General Surgery, A.C.**Enhanced Surgical Recovery Program.****Thyroid endocrine surgery** 138

Rafael Humberto Pérez-Soto, Uriel Clemente-Gutiérrez, Raúl Alvarado-Bachmann, Erich Otto Paul Basurto-Kuba, Claudia Beatriz Domínguez-Fonseca, Elpidio Manuel Barajas-Fregoso, María Nayvi España-Gómez, Luis Mauricio Hurtado-López, Sandra Gabriela Medina-Escobedo, Jorge Montalvo-Hernández, Juan Pablo Pantoja-Millán, Marco Antonio Piscil-Salazar, Guillermo Ponce de León-Ballesteros, Héctor Romero-Talamás, Mauricio Sierra-Salazar, Jorge Emilio Arch-Ferrer, Karla Verónica Chávez-Tostado, Carlos Gustavo Rivera-Robledo, Daniel Garay-Lechuga, Enrique Stoopen-Margáin, Rafael Enrique Fajardo-Cevallo, Samuel Ordóñez-Ortega, David Velázquez-Fernández

Global surgery in Mexico: a cross-sectional analysis of the “Extramural Surgery Campaigns” 152

David Olvera-Pérez, Vicente González-Ruiz, Guillermo López-Espinoza, Bernardo Medina-Portillo, Eric Romero-Arredondo

REVIEW**Surgical versus medical management in cutaneous loxoscelism: systematic review and update** 160

Aldo Israel Olan-De Los Santos, Hilda Alejandra Manzo-Castrejón, Enrique Corona-Díaz, Grecia Fernanda Hurtado-Miranda, Leonel Eduardo Franco-Ponce, Juan Daniel Arreola-Pérez, Uriel Esaid Arellano-Romero, Juan Manuel Alanís-Nava, Jonathan Javier Ortiz-Márquez, Iván San Pedro-Rodríguez

CLINICAL CASES**Conservative management of severe hepatic injury by firearm projectile** 175

Jorge Octavio Gutiérrez-Pérez, Cristina Grado-Limas, Yazmín Cabello-Aguilar, Luis Cruz-Benítez

Anal melanoma: the importance of its diagnosis 180

Yoselin Julisa Sarabia-Pérez, Cheryl Zilahy Díaz-Barrientos, Mónica Heredia-Montaño, Jorge Miguel García-Salazar, Omar Sosa-Sánchez

Reconstruction of skin defects on the penis after severe burns 184

Paul Robledo-Madrid, Nelson Niels Espinosa-Queb, María Fernanda Álvarez-Alatriste, Erik Agustín Márquez-Gutiérrez, Mario Vélez-Palafox

HISTORY, ETHICS AND PHILOSOPHY**The ABC of palliative care for the general surgeon** 190

Sara Concepción Ortega-Espino, Josefina Serrano-Pérez

EDITORIAL

- Reducir los riesgos de una guerra nuclear: el papel de los profesionales de la salud** 129
Kamran Abbasi, Parveen Ali, Virginia Barbour, Kirsten Bibbins-Domingo, Marcel GM Olde Rikkert, Andy Haines, Ira Helfand, Richard Horton, Bob Mash, Arun Mitra, Carlos Monteiro, Elena N Naumova, Eric J Rubin, Tilman Ruff, Peush Sahni, James Tumwine, Paul Yonga, Chris Zielinski

ARTÍCULOS ORIGINALES

- Prevalencia de colecistitis complicada durante el tiempo de la pandemia por COVID-19 en un hospital de segundo nivel** 132
Mauricio Muñoz-Muñoz, Michelle G Macías-Rodríguez, Sergio I Castañeda-Rocha, Mariana A Torres-Ramírez

- Asociación Mexicana de Cirugía General, A.C. Programa de Recuperación Quirúrgica Mejorada. Cirugía endocrina tiroidea** 138
Rafael Humberto Pérez-Soto, Uriel Clemente-Gutiérrez, Raúl Alvarado-Bachmann, Erich Otto Paul Basurto-Kuba, Claudia Beatriz Domínguez-Fonseca, Elpidio Manuel Barajas-Fregoso, María Nayví España-Gómez, Luis Mauricio Hurtado-López, Sandra Gabriela Medina-Escobedo, Jorge Montalvo-Hernández, Juan Pablo Pantoja-Millán, Marco Antonio Piscil-Salazar, Guillermo Ponce de León-Ballesteros, Héctor Romero-Talamás, Mauricio Sierra-Salazar, Jorge Emilio Arch-Ferrer, Karla Verónica Chávez-Tostado, Carlos Gustavo Rivera-Robledo, Daniel Garay-Lechuga, Enrique Stoopan-Margáin, Rafael Enrique Fajardo-Cevallo, Samuel Ordóñez-Ortega, David Velázquez-Fernández

- Cirugía global en México: análisis transversal de las “Campañas de Cirugía Extramuros”** 152
David Olvera-Pérez, Vicente González-Ruiz, Guillermo López-Espinoza, Bernardo Medina-Portillo, Eric Romero-Arredondo

ARTÍCULO DE REVISIÓN

- Manejo quirúrgico versus tratamiento médico en loxoscelismo cutáneo: revisión sistemática y actualización** 160
Aldo Israel Olan-De Los Santos, Hilda Alejandra Manzo-Castrejón, Enrique Corona-Díaz, Grecia Fernanda Hurtado-Miranda, Leonel Eduardo Franco-Ponce, Juan Daniel Arreola-Pérez, Uriel Esaid Arellano-Romero, Juan Manuel Alanís-Nava, Jonathan Javier Ortiz-Márquez, Iván San Pedro-Rodríguez

CASOS CLÍNICOS

- Manejo conservador de lesión hepática severa por proyectil de arma de fuego** 175
Jorge Octavio Gutiérrez-Pérez, Cristina Grado-Limas, Yazmín Cabello-Aguilar, Luis Cruz-Benítez

- Melanoma anal: la importancia en su diagnóstico** 180
Yoselin Julisa Sarabia-Pérez, Cheryl Zilahy Díaz-Barrientos, Mónica Heredia-Montaño, Jorge Miguel García-Salazar, Omar Sosa-Sánchez

- Reconstrucción de defectos cutáneos en pene después de quemaduras severas** 184
Paul Robledo-Madrid, Nelson Niels Espinosa-Queb, María Fernanda Álvarez-Alatraste, Erik Agustín Márquez-Gutiérrez, Mario Vélez-Palafox

HISTORIA, ÉTICA Y FILOSOFÍA

- El ABC de los cuidados paliativos para el cirujano general** 190
Sara Concepción Ortega-Espino, Josefina Serrano-Pérez

Reducing the risks of nuclear war: the role of health professionals

Reducir los riesgos de una guerra nuclear: el papel de los profesionales de la salud

Kamran Abbasi,¹ Parveen Ali,² Virginia Barbour,³ Kirsten Bibbins-Domingo,⁴ Marcel GM Olde Rikkert,⁵ Andy Haines,⁶ Ira Helfand,⁷ Richard Horton,⁸ Bob Mash,⁹ Arun Mitra,⁷ Carlos Monteiro,¹⁰ Elena N Naumova,¹¹ Eric J Rubin,¹² Tilman Ruff,⁷ Peush Sahni,¹³ James Tumwine,¹⁴ Paul Yonga,¹⁵ Chris Zielinski¹⁶

¹ Editor-in-Chief, British Medical Journal.

² Editor-in-Chief,

International Nursing Review.

³ Editor-in-Chief, Medical Journal of Australia.

⁴ Editor-in-Chief, Journal of the American Medical Association.

⁵ Editor-in-Chief, Dutch Journal of Medicine.

⁶ London School of Hygiene and Tropical Medicine.

⁷ Past President, International Physicians for the Prevention of Nuclear War.

⁸ Editor-in-Chief, The Lancet.

⁹ Editor-in-Chief, African Journal of Primary Health Care & Family Medicine.

¹⁰ Editor-in-Chief, Revista de Saúde Pública.

¹¹ Editor-in-Chief, Journal of Public Health Policy.

¹² Editor-in-Chief, New England Journal of Medicine.

¹³ Editor-in-Chief, National Medical Journal of India.

¹⁴ Editor-in-Chief, African Health Sciences.

On January 2023, the Science and Security Board of the Bulletin of the Atomic Scientists advanced the hands of the 90s doomsday clock ahead of midnight, reflecting the growing risk of nuclear war.¹ In August 2022, United Nations (UN) Secretary-General António Guterres warned that the world is now in “an era of nuclear danger not seen since the height of the Cold War.”² Growing tensions between many nuclear-armed states have accentuated the danger.^{1,3} As editors of health-related biomedical journals worldwide, we call on health professionals to alert the public and our leaders to this grave danger to public health and the planet’s essential life-support systems. We urge that action be taken to avert it.

Current nuclear arms control and nonproliferation efforts need to be improved to protect the world’s population against the threat of nuclear war by design, error, or miscalculation. The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) commits each of the 190 participating nations to “pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control”.⁴ Progress could have been much faster, and the last

NPT review conference, held in 2022, ended without a consensus statement.⁵

There are many examples of near catastrophes that have highlighted the risks of relying on nuclear deterrence for the indefinite future.⁶ Modernization of nuclear arsenals could increase the risks; for example, hypersonic missiles decrease the time available to distinguish between an attack and a false alarm, increasing the likelihood of rapid escalation.

Any use of nuclear weapons would be catastrophic for humanity. Even a “limited” nuclear war involving only 250 of the world’s 13,000 nuclear weapons could kill 120 million people and cause global climate disruption, leading to a nuclear famine endangering 2 billion people.^{7,8} A full-scale nuclear war between the U.S. and Russia could kill 200 million people or more in the short term and potentially trigger a global “nuclear winter” that could kill between 5 billion and 6 billion people, threatening the survival of humanity.^{7,8} Once a nuclear weapon is detonated, a nuclear war could quickly ensue. Preventing any use of nuclear weapons is, therefore an urgent public health priority, and fundamental steps must also be taken to address the root of the problem: the abolition of nuclear weapons.

Health-focused communities have played a crucial role in reducing the risk of nuclear war



How to cite: Abbasi K, Ali P, Barbour V, Bibbins-Domingo K, Olde RMGM, Haines A, et al. Reducing the risks of nuclear war: the role of health professionals. *Cir Gen.* 2023; 45 (3): 129-131. <https://dx.doi.org/10.35366/112921>

¹⁵ Editor-in-Chief, East African Medical Journal.

¹⁶ University of Winchester, World Association of Medical Editors.

and must continue to do so in the future.⁹ In the 1980s, the efforts of health professionals, led by the International Physicians for the Prevention of Nuclear War (IPPNW), helped end the Cold War arms race by educating policymakers and the public on both sides of the Iron Curtain about the medical consequences of nuclear war. This was recognized by the award of the 1985 Nobel Peace Prize to IPPNW¹⁰ (<http://www.ippnw.org>).

In 2007, IPPNW launched the International Campaign to Abolish Nuclear Weapons, a global civil society campaign with hundreds of partner organizations. A path to nuclear abolition was created with the adoption of the Treaty on the Prohibition of Nuclear Weapons in 2017, for which the International Campaign to Abolish Nuclear Weapons received the 2017 Nobel Peace Prize.

International medical organizations such as the International Committee of the Red Cross, the IPPNW, the World Medical Association, the World Federation of Public Health Associations, and the International Council of Nurses played a crucial role in the process leading up to the negotiations and in the talks, themselves, presenting the scientific evidence on the catastrophic health and environmental consequences of nuclear weapons and nuclear warfare. They continued this essential collaboration during the First Meeting of States Parties to the Treaty on the Prohibition of Nuclear Weapons, which now has 92 signatories, including 68 member states.¹¹

We now call on health professional associations to inform their members worldwide about the threat to human survival and to join the IPPNW in supporting efforts to reduce the near-term risks of nuclear war, including three immediate steps by the nuclear weapons states and their allies: first, adopt a no-first-use policy;¹² second, take their nuclear weapons off hair-trigger alert; and, third, urge all states involved in current conflicts to publicly and unequivocally commit not to use nuclear weapons in these conflicts.

In addition, we call on you to work for a definitive end to the nuclear threat by supporting the urgent commencement of negotiations among the nuclear-armed states to

reach a verifiable and time-bound agreement to eliminate their nuclear weapons under NPT commitments, opening the way for all nations to accede to the Treaty on the Prohibition of Nuclear Weapons.

The danger is significant and growing. Nuclear-armed states must eliminate their nuclear arsenals before they eliminate us. Health-focused communities have played a decisive role during the Cold War and, more recently, in developing the Treaty on the Prohibition of Nuclear Weapons. We must once again take up this challenge as an urgent priority, working with renewed energy to reduce the risks of nuclear war and eliminate nuclear weapons.

This editorial is published simultaneously in several journals: <https://www.bmj.com/content/full-list-authors-and-signatories-nuclear-risk-editorial-august-2023>

REFERENCES

1. Science and Security Board, Bulletin of the Atomic Scientists. A time of unprecedented danger: it is 90 seconds to midnight. 2023 Doomsday Clock Statement. Jan 24, 2023. [Accessed June 1, 2023] Available in: <https://thebulletin.org/doomsday-clock/current-time/>
2. Meetings Coverage and Press Releases. Future Generations Counting on Our Commitment to Step Back from Abyss, Lift Cloud of Nuclear Annihilation for Good, Secretary-General Tells Review Conference, Press Release Aug 1, 2022, SG/SM/21394. [Accessed 10 July 2023] Available in: <https://press.un.org/en/2022/sgsm21394.doc.htm>
3. Tollefson J. Is nuclear war more likely after Russia's suspension of the New START treaty? *Nature*. 2023; 615: 386.
4. 2005 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). May 2–27, 2005. [Accessed June 2, 2023] Available in: <https://www.un.org/en/conf/npt/2005/npttreaty.html>
5. Mukhatzhanova 10th NPT Review Conference: why it was doomed and how it almost succeeded. Arms Control Association. October 2022. [Accessed June 2, 2023] Available in: <https://www.armscontrol.org/act/2022-10/features/10th-npt-review-conference-why-doomed-almost-succeeded>
6. Lewis P, Pelopidas B, Williams H, Aghlani S. Too close for comfort, cases of near nuclear use and options for policy. Chatham house report. 2014. [Accessed June 1, 2023] Available in: <https://www.chathamhouse.org/2014/04/too-close-comfort-cases-near-nuclear-use-and-options-policy>
7. Bivens M. Nuclear famine. IPPNW. August 2022. [Accessed June 1, 2023] Available in: <https://www.ippnw.org/>

- ippnw.org/wp-content/uploads/2022/09/ENGLISH-Nuclear-Famine-Report-Final-bleed-marks.pdf
8. Xia L, Robock A, Scherrer K, et al. Global food insecurity and famine from reduced crop, marine fishery, and livestock production due to climate disruption from nuclear war soot injection. *Nat Food*. 2022; 3: 586-596.
 9. Helfand I, Lewis P, Haines A. Reducing the risks of nuclear war to humanity. *Lancet*. 2022; 399: 1097-1098.
 10. Nobel Prize Outreach AB. International physicians for the prevention of nuclear war facts. 1985. [Accessed June 1, 2023] Available in: <https://www.nobelprize.org/prizes/peace/1985/physicians/facts/>
 11. United Nations. Office for Disarmament Affairs. Treaties database. Treaty on the prohibition of nuclear weapons, status of the treaty. 2023. [Accessed June 1, 2023] Available in: <https://treaties.unoda.org/t/tpnw>
 12. Center for Arms Control and Non-Proliferation. No first use: frequently asked questions. 2023. [Accessed June 2, 2023] Available in: <https://armscontrolcenter.org/issues/no-first-use/no-first-use-frequently-asked-questions/>

Correspondence:

Chris Zielinski

Centre for Global Health, University of Winchester, UK, Vice President, World Association of Medical Editors (WAME)

E-mail: czielinski@ippnw.org

Prevalence of complicated cholecystitis during COVID-19 pandemic time in a second level hospital

Prevalencia de colecistitis complicada durante el tiempo de la pandemia por COVID-19 en un hospital de segundo nivel

Mauricio Muñoz-Muñoz,* Michelle G Macías-Rodríguez,*
Sergio I Castañeda-Rocha,* Mariana A Torres-Ramírez*

Keywords:

cholecystitis,
cholelithiasis,
pyocholecystolithiasis,
hydrocholecystolithiasis.

Palabras clave:

colecistitis,
colecistiasis,
piocolecisto,
hidrocolecistolitiasis.

ABSTRACT

Introduction: acute cholecystitis is an inflammation of the gallbladder, secondary to obstruction in most cases. **Objective:** to determine the prevalence of complicated cholecystitis. **Material and methods:** a descriptive, cross-sectional and observational study was performed; records of 73 patients operated on for acute cholecystitis during January 2020 to February 2021 were collected to determine the prevalence of this pathology during this period. Inclusion criteria: patients who met criteria for acute lithiasic cholecystitis; exclusion criteria: patients with data of choledocholithiasis and biliary pancreatitis. **Results:** 73 postoperative cholecystectomy patients with acute lithiasic cholecystitis were included, of which 79% (n = 58) were women and 21% (n = 15) men; the age group most affected was between 40-49 years old in 31% (n = 23). Seventy-five percent (n = 55) met Tokio grade II criteria, with duration of more than 72 hours being the criterion most present in 77% (n = 42), and 92% (n = 67) of the surgeries were performed laparoscopically. **Conclusions:** there was a slight increase in the prevalence of complicated cholecystitis with 8% of pyocholecystolithiasis, 7% hydrocholecystolithiasis and 3% gangrenous cholecystitis, which represents double the prevalence in other studies, and shows that it could have been affected by the closure of the consultation and elective surgery as a consequence of the pandemic.

RESUMEN

Introducción: la colecistitis aguda es una inflamación de la vesícula, secundaria a obstrucción en la mayor parte de las ocasiones. **Objetivo:** determinar la prevalencia del aumento de colecistitis complicada. **Material y métodos:** se realizó un estudio descriptivo, transversal y observacional, se recabaron expedientes de 73 pacientes operados por colecistitis aguda durante enero de 2020 a febrero de 2021 para determinar la prevalencia de esta patología durante este periodo. **Criterios de inclusión:** pacientes que cumplieran criterios de cuadro agudo de colecistitis litiasica; **criterios de exclusión:** pacientes con datos de coledocolitiasis y pancreatitis biliar. **Resultados:** se incluyeron 73 pacientes postoperados de colecistectomía por colecistitis litiasica agudizada, de los cuales 79% (n = 58) fueron mujeres y 21% (n = 15) hombres, el grupo de edad mayormente afectado estuvo entre 40-49 años en 31% (n = 23). El 75% (n = 55) cumplieron con criterios de Tokio grado II, siendo la duración mayor de 72 horas el criterio más presente en 77% (n = 42) y 92% (n = 67) de las cirugías se realizaron vía laparoscópica. **Conclusiones:** se demostró un ligero aumento de la prevalencia de colecistitis complicada con 8% de piocolecistolitiasis, 7% hidrocolecistolitiasis y 3% colecistitis gangrenosa, lo que representa el doble de prevalencia en otros estudios, esto demuestra que pudo verse afectado por el cierre de la consulta y la cirugía electiva a consecuencia de la pandemia.

* General Surgery
Resident. General
Hospital "Dr. Norberto
Treviño Zapata".

Received: 02/21/2023
Accepted: 07/18/2023



INTRODUCTION

Acute cholecystitis is an inflammation of the gallbladder, where biliary colic is the main symptom of cholelithiasis without inflammation

of the gallbladder; the inflammation is secondary to obstruction of the gallbladder usually secondary to a litho at the level of the neck or cystic duct, obstructing the drainage of the gallbladder and causing an increase in

How to cite: Muñoz-Muñoz M, Macías-Rodríguez MG, Castañeda-Rocha SI, Torres-Ramírez MA. Prevalence of complicated cholecystitis during COVID-19 pandemic time in a second level hospital. Cir Gen. 2023; 45 (3): 132-137. <https://dx.doi.org/10.35366/112922>

intraluminal pressure, producing edema of the wall that can progress to ischemia, necrosis, and perforation.¹

Diagnosis is based on clinical findings on physical examination, laboratory results and imaging criteria;² in 2008 the Tokyo guidelines were published and subsequently updated in 2013 and 2018, and their criteria include local signs of inflammation, systemic signs of inflammation, and imaging study findings, which help in the diagnosis and staging of the clinical picture according to the severity of the inflammatory process.

In the clinical picture is common the presence of pain in the right hypochondrium that can sometimes radiate to the ipsilateral scapula and positive Murphy's sign; and signs of systemic inflammation may include fever, tachycardia, elevated blood cell count, C-reactive protein (CRP), and other laboratory markers.

Ultrasound imaging is the initial study of choice when acute cholecystitis is suspected, due to its low cost, easy access, and short time required to perform it; computed tomography (CT) or magnetic resonance imaging (MRI) can be used to evaluate or exclude other pathologies that present with pain in the right hypochondrium.³ Ultrasound is more sensitive for detecting gallbladder stones, CT is less sensitive because the composition of the stones may vary; thickening of the gallbladder wall is the most common finding during imaging studies, and distension of the gallbladder, pericholecystic fluid and sometimes a stone embedded in the neck or cystic duct can also be visualized.

Based on the Tokyo guidelines, a grade I cholecystitis can be considered as an uncomplicated condition, while a complicated cholecystitis would be a grade II or III,⁴ giving a treatment algorithm according to the degree of severity, in which it is recommended that in patients with grade I, a laparoscopic cholecystectomy be performed, in grade II it is suggested that laparoscopic cholecystectomy be performed in highly experienced centers, and in grade III a cholecystostomy should be performed.

Laparoscopic cholecystectomy has been accepted as the treatment of choice for acute

cholecystitis.⁵ Traditionally acute cholecystitis was treated conservatively in its acute phase with a new hospital admission several weeks later for scheduled cholecystectomy.⁶ It was thought that avoiding the acute inflammatory process could have a lower incidence of complications. Multiple studies have been carried out to determine the optimal time for cholecystectomy, and it is recommended that cholecystectomy be performed as soon as possible after diagnosis, unlike the Tokyo guidelines, which recommend that it should be performed only in grade I cases and in some selected grade II cases. Early cholecystectomy has been shown to decrease in-hospital stay. There is no increased risk of complications or procedure conversion, and it has been shown that there is a higher risk of bile duct injury in patients with delayed cholecystectomy.⁷

We speak of a difficult cholecystectomy when there is a conversion from laparoscopic to open surgery or when an iatrogenic injury occurs during surgery.⁸ The incidence of procedure conversion is reported as 1.9-11.9%.⁹ Several risk factors for a difficult cholecystectomy have been identified throughout clinical history, among which are: male sex, advanced age, chronic acute cholecystitis, obesity, liver cirrhosis, biliodigestive fistula, adhesions due to previous surgeries in the right upper quadrant, and others. Within the imaging studies, the factor with statistical association for conversion was the thickness of the gallbladder wall, being than 6 mm,¹⁰ and during surgery the main reason for conversion is the poor visualization of the biliary anatomy and the difficulty to dissect the structures of Calot's triangle.

Complicated cholecystitis includes empyema and gangrenous cholecystitis, the latter occurring in 2 to 36% of patients with acute cholecystitis,¹¹ which increases the incidence of morbidity and mortality. Several scales have been used to try to predict complicated cholecystitis and difficult laparoscopic cholecystectomy. We previously mentioned the Tokyo scale, later the American Association of Trauma Surgeons (AATS) scale was developed, which includes among its criteria radiological findings, intraoperative findings, and the histopathological report¹² and it has been mentioned in studies that

the latter is more sensitive than the Tokyo scale which does not mention the extent of gallbladder inflammation, as it does not include intraoperative findings in its criteria,¹³ so studies have shown that the way to classify the severity of inflammation for cholecystitis is better defined and classified during surgery than any imaging study.¹⁴

Medical treatment is considered in certain areas, prevents the risk of surgery, includes fasting, intravenous hydration, analgesics, and intravenous antibiotics, followed by delayed cholecystectomy.¹⁵ Medical management can be effective in patients with grade I cholecystitis, but recurrence of the clinical picture has been demonstrated within two years after the initial clinical picture, and medical management may be considered in elderly patients or those with multiple comorbidities.

Open surgery was once considered the gold standard for acute cholecystitis, until a few years ago when it was demonstrated, that emergency gallbladder surgery had benefits such as: low incidence of surgical site infection and fewer days of hospital stay, but did not show great differences between the time of intervention, blood loss during surgery or incidence of biliary injury.¹⁶ Studies have also been carried out to determine the optimal time for cholecystectomy and it has been determined that the ideal time is to operate within 72 hours after admission to the emergency room,¹⁷ it has been shown that chronic inflammation causes fibrosis, adhesions, and distortion of the anatomy, making dissection difficult when performing laparoscopic cholecystectomy.¹⁸ It has been seen that there is a lower rate of morbidity, complications, and conversion from laparoscopic to open surgery when an early cholecystectomy is performed compared to a late one.

Among them, subtotal cholecystectomy has been reported, which is performed when the structures of Calot's triangle are not clearly visualized due to a dense fibrosis.¹⁹ When performed laparoscopically, it prevents injury to the biliary tract and significantly reduces the conversion of the procedure, and cases of recurrence of lithiasic disease are rare. Another option that has been described is cholecystostomy, which has been accepted as

a less invasive procedure than cholecystectomy and temporary improvement, especially in critical patients; it has been used to decompress the gallbladder and improving the subsequent inflammation.²⁰ However, there are not established defined criteria to perform this procedure, but the main indication is in patients with grade III cholecystitis, according to the Tokyo scale.²¹

There are intraoperative scales that evaluate the degree of inflammation and anatomy, such as the Parkland and the World Society of Emergency Surgery (WSES) scales. They have a good correlation with technical difficulties during the procedure or conversion of the surgery.²² The main complications following cholecystectomy are bile duct injury, biliary leakage, bile duct stenosis, biliomas, and presence of retained bile in the common bile duct.²³

Gestational cholecystitis occurs in 1 to 6 per 10,000 pregnancies and represents the second most frequent cause of non-obstetric abdominal pain during pregnancy.²⁴ It has been recommended to perform laparoscopic cholecystectomy during the second trimester, since it has been shown that delaying the procedure may increase the risk of maternal-fetal complications.

During the COVID-19 pandemic, surgical services were forced to suspend all scheduled surgeries for the management of benign and low-risk pathologies,²⁵ so it is believed that most of acute cholecystitis cases that arrived to the emergency departments were at higher risk of complication or more severe enough to proceed to surgery.

MATERIAL AND METHODS

A descriptive, cross-sectional, and observational study was conducted, where records of 73 patients operated on for acute cholecystitis during the period from January 2020 to February 2021 were collected to determine the prevalence of this pathology.

Inclusion criteria were all patients who met the criteria for acute lithiasic cholecystitis. Exclusion criteria included patients with data of choledocholithiasis and biliary pancreatitis.

Descriptive statistics were performed, and values were expressed as mean and standard deviation. Qualitative variables were expressed as percentages.

RESULTS

The records of 73 patients undergoing cholecystectomy for acute calculous cholecystitis during the study period were included, where 79% (n = 58) were female and 21% (n = 15) were male. The patients were grouped by decade of life (Figure 1).

To determine the severity of acute lithiasic cholecystitis, we classified them based on the Tokyo criteria; of the 73 patients who underwent surgery, 25% (n = 18) met grade I criteria (mild) and 75% (n = 55) presented at least one criterion for grade II (moderate) and there were no cases with grade III criteria (severe). Within the 75% (n = 55) of patients who had a moderate criteria picture, the presence of symptoms greater than 72 hours was the main parameter in 77% (n = 42), followed by local findings in 14% (n = 7) and leukocytosis in 9% (n = 5); none had a mass on palpation of the right upper quadrant.

During the surgical findings of the 73 patients, 81% (n = 59) had an uncomplicated acute condition and 19% (n = 14) had a complicated acute condition, 8% (n = 6) had pycholecystolithiasis, 4% (n = 3) had gangrenous cholecystitis, and 7% (n = 5) had hydrocholecystolithiasis. Cholecystectomy

was performed laparoscopically in 92% (n = 67), and in 8% (n = 6) it was used an open approach. In all of them, the procedure was successfully performed with complete removal of the gallbladder. Of the 14 patients who had complicated cholecystitis, 71% (n = 10) were female and 29% (n = 4) were male.

DISCUSSION

As previously mentioned, in Mexico there is a lack of reliable information on the pathology of biliary lithiasis, its incidence and the different treatments.

Acute cholecystitis is the main complication of cholelithiasis and represents 20% of admissions to emergency centers. In our case, 100% of the patients had acute symptoms, of which 81% (n = 59) met the Tokyo criteria for mild symptoms, 19% (n = 14) for moderate symptoms and none for severe symptoms.

Based on a study performed at the Central Hospital of Chihuahua on emergency cholecystectomies performed in a period of one year, there were 22 hydrocholecystolithiasis cases representing 3.73%, 36 cases with pyocystocystolithiasis (7.18%) and one gangrenous cholecystitis. In our study, there were 3% of gangrenous cholecystitis, 7% hydrocholecystolithiasis, and 8% piocholecystolithiasis, which in general shows that there was an increase of almost the double of the percentage for hydrocholecystolithiasis and 1% in piocholecystolithiasis.

Overall, for patients undergoing elective cholecystectomy surgery, there is an incidence of conversion of 5%, increasing 5% in emergency surgery; in our study, no conversion procedures were done.

Of the 73 cholecystectomies, 8% (n = 6) were initially performed openly; this decision may have been influenced by a lack of material or by the attending physician decision based on the Tokyo criteria and the high risk of conversion.

It is shown that there was a slight increase in the prevalence of complicated cholecystitis influenced not only by the suspension of elective surgery, but also by the fear of going to hospital centers for evaluation due to the high incidence of COVID-19 cases, so it was

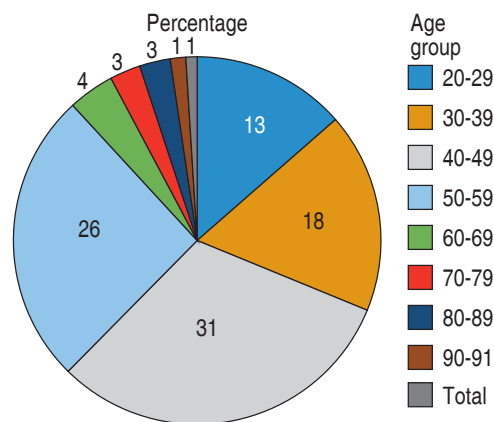


Figure 1: Age group percentage presentation.

evidenced that the patients were on distress for more than 72 hours, which favored that they could present a complicated picture.

CONCLUSIONS

1. Acute cholecystitis represents the most frequent complication in patients with cholelithiasis and constitutes 20% of admissions to emergency departments. In our study, all patients who underwent surgery presented acute symptoms, some with more severe criteria than others.
2. There was a minimal increase in cases of complicated cholecystitis during the COVID-19 pandemic period with the subsequent suspension of elective surgeries.
3. There was an increase in the number of days of hospital stay in patients with complicated cholecystitis.
4. All laparoscopic cholecystectomies were successfully performed, so there was no incidence of conversion procedures from laparoscopic to open surgery.

ACKNOWLEDGMENTS

The authors would like to thank all the operating room staff of the Hospital General Dr. Norberto Treviño Zapata in Ciudad Victoria, Tamaulipas.

REFERENCES

1. Kirkendoll SD, Kelly E, Kramer K, Alouidor R, Winston E, Putnam T, et al. Optimal timing of cholecystectomy for acute cholecystitis: a retrospective cohort study. *Cureo*. 2022; 14: e28548.
2. Escartín A, González M, Muriel P, Cuello E, Pinillos A, Santamaría M, et al. Acute calculous cholecystitis: application of the Tokyo Guidelines in severity criteria. *Cir Cir*. 2020; 89: 12-21.
3. Chawla A, Bosco JJ, Lim TC, Srinivasan S, Teh HS, Shenoy JN. Imaging of acute cholecystitis and complications associated with cholecystitis in the emergency setting. *Singapore Med J*. 2015; 56: 438-443.
4. Ambe PC, Christ H, Wassenberg D. Do the Tokyo guidelines predict the degree of gallbladder inflammation in patients with acute cholecystitis? A single-center retrospective analysis. *BMC Gastroenterol*. 2015; 15: 142.
5. Endo I, Takada T, Hwang TL, Akazawa K, Mori R, Miura F, et al. Optimal treatment strategy for acute cholecystitis based on predictive factors: a Japan-Taiwan multicenter cohort study. *J Hepatobiliary Pancreat Sci*. 2017; 24: 346-361.
6. Zafar SN, Obirieze A, Adesibikan B, Cornwell EE 3rd, Fullum TM, Tran DD. Optimal timing of early laparoscopic cholecystectomy for acute cholecystitis. *JAMA Surg*. 2015; 150: 129-136.
7. Campanile FC, Pisano M, Coccolini F, Catena F, Agresta F, Ansaloni L. Acute cholecystitis: position statement of WSES. *World J Emerg Surg*. 2014; 9: 58.
8. Díaz-Flores A, Cárdenas-Lailson E, Cuendis-Velázquez A, Rodríguez-Parra A, Trejo-Ávila ME. C-reactive protein as a predictor of difficult laparoscopic cholecystectomy in patients with acute calculous cholecystitis: a multivariate analysis. *J Laparoendosc Adv Surg Tech A*. 2017; 27: 1263-1268.
9. Sapmaz A, Karaca AS. Risk factors for conversion to open surgery in laparoscopic cholecystectomy: a single center experience. *Turk J Surg*. 2021; 37: 28-32.
10. Izquierdo YE, Díaz Díaz NE, Muñoz N, Guzmán OE, Contreras Bustos I, Gutiérrez JS. Presurgical factors associated with technical difficulties of laparoscopic cholecystectomy in acute cholecystitis. *Radiology*. 2018; 60: 57-63.
11. Wu B, Buddensick TJ, Ferdosi H, Narducci DM, Sautter A, Setiawan L, et al. Predicting gangrenous cholecystitis. *HPB (Oxford)*. 2014; 16: 801-806.
12. Hernandez M, Murphy B, Aho JM, Haddad NN, Saleem H, Zeb M, et al. Validation of the AAST EGS acute cholecystitis grade and comparison with the Tokyo guidelines. *Surgery*. 2018; 163: 739-746.
13. Sugrue M, Coccolini F, Bucholz M, Johnston A, Contributors from WSES. Intra-operative gallbladder scoring predicts conversion of laparoscopic to open cholecystectomy: a WSES prospective collaborative study. *World J Emerg Surg*. 2019; 14: 12.
14. Madni TD, Nakonezny PA, Imran JB, Taveras L, Cunningham HB, Vela R, et al. A comparison of cholecystitis grading scales. *J Trauma Acute Care Surg*. 2019; 86 (3): 471-478.
15. Van Dijk AH, de Reuver PR, Tasma TN, van Dieren S, Hugh TJ, Boermeester MA. Systematic review of antibiotic treatment for acute calculous cholecystitis. *Br J Surg*. 2016; 103: 797-811.
16. Loozen CS, Oor JE, van Ramshorst B, van Santvoort HC, Boerma D. Conservative treatment of acute cholecystitis: a systematic review and pooled analysis. *Surg Endosc*. 2017; 31: 504-515.
17. Coccolini F, Catena F, Pisano M, Gheza F, Fagioli S, Di Saverio S, et al. Open versus laparoscopic cholecystectomy in acute cholecystitis. Systematic review and meta-analysis. *Int J Surg*. 2015; 18: 196-204.
18. Cao AM, Eslick GD, Cox MR. Early laparoscopic cholecystectomy is superior to delayed acute cholecystitis: a meta-analysis of case-control studies. *Surg Endosc*. 2016; 30: 1172-1182.
19. José R, Tamayo A, Tort Martínez A, Olvera Hernández H, Ugalde Velásquez F, Israel J, et al. Role of laparoscopic subtotal cholecystectomy in complicated acute cholecystitis. *Rev Mex Cir Endoscop* 2016; 17: 146-150.
20. Atar E, Bachar GN, Berlin S, Neiman C, Bleich-Belenky E, Litvin S, et al. Percutaneous cholecystostomy in critically ill patients with acute cholecystitis:

- complications and late outcome. *Clin Radiol*. 2014; 69: e247-252.
21. Venara A, Carretier V, Lebigot J, Lermite E. Technique, and indications of percutaneous cholecystostomy in the management of cholecystitis in 2014. *J Visc Surg*. 2014; 151: 435-439.
 22. Di Martino M, Mora-Guzman I, Jodra VV, Dehesa AS, Garcia DM, Ruiz RC, et al. How to predict postoperative complications after early laparoscopic cholecystectomy for acute cholecystitis: the chole-risk Score. *J Gastrointest Surg*. 2021; 25: 2814-2822.
 23. Ahmad DS, Faulx A. Management of postcholecystectomy biliary complications: a narrative review: a narrative review. *Am J Gastroenterol*. 2020; 115: 1191-1198.
 24. Bustos-Guerrero AM, Guerrero-Macías SI, Manrique-Hernández EF, Gomez-Rincón GA. Severity of acute cholecystitis in times of COVID-19: myth or reality? *Rev Colomb Cir*. 2022; 37: 206-213.
 25. Cheng V, Matsushima K, Sandhu K, Ashbrook M, Matsuo K, Inaba K, et al. Surgical trends in the management of acute cholecystitis during pregnancy. *Surg Endosc*. 2021; 35: 5752-5759.

Ethical considerations and responsibility: data privacy. According to the protocols established in our work center, we declare that all the applying protocols on patient data privacy were followed, preserving their anonymity.

Funding: no financial support was received for the preparation of this work.

Disclosure: none of the authors have a conflict of interest in the conduct of this study.

Correspondence:

Mauricio Muñoz-Muñoz

E-mail: mao_mumu@hotmail.com

Mexican Association of General Surgery, A.C. Enhanced Surgical Recovery Program. Thyroid endocrine surgery

*Asociación Mexicana de Cirugía General, A.C.
Programa de Recuperación Quirúrgica Mejorada.
Cirugía endocrina tiroidea*

Rafael Humberto Pérez-Soto,¹ Uriel Clemente-Gutiérrez,¹ Raúl Alvarado-Bachmann,² Erich Otto Paul Basurto-Kuba,³ Claudia Beatriz Domínguez-Fonseca,⁴ Elpidio Manuel Barajas-Fregoso,⁵ María NayvÍ España-Gómez,⁶ Luis Mauricio Hurtado-López,³ Sandra Gabriela Medina-Escobedo,⁷ Jorge Montalvo-Hernández,⁸ Juan Pablo Pantoja-Millán,⁹ Marco Antonio Piscil-Salazar,¹⁰ Guillermo Ponce de León-Ballesteros,¹¹ Héctor Romero-Talamás,¹² Mauricio Sierra-Salazar,¹ Jorge Emilio Arch-Ferrer,¹³ Karla Verónica Chávez-Tostado,¹⁴ Carlos Gustavo Rivera-Robledo,¹⁵ Daniel Garay-Lechuga,¹ Enrique Stoopen-Margáin,² Rafael Enrique Fajardo-Cevallo,¹⁶ Samuel Ordóñez-Ortega,¹⁷ David Velázquez-Fernández¹

Keywords:

thyroid, endocrine surgery, thyroidectomy, enhanced recovery.

Palabras clave:

tiroides, cirugía endocrina, tiroidectomía, recuperación mejorada.

¹ Endocrine Surgery and Advanced Laparoscopy Service, Department of Surgery, National Institute of Medical Sciences and Nutrition "Salvador Zubirán".

² Department of Surgery, ABC Medical Center, Mexico City.

ABSTRACT

The main objective of enhanced recovery programs in surgery is to provide an efficient treatment based on the best scientific evidence in order to shorten the postoperative recovery time of patients, reduce the incidence of complications inherent to hospitalization and surgical treatment, and consequently reduce hospital costs. In our country, more than 50% of thyroidectomies are performed by low-volume surgeons, which has already been shown to increase the possibility of post-surgical complications, such as hypoparathyroidism and transient or permanent chordal paralysis. In the understanding that achieving the availability of high volume surgical human resources throughout the national territory is not a viable short-term objective, despite the efforts to train high specialists in endocrine surgery, one of the initiatives of the Mexican Association of General Surgery, A.C., is to issue a series of recommendations that support national surgeons to have better surgical results, with the sole objective of increasing the quality of care of the Mexican population. Until now, there was no established protocol in Mexico for

RESUMEN

Los programas de recuperación mejorada en cirugía tienen como principal objetivo brindar un tratamiento eficiente basado en la mejor evidencia científica con la finalidad de acortar el tiempo de recuperación postoperatoria de los pacientes, disminuir la incidencia de complicaciones inherentes a la hospitalización y tratamiento quirúrgico; y por consecuencia reducir los costos hospitalarios. En nuestro país, más de 50% de las tiroidectomías son realizadas por cirujanos de bajo volumen, lo que ya se ha demostrado que incrementa la posibilidad de complicaciones postquirúrgicas, tales como hipoparatiroidismo y parálisis cordal transitoria o permanente. En el entendimiento de que alcanzar la disponibilidad de recursos humanos quirúrgicos de alto volumen en todo el territorio nacional es un objetivo no viable a corto plazo, a pesar de los esfuerzos de formar altos especialistas en cirugía endocrina, una de las iniciativas de la asociación mexicana de cirugía general, A.C., es la de emitir una serie de recomendaciones que apoyen a los cirujanos nacionales a tener mejores resultados quirúrgicos, con el objetivo único de incrementar la



How to cite: Pérez-Soto RH, Clemente-Gutiérrez U, Alvarado-Bachmann R, Basurto-Kuba EOP, Domínguez-Fonseca CB, Barajas-Fregoso EM, et al. Mexican Association of General Surgery, A.C. Enhanced Surgical Recovery Program. Thyroid endocrine surgery. Cir Gen. 2023; 45 (3): 138-151. <https://dx.doi.org/10.35366/112923>

³ Neck Surgery Clinic and Thyroid Clinic, General Surgery Service, Hospital General de México "Dr. Eduardo Liceaga", Mexico City.

⁴ Department of General Surgery, Hospital General Regional No. 1 del IMSS "Dr. Carlos MacGregor Sánchez Navarro", Mexico City.

⁵ Endocrine Surgery, Head and Neck Oncologic Surgery Service, Clínica de Occidente, Cali, Colombia.

⁶ Endocrine Surgery Service, Hospital Ángeles de León, León, Guanajuato.

⁷ Endocrine and Minimally Invasive Surgery, Surgery Service, Hospital Regional de Alta Especialidad, Ciudad Victoria, Tamaulipas.

⁸ Endocrine Surgery and Advanced Laparoscopy Service, Hospital Central de PEMEX, Mexico City.

⁹ Digestive Disease Institute, Cleveland Clinic, Abu Dhabi.

¹⁰ Head and Neck Surgery, Department of General Surgery, Hospital de Especialidades Centro Médico Nacional La Raza.

¹¹ General Surgery Service, Civil Hospital of Morelia "Dr. Miguel Silva", Morelia, Michoacán.

¹² Department of Surgery and Chief of Teaching, Hospital Ángeles Chihuahua, Chihuahua, Chihuahua.

¹³ General and Oncologic Surgery, Hospital Ángeles del Carmen, Guadalajara, Jalisco.

¹⁴ General Surgery Service, Hospital General Ajusco Medio, Mexico City.

¹⁵ Head and Neck Surgery Service, Hospital de Especialidades Centro Médico Nacional Siglo XXI.

¹⁶ Endocrine Surgery, Hospital Faro del Mayab and Star Médica, Mérida, Yucatán.

¹⁷ General Surgery Service, General Hospital Zone No. 30, Iztacalco IMSS, Mexico City.

Received: 03/13/2023

Accepted: 06/30/2023

patients undergoing thyroid surgery. The purpose of the present work was to make a consensus of experts to issue recommendations in the preoperative, intraoperative and postoperative period to improve the outcomes of patients undergoing thyroidectomy. All these recommendations are based on the best available scientific evidence and are oriented to surgeons of both high and low surgical volume in terms of thyroidectomy.

calidad de atención de la población mexicana. Hasta la fecha actual, en México no existía, un protocolo establecido para los pacientes que son intervenidos de cirugía tiroidea. El presente trabajo tuvo como finalidad realizar un consenso de expertos para emitir recomendaciones en el periodo preoperatorio, intraoperatorio y postoperatorio para mejorar los desenlaces de los pacientes intervenidos de tiroidectomía. Todas estas recomendaciones basadas en la mejor evidencia científica disponible y orientadas a cirujanos tanto de alto como de bajo volumen quirúrgico en cuanto a tiroidectomía se refiere.

INTRODUCTION

Thyroid pathology, especially structural pathologies such as thyroid nodules, has a prevalence of approximately 25% in the general population, followed in order of frequency by functional pathologies such as hypothyroidism and hyperthyroidism (especially those of autoimmune etiology).¹ All these pathologies are of potential surgical treatment and, therefore, of interest to the general surgeon and the subspecialist. In addition to this, the procedures associated with endocrine pathology most frequently performed at the specialty and high specialty level are those related to the thyroid gland, especially with thyroid malignant disease, which is the third leading cause of oncologic surgery in our country according to data reported by Globocan.^{2,3} In such a way that the work carried out by Table 4 (endocrine surgery) within the National Surgeon's Meeting (ENC) of 2021 for the Mexican Enhanced Surgical Recovery Program (PRQ-MX) of the Mexican Association of General Surgery (AMCG) has focused on thyroidectomy patients.

The primary objective of AMCG's PRQ-MX is to achieve efficient and quality recovery in surgical patients through cost-effective pre-, intra-, and postoperative interventions based on the best scientific evidence published to date. The impact of these measures not only crystallizes in the reduction of potential postoperative complications in patients but also in the length of hospital stay, as well as in the costs for the patient and the health system.⁴

With this scenario and these objectives in mind, the activities of roundtable 4 for

the ENC began with elaborating a series of recommendations classified under the GRADE schemes for the level of evidence and degree of recommendation. These recommendations were initially submitted for review in two independent sessions in virtual surveys using the SurveyMonkey® tool sent electronically to structure a definitive list of guidelines to be discussed and voted on during the virtual activities of the ENC 2021. During the ENC, these guidelines were reviewed, modified, and approved by consensus through the Delphi method, establishing a majority consensus among the participating experts of at least 70%. The final product of months of work in table 4 concerning the PRQ-MX in thyroid surgery are summarized in [Table 1](#) and [Figure 1](#) and are analyzed in detail below according to the perioperative moment.^{5,6}

PREOPERATIVE TIME

What is the minimum recommended approach for appropriate surgical planning in patients with thyroid pathology of potential surgical treatment?


Recommendation 1. *The patient should have imaging studies and BAAD (Thin Needle Aspiration Biopsy) to determine the nature and staging of the thyroid lesion and suspicious adenopathies (high level of evidence; strong grade of recommendation).*

Cervical ultrasound (US) is the imaging study of choice in the approach to structural alterations of the thyroid gland. US evaluation in patients with thyroid pathology should

Table 1: Summary of the recommendations described according to their level of evidence and grade of recommendation.

Preoperative	Level of evidence	Grade of recommendation
Recommendation 1. The patient should have imaging studies and BAAD (fine needle aspiration biopsy) to determine the nature and staging of the thyroid lesion and suspicious adenopathies	High	Strong
Recommendation 2. Thyroid function status should always be checked. Ideally, all patients should be admitted to surgery euthyroid. In the case of hypofunction, it should be previously replaced. In the case of hyperthyroidism, optimal pharmacological treatment should be implemented (e.g., beta-blockers, methimazole, propylthiouracil, and Lugol, as the case may be) and cardiovascular risk should be evaluated	High	Strong
Recommendation 3. Subjective voice evaluation (<i>Voice Handicap Index</i> questionnaire) is recommended. Objective evaluation by laryngoscopy or translingual ultrasound should be performed in patients with dysphonia, dysphagia, previous surgery, or imaging suspicion of recurrent laryngeal nerve invasion	Moderate-high	Intermediate
Recommendation 4. Routine assessment of 25-OH vitamin D levels and replenishment of vitamin D, if necessary, is recommended to reduce the incidence of transient post-thyroidectomy hypocalcemia	Moderate	Intermediate
Intraoperative		
Recommendation 5. The extent of thyroid resection should be adjusted to the ATA risk group and data on local invasion and lymph node metastasis	Moderate-high	Strong
Recommendation 6. Identifying and preserving the recurrent laryngeal nerves, superior laryngeal nerves, and parathyroid glands without compromising their integrity is recommended whenever possible	High	Strong
Recommendation 7. The use of advanced energy equipment (ultrasonic, advanced bipolar, mixed) is recommended to reduce blood loss and surgical time	Moderate-high	Strong
Recommendation 8. Intraoperative neuromonitoring is recommended since it has proven to be helpful in the functional preservation of the recurrent laryngeal nerve and the external branch of the superior laryngeal nerve in neck reoperations or cases of high risk for chordal dysfunction	Moderate-high	Intermediate
Recommendation 9. Routine use of drains in thyroid surgery is not recommended	High	Strong
Postoperative		
Recommendation 10. Measuring serum calcium (ionized or corrected) and PTH in the immediate postoperative period is recommended. Immediate oral use of calcium with or without calcitriol can be implemented in those patients at higher risk of hypocalcemia	High	Strong
Recommendation 11. Measurement of serum magnesium levels and its replacement, if necessary, is recommended	Low	Weak
Recommendation 12. It is recommended that levothyroxine be started immediately postoperatively in patients with total thyroidectomy or pre-existing hypothyroidism. TSH levels should be monitored in the following 4-6 weeks to adjust this substitution scheme	High	Strong

PRQ-MX THYROID SURGERY Checklist



	No.	Recommendation	Revised
Preoperative	1	<i>Imaging studies and BAAD are available to determine the nature and staging of the thyroid lesion and suspicious adenopathies</i>	<input type="checkbox"/>
	2	<i>Thyroid function and vitamin D tests are normal</i>	<input type="checkbox"/>
	3	<i>In case of dysphonia, dysphagia, previous surgery or imaging suspicion of NUR invasion, an evaluation of chordal mobility and voice has been performed</i>	<input type="checkbox"/>
Intraoperative	4	<i>The extent of thyroid resection will be adjusted to the ATA risk group as well as by data on local invasion and lymph node metastasis</i>	<input type="checkbox"/>
	5	<i>The NUR, RENSUS and parathyroid glands were preserved without compromising their integrity and function</i>	<input type="checkbox"/>
	6	<i>Advanced energy (ultrasound, bipolar or mixed) was used</i>	<input type="checkbox"/>
	7	<i>In the case of neck reoperation or high risk for chordal dysfunction, neuro monitoring was used to corroborate functional preservation of the NUR and RENSUS</i>	<input type="checkbox"/>
	8	<i>Routine use of drains without clear indication was avoided</i>	<input type="checkbox"/>
Postoperative	9	<i>Serum calcium and magnesium levels were measured</i>	<input type="checkbox"/>
	10	<i>In case of hypocalcemia, PTH levels were measured</i>	<input type="checkbox"/>
	11	<i>Levothyroxine administration was initiated in patients with total thyroidectomy or pre-existing hypothyroidism</i>	<input type="checkbox"/>
	12	<i>TSH levels will be monitored over the next 4-8 weeks to adjust levothyroxine replacement according to the ATA risk group</i>	<input type="checkbox"/>

PTH = parathyroid hormone. TSH = thyroid-stimulating hormone. ATA = American Thyroid Association.

Figure 1:

Quick checklist of suggested recommendations.

include at least the following: characteristics of the thyroid tissue, size of the gland, size of the nodules (in all three dimensions), location of the nodule within the parenchyma, characteristics of the nodules (composition, echogenicity, margins, presence or absence of calcifications (micro or macro), vascularity and relation between height and width of the nodule), in addition to the presence or absence of cervical lymphadenopathy suspicious of malignancy in the central (levels

VI and VII) and lateral (cervical levels II to V) lymph node compartments bilaterally. In patients with suspected locally advanced malignant thyroid disease (invasion to adjacent structures), the use of studies such as contrast-enhanced computed tomography and nuclear magnetic resonance have an added value in the preoperative planning of surgical resection, especially in patients with advanced local invasion, as well as pulmonary and distant metastases.⁷⁻⁹

The BAAD of thyroid nodules should be performed following the guidelines established by the American Thyroid Association (ATA) or by the American College of Radiology (TI-RADS stratification) concerning US stratification, as well as the Bethesda cytopathological classification for the risk of malignancy of the suspected thyroid nodule. About lymphadenopathies, BAAD should be performed (with the respective cytopathological analysis, as well as thyroglobulin measurement in the aspirate lavage) in those whose positive result for metastases could modify the degree or extent of surgical resection, especially when central compartment dissection or functional modified radical dissection is indicated.^{8,10}

Recommendation 2. *Thyroid function status should always be checked. Ideally, all patients should be admitted to surgery euthyroid. In the case of hypofunction, it should be previously replaced. In case of hyperthyroidism, optimal pharmacological treatment should be implemented (e.g., beta-blockers, methimazole, propylthiouracil, and Lugol, as appropriate), and cardiovascular risk should be assessed (high level of evidence; strong grade of recommendation).*

Dysthyroid states (hypo- or hyperthyroidism) confer an increased cardiovascular risk to the anesthetic event during surgery. In cases of patients with hyperthyroidism requiring surgical treatment, the drugs used during anesthesia, the stress of the surgical event, and even the manipulation of the gland during surgery can induce a state of thyrotoxicosis with subsequent systemic and cardiovascular repercussions in the patient. In the latter group of patients, cardiac output is increased by 50 to 300% due to sodium and water retention due to overactivation of the renin-angiotensin-aldosterone system, a fall in peripheral vascular resistance, and a positive inotropic and chronotropic effect on the myocardium. In addition, there is an increased risk for the development of atrial fibrillation in these patients, ranging from 10 to 15%. On the other

hand, hypothyroidism increases the risk of coronary events by increasing blood lipid levels, prolonging the half-life of coagulation factors, and inducing anemia. Additionally, it predisposes to the development of cardiac arrhythmias such as “torsade de pointes” or polymorphic ventricular tachycardia, decreases cardiac output by 30 to 50%, and increases peripheral vascular resistance, which puts the patient’s cardiovascular status at risk during the anesthetic event.

Because of all these effects on the cardiovascular system, which expose the patient to complications associated with the surgical event, patients who undergo thyroidectomy should be adequately assessed for anesthetic-surgical risk and myocardial function, as well as their thyroid functional status before the surgical event. Whenever possible, these patients should be biochemically and clinically euthyroid before the scheduled surgery, especially if thyroid surgery is involved.¹¹⁻²⁰

In which patients is voice evaluation recommended before thyroid surgery?

Recommendation 3. *Subjective voice evaluation (Voice Handicap Index questionnaire) is recommended for all patients undergoing thyroid surgery. Objective evaluation by laryngoscopy or trans laryngeal ultrasound should be performed in patients who report dysphonia, dysphagia, previous surgery or in whom there is suspicion of invasion of the recurrent laryngeal nerve by imaging (moderate-high level of evidence; intermediate grade of recommendation).*

Up to 33% of patients undergoing thyroid surgery may present with asymptomatic or subclinical chordal paralysis. Because of this non-negligible percentage, routine preoperative voice evaluation is recommended for all patients undergoing thyroidectomy. In addition, this evaluation provides a baseline measurement against which to compare postoperatively. Such periodic evaluation should include targeted questioning to detect changes in the quality and quantity of the patient’s voice and standardized

questionnaires such as the Voice Handicap Index (VHI). In those cases, in which alterations are detected in the subjective evaluation, in patients with suspected invasion by imaging studies or who have previously undergone surgery (1.5 to 30% of these patients may present chordal palsy), an additional evaluation of the voice should be implemented with the use of tools such as transoperative ultrasound, laryngoscopy, and other validated instruments.²¹⁻²⁴

What preoperative measures impact the incidence of postoperative hypocalcemia in patients undergoing thyroid surgery?

Recommendation 4. *Routine assessment of vitamin D levels and vitamin D replacement, if necessary, is recommended to reduce the incidence of transient symptomatic post-thyroidectomy hypocalcemia (moderate level of evidence; intermediate grade of recommendation).*

The concomitant use of oral vitamin D and calcium in the immediate postoperative period of thyroidectomy patients helps avoid symptomatic hypocalcemia. It reduces the time of use of intravenous calcium preparations. On the other hand, a recent meta-analysis and systematic review found vitamin D deficiency to be a risk factor for transient post-surgical hypocalcemia and permanent hypocalcemia in cases of severe deficiency.²⁵ Furthermore, sufficient evidence exists regarding the superiority of the concomitant use of these two drugs in the prevention of postoperative hypocalcemia compared to their separate or individual use.^{26,27} Preoperative vitamin D supplementation, however, remains controversial. In 2019, Rowe et al. reported a double-blind controlled clinical trial in 150 patients at high risk for postoperative hypocalcemia (cancer, Graves' disease, and goiters) who were randomized to receive high-dose vitamin D (300,000 IU) or placebo. In this study, no significant differences were identified between the two groups regarding the primary outcome (postoperative hypocalcemia) at seven days,

21/72 (29%) in the group that received the intervention and 30/78 (38%) of those assigned to placebo ($p = 0.23$). In addition, no significant differences were found in in-hospital or symptomatic hypocalcemia events.²⁸ Conversely, Khatiwada and associates recently conducted a systematic literature review. They found nine studies (two of them placebo-controlled) in which treatments with hypercalcemic drugs (vitamin D, oral calcium, and calcium-sparing diuretics) were implemented preoperatively to avoid post-thyroidectomy hypocalcemia. In seven of the nine studies, benefits were identified in terms of reduction in the rate of post-surgical hypocalcemia in the groups that implemented these measures. Within the studies discussed, two used vitamin D exclusively, one implemented oral calcium alone, three combined oral calcium and vitamin D, and one used all three strategies (oral calcium, vitamin D, and diuretic).²⁹ In 2019, Bhetanni and colleagues reported their randomized clinical trial in 102 patients undergoing thyroidectomy surgery who were assigned a substitution schedule with vitamin D (200,000 single-dose units) + 700 mg of oral calcium carbonate or calcium alone in the preoperative period. In their study, the authors report a significant difference in the event rates of asymptomatic hypocalcemia, latent hypocalcemia (absence of symptoms with presence of Chvostek and Trousseau signs), and symptomatic hypocalcemia.³⁰ In 2020, Ramouz and his group reported their clinical trial conducted in 100 patients undergoing total thyroidectomy with preoperative documented vitamin D deficiency. They were randomized to receive placebo or replacement with 50,000 units of vitamin D3 weekly for four weeks. In their study they found a lower incidence rate of symptomatic hypocalcemia, as well as lower intravenous calcium requirements for the treatment of those patients who developed symptomatic hypocalcemia.³¹

Although more randomized, controlled clinical trials are needed, the benefit of preoperative vitamin D use to reduce the incidence of postoperative hypocalcemia outweighs the risks.

INTRAOPERATIVE TIME

What is the appropriate extent of surgical resection for patients diagnosed with well-differentiated thyroid cancer?

Recommendation 5. *The extent of thyroid surgical resection should be adjusted to the dynamic risk group of TAA, as well as data on local invasion and nodal metastasis (moderate-high level of evidence; strong grade of recommendation).*

One of the most controversial topics in thyroid surgery is the extent of surgical resection necessary for the treatment of well-differentiated thyroid cancer. In the most recent version of the 2015 American Thyroid Association (ATA) guidelines for treating thyroid nodules and well-differentiated thyroid cancer, a modification was made to the extent of resection for lesions larger than 1 cm. The previous guidelines proposed total thyroidectomies for all lesions larger than 1 cm. However, in 2015, this recommendation changed, suggesting lobectomy as an appropriate treatment for low-risk lesions of 1 to 4 cm (absence of extrathyroidal extension, lack of lymph node, or distant metastases) in patients with papillary or follicular thyroid cancer. Leaving total thyroidectomy for the treatment of high-risk lesions (such as histotype or genotype), tumors > 4 cm, or patients requiring close follow-up, adjuvant therapy with radio-iodine ablation or if so, decided by the patient following a risk-benefit discussion between the patient and the treating physician.^{32,33}

For patients with medullary or oncocytic Hürthle cell carcinoma of the thyroid, the extent of surgical resection of thyroid tissue is total thyroidectomy in all cases, except in palliative instances where the risk of complications exceeds the benefit to the patient.⁸

Cases of patients with anaplastic or undifferentiated thyroid carcinoma should undergo preoperative evaluation and multidisciplinary discussion before surgical treatment is offered. Total thyroidectomy is reserved for patients with stage IVA and IVB tumors of this type, in which an

R0 resection can be achieved without leading to complications that postpone the administration of adjuvant therapy (radiotherapy and chemotherapy). In stage IVC, the role of surgery is limited.³⁴

What intraoperative maneuvers are essential to reduce the risk of postoperative complications in patients undergoing thyroidectomy?

Recommendation 6. *Whenever possible, identification and preservation of the recurrent laryngeal nerves (RLN), external branches of the superior laryngeal nerves (ULN), and parathyroid glands, without compromising their integrity, is recommended (high level of evidence; strong recommendation).*

Chordal palsy and post-surgical hypoparathyroidism are the two complications secondary to thyroidectomy, with the most significant impact on the quality of life of patients. To avoid these complications permanently, identifying and preserving the recurrent laryngeal nerve (RLN), the external branch of the superior laryngeal nerve (ENLN), and parathyroid glands is a priority during the surgical procedure. Despite the advent of technology to avoid these complications (e.g., intraoperative neuromonitoring, parathyroid fluorescence, etc.), today's standard of care is visual identification and anatomic preservation of the structures. The most crucial preventive maneuver for post-surgical hypoparathyroidism is in situ preservation of the parathyroid glands and their vascularity.³⁵ On the other hand, although it is a recommended practice, there is controversy on the usefulness of autotransplantation of de-vascularized parathyroid glands in postoperative total thyroidectomy patients to prevent postoperative hypocalcemia.^{36,37} Likewise, the identification of the NLR reduces the risk of transection and dysfunction of the same, which is why it is the general recommendation during thyroidectomy.³⁸ In the particular case of the NLRNLS, its identification within the inter-cricothyroid space (Reeve's space or avascular plane between the upper pole of the thyroid lobe and the cricothyroid muscle)

is recommended. In case the identification of the latter is not achieved, to reduce the risk of injury, dissection as close as possible to the superior pole of the thyroid and individual ligation of the vascular structures is recommended.

How useful is the use of advanced energy devices in thyroid surgery?

Recommendation 7. *The use of advanced energy equipment (ultrasonic, advanced bipolar, mixed) is recommended to reduce blood loss and surgical time (moderate-high level of evidence; strong grade of recommendation).*

Although they are not indispensable instruments for performing thyroid surgery, current systematic reviews and meta-analyses have shown a statistically significant difference in clinical impact in favor of the use of advanced energy instruments (ultrasonic, advanced bipolar, or mixed devices) in thyroid surgery compared to the conventional technique (clamp, suture and cut plus electrocautery or monopolar energy) in terms of operative time (average difference between 20 and 22 minutes) and blood loss (20 ml).^{39,40} The same studies have shown similar rates of complications associated with the procedure. On the other hand, some meta-analyses have found a shorter operative time (8 min) in favor of using ultrasonic energy.⁴¹ However, none of the advanced energy devices are significantly superior to the other (e.g., ultrasonic vs. bipolar) in terms of operative time, blood loss or complication rates.^{42,43}

What is the clinical impact of the use of intraoperative neuromonitoring (NMio) of the recurrent laryngeal nerve (RLN) and external branch of the superior laryngeal nerve (RENLS) in thyroid surgery, and in which patients is its implementation recommended?

Recommendation 8. *The use of intraoperative neuromonitoring (IMN) in thyroid surgery is recommended since it has proven to be helpful in the functional preservation of the recurrent laryngeal nerve (RLN) and the*

external branch of the superior laryngeal nerve (ENLN), mainly in neck reoperations or patients at high risk of chordal dysfunction (**moderate-high level of evidence; intermediate grade of recommendation**).

One of the most feared complications during thyroidectomy is chordal palsy due to NLR and RENLS involvement. Intraoperative NMio is an adjuvant tool in thyroid surgery, allowing the functional evaluation of the NLR and RENLS through an intraoperative electromyographic recording. However, according to the most recently published scientific literature, the use of NMio has not been shown to be superior or inferior to anatomical identification of the LNR in relation to the outcome of transient or permanent chordal palsy.⁴⁴ Contradictorily, in the meta-analysis by Yang et al, these authors found statistically significant utility of NMio in reducing rates of transient chordal palsy.⁴⁵ In 2017, Wong and colleagues performed a systematic review and meta-analysis on the use of NMio in patients with high-risk thyroidectomy for chordal palsy (defined as reoperations, thyroid cancer, substernal or retrosternal goiter, and thyrotoxicosis). These authors found a reduction in the rates of transient and permanent paralysis in reoperations and transient paralysis in patients with thyroid cancer, recommending its use in patients at high risk for chordal palsy.⁴⁶ Finally, NMio seems to have an important role in the transoperative detection of chordal palsy, allowing the change of strategy in the transoperative period with respect to whether or not to perform complementary hemithyroidectomy at the same time in case a total thyroidectomy is necessary. With this, NMio seems to significantly reduce the incidence of cases with bilateral chordal palsy and even the need for tracheostomy.⁴⁷

What is the benefit of placing drains in patients who have undergone thyroid surgery?

Recommendation 9. *Routine use of drains in thyroid surgery is not recommended (high level of evidence; strong grade of recommendation).*

The placement of drains in thyroidectomy has been implemented in past decades with the apparent objective of decreasing the rates of postoperative cervical hematoma and seroma, as well as of reoperation in the case of the former. However, the most recent meta-analysis of the Cochrane Library, performed by Samraj et al. (analysis of 13 studies), found no significant differences in the need for reoperation, respiratory distress, surgical site infection, and low-volume seroma. On the contrary, the use of post-thyroidectomy drainage was associated with a more significant number of patients with postoperative pain, greater pain intensity, and longer hospital stays. It is important to comment that the studies in this meta-analysis did not include patients with goiters with retrosternal extension, patients at high risk of bleeding, or concomitant lateral cervical dissections.⁴⁸ Similar to what was reported by previous authors, in 2020, Soh and his group, in a meta-analysis that included 16 studies, reported a statistically significant association between the presence of cervical drainage and the development of post-surgical hematomas, as well as surgical site infection and even a more extended hospital stay.⁴⁹

Although the evidence against the routine use of active drains in thyroid surgery is clear, in special cases such as goiters with retrosternal extension or lateral modified radical dissections or extensive dissections, the use of active drains is always at the surgeon's discretion, with the only recommendation being to avoid the use of open or passive drains.

POSTOPERATIVE TIME

When and how is the risk assessment of postoperative hypocalcemia in thyroid surgery patients performed?

Recommendation 10. *To evaluate the risk of hypocalcemia in patients who have undergone thyroid surgery, it is recommended to measure serum calcium (ionized or corrected) and/or PTH in the immediate postoperative period. Immediate oral use of calcium with or without calcitriol can be implemented in those patients at increased risk of developing*

hypocalcemia (high level of evidence; strong grade of recommendation).

Postoperative transient hypocalcemia is the most frequent complication after thyroidectomy, with an estimated incidence between 19 and 38%, depending on the series analyzed.⁵⁰ Calcium measurement as a diagnosis of hypocalcemia is reliable only between 48 and 72 hours postoperatively, which prolongs the in-hospital follow-up of these patients to identify this complication.⁵¹ A recent meta-analysis and systematic review published in 2014 identified that ionized calcium levels below 0.95 mmol/L within the first 24 hours had a sensitivity between 19 and 90% for identifying postoperative transient hypocalcemia.⁵² Two other studies regarding isolated serum calcium determinations identified cutoff points of 8.4 and 7.52 mg/dL in the first 24 hours postoperatively as predictors of postoperative transient hypocalcemia.^{53,54}

On the other hand, a 2.3% decrease in preoperative serum calcium levels at 24 hours postoperatively was predictive of transient hypocalcemia in 94% of patients (sensitivity).⁵⁵ Other authors have analyzed the trend of calcium levels in two serial postoperative determinations within the first 24 hours (at 6 and 24 hours), identifying that a positive direction, that is, an increase in calcium levels between one determination and another, allows excluding a postoperative transient hypocalcemia event with a negative predictive value of 86 to 100%. Likewise, a negative trend, i.e., a decrease in calcium levels between both measurements, has a positive predictive value of 20 to 46% for postoperative transient hypocalcemia.⁵⁶ Thus, serum calcium measurements 48 to 72 hours postoperatively help predict the development of hypocalcemia. In measurements performed in the first 24 hours, the trend between two determinations (six and 24 hours) can help identify patients at risk of this complication.

Parathyroid hormone (PTH) has a plasma half-life of three to four minutes, so some authors have attempted to identify the predictive utility of postoperative PTH levels and the risk of developing hypocalcemia after thyroidectomy. In 2017, Mathur et al. published a systematic review

regarding postoperative PTH determination and post-thyroidectomy hypocalcemia. These authors identified a value between 15 and 20 pg/ml as the predictor with the highest accuracy for developing hypocalcemia (sensitivity of 94% and specificity of 90.8%). Additionally, a decrease of between 75 and 90% of PTH concerning the initial value identified patients with postoperative hypocalcemia with a sensitivity and specificity of 93 and 90%, respectively. However, the studies included in this systematic review were heterogeneous with the time of taking postoperative PTH levels, making it difficult to establish a conclusive conclusion and develop guidelines or specific recommendations. In addition, about 70% of patients developed hypocalcemia despite normal PTH levels.⁵⁷ In 2016, Inversini and associates published a work performed on 206 postoperative total thyroidectomy patients. In this work, PTH levels correlated positively and significantly with calcium levels at 48 hours after surgery, i.e., patients had higher serum calcium levels at higher PTH levels. These authors concluded that patients with PTH levels equal to or higher than ten pg/ml (three to six hours after surgery) allow patients to be discharged early and safely due to the low risk of developing postoperative hypocalcemia.⁵⁸ On the other hand, intraoperative PTH measurements (10 minutes after thyroid resection) allow for predicting the risk of postoperative hypocalcemia without an additional advantage over postoperative measurements between the first and fourth hour after surgery.⁵⁹

Most studies show that PTH levels below double digits (< 10 pg/ml) within the first six postoperative hours are statistically significant predictors of postoperative hypocalcemia.

Finally, calcium supplementation with or without vitamin D is an appropriate and cost-effective strategy to decrease the risk of postoperative hypocalcemia and hospitalization time after thyroidectomy, with the risk of overtreatment of patients who will not develop hypocalcemia.^{60,61} Therefore, the use of this evidence-based strategy in patients at high risk of postoperative hypocalcemia (such as patients with Graves' disease, central compartment dissection in thyroid cancer, reoperations, etc.) could be helpful for such purposes.

Recommendation 11. *It is recommended that serum magnesium levels be measured and replaced, if necessary, in the immediate postoperative period in patients undergoing thyroid surgery (low level of evidence; weak grade of recommendation).*

Magnesium is an electrolyte that regulates serum calcium concentrations due to its promoting effect on the synthesis and release of parathyroid hormone (PTH) and the modulation of renal calcium excretion. Thus, the state of hypomagnesemia reduces PTH secretion, perpetuating the state of hypocalcemia.^{62,63} The incidence of hypomagnesemia in the preoperative and immediate postoperative period after total thyroidectomy is reported to range from 24% to 23-70%, respectively.^{64,65} Some studies have identified hypomagnesemia as a preoperative risk factor for the development of prolonged transient hypocalcemia in postoperative total thyroidectomy patients, in contrast to other reports in which this risk factor has not been identified.⁶⁶⁻⁶⁹ In the most recent meta-analysis by Chen et al., hypomagnesemia was identified as a risk factor for postoperative prolonged hypocalcemia with an odds ratio (OR) of 2.9 (95% CI 1.9-4.2; $p < 0.00001$).⁷⁰ Although the evidence regarding preoperative magnesium supplementation is sparse, the benefit is cost-effective and appears to outweigh the risks.

What is the appropriate time to initiate hormone replacement with levothyroxine postoperatively in patients undergoing thyroidectomy or with pre-existing hypothyroidism?

Recommendation 12. *It is recommended that levothyroxine be started immediately postoperatively in patients with total thyroidectomy or pre-existing hypothyroidism. Thyroid-stimulating hormone (TSH) levels should be monitored in the following 4-6 weeks to adjust this substitution scheme (high evidence level; strong recommendation grade).*

Regardless of the scheme used for the calculation of the substitution dose (based on weight, age, gender, or body mass index),⁷¹ recommends starting levothyroxine at the

total dose or progressively (increments of 12.5 to 25 micrograms/day) in cases of advanced age, cardiovascular disease or other associated comorbidities.⁷² The most reliable parameter to guide changes in hormone replacement is TSH. This should be evaluated at four to six weeks since this is the time necessary to achieve stable T4 levels due to its prolonged half-life (seven days).⁷³

CONCLUSIONS

This document includes a series of recommendations that include the three stages of the perioperative period to provide optimal care for patients who will undergo thyroid resection, including the scientific evidence available at the time. The authors recognize that some of the recommended tools are not always available in our country; however, the objective of the present work is to inform and disseminate the best practices available regarding thyroidectomy, to improve the surgical care of patients in Mexico, and to reach as far as possible the international standards of care for this group of patients.

ACKNOWLEDGMENTS

The authors of this consensus would like to thank Dr. Saúl Ocampo González and Dr. Luis Alfonso Martín del Campo González for the space given to thyroid surgery within the academic activities of the National Meeting of the Surgeon 2021 of the Mexican Association of General Surgery.

REFERENCES

1. Golden SH, Robinson KA, Saldanha I, Anton B, Ladenson PW. Clinical review: prevalence and incidence of endocrine and metabolic disorders in the United States: a comprehensive review. *J Clin Endocrinol Metab.* 2009; 94: 1853-1878. Available in: <https://doi.org/10.1210/jc.2008-2291>
2. Wang TS. Endocrine surgery. *Am J Surg.* 2011; 202: 369-371. Available in: <https://doi.org/10.1016/j.amjsurg.2011.06.004>
3. International Agency for Research on Cancer, World Health Organization. Cancer Today webpage. (August 2021) Available at: <https://gco.iarc.fr/today/home> accessed
4. Ljungqvist O, Scott M, Fearon KC. enhanced recovery after surgery: a review. *JAMA Surgery.* 2017; 152: 292-298. Available in: <https://doi.org/10.1001/jamasurg.2016.4952>
5. Aguayo-Albasini JL, Flores-Pastor B, Soria-Aledo V. [GRADE system: classification of quality of evidence and strength of recommendation]. *Spanish Surgery.* 2014; 92: 82-88. Available in: <https://doi.org/10.1016/j.ciresp.2013.08.002>
6. Balakrishnan N, Colton T, Everitt B, et al. Wiley StatsRef: Statistics Reference Online. 2014; Wiley. Available at: <https://doi.org/10.1002/9781118445112>
7. Yeh MW, Bauer AJ, Bernet VA, et al. American Thyroid Association statement on preoperative imaging for thyroid cancer surgery. *Thyroid.* 2015;25(1):3-14. doi: 10.1089/thy.2014.0096.
8. Haugen BR, Alexander EK, Bible KC, et al. 2015 American thyroid association management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer: the American Thyroid Association guidelines task force on thyroid nodules and differentiated thyroid cancer. *Thyroid.* 2016: 261-133. doi:10.1089/thy.2015.0020.
9. Leboulleux S, Girard E, Rose M, et al. Ultrasound criteria of malignancy for cervical lymph nodes in patients followed up for differentiated thyroid cancer. *J Clin Endocrinol Metab.* 2007; 92: 3590-3594. doi: 10.1210/jc.2007-0444.
10. Tessler FN, Middleton WD, Grant EG, et al. ACR Thyroid Imaging, Reporting and Data System (TI-RADS): White Paper of the ACR TI-RADS Committee. *Journal of the American College of Radiology.* 2017; 14: 587-595. doi: 10.1016/j.jacr.2017.01.046.
11. Axelrod AR, Berman L. The bone marrow in hyperthyroidism and hypothyroidism. *Blood.* 1951; 6: 436-453.
12. Anthonisen BP, Holst E, Chr. Thomsen Aa. Determination of cardiac output and other hemodynamic data in patients with hyper- and hypothyroidism, using dye dilution technique. *Scand J Clin Laboratory Invest.* 1960; 12: 472-480. doi: 10.3109/00365516009065412.
13. Loeliger EA, Van Der Esch B, Mattern MJ, Hemker HC. The biological disappearance rate of prothrombin, factors VII, IX and X from plasma in hypothyroidism, hyperthyroidism and during fever. *Thromb Diath Haemorrh.* 1964; 10: 267-277.
14. Adlerberth A, Stenstrom G, Hasselgren P-O. Results from a prospective, randomized study. *Ann Surg.* 1987; 205: 182-188. doi:10.1097/00000658-198702000-00013.
15. Sawin CT, Geller A, Wolf PA, et al. Low serum thyrotropin concentrations as a risk factor for atrial fibrillation in older persons. *N Engl J Med.* 1994; 331: 1249-1252. doi: 10.1056/NEJM199411103311901.
16. Diekman T, Lansberg PJ, Kastelein JJ, Wiersinga WM. Prevalence and correction of hypothyroidism in a large cohort of patients referred for dyslipidemia. *Arch Intern Med.* 1995; 155: 1490-1495.
17. Hak AE, Pols HAP, Visser TJ, Drexhage HA, Hofman A, Witteman JCM. Subclinical hypothyroidism is an independent risk factor for atherosclerosis and myocardial infarction in elderly women: the Rotterdam study. *Ann Intern Med.* 2000; 132: 270-278. doi: 10.7326/0003-4819-132-4-200002150-00004.

18. Stathatos N, Wartofsky L. Perioperative management of patients with hypothyroidism. *Endocrinol Metab Clin North Am.* 2003; 32: 503-518. doi: 10.1016/S0889-8529(03)00007-0.
19. Fredlund BO, Olsson SB. Long QT interval and ventricular tachycardia of "torsade de pointe" type in hypothyroidism. *Acta Med Scand.* 2009; 213: 231-235. doi:10.1111/j.0954-6820.1983.tb03724.
20. Ross DS, Burch HB, Cooper DS, et al. 2016 American Thyroid Association guidelines for diagnosis and management of hyperthyroidism and other causes of thyrotoxicosis. *Thyroid.* 2016; 26: 1343-1421. doi: 10.1089/thy.2016.0229.
21. Farrag TY, Samlan RA, Lin FR, Tufano RP. The utility of evaluating true vocal fold motion before thyroid surgery: the laryngoscope. 2006; 116: 235-238. doi: 10.1097/01.mlg.0000191472.02720.1f.
22. Randolph GW, Kamani D. The importance of preoperative laryngoscopy in patients undergoing thyroidectomy: Voice, vocal cord function, and the preoperative detection of invasive thyroid malignancy. *Surgery.* 2006; 139: 357-362. doi: 10.1016/j.surg.2005.08.009.
23. Roh JL, Yoon YH, Park CI. Recurrent laryngeal nerve paralysis in patients with papillary thyroid carcinomas: evaluation and management of resulting vocal dysfunction. *The Am J Surg.* 2009; 197: 459-465. doi: 10.1016/j.amjsurg.2008.04.017.
24. Cheng SP, Lee JJ, Liu TP, Lee KS, Liu C-L. Preoperative ultrasonography assessment of vocal cord movement during thyroid and parathyroid surgery. *World J Surg.* 2012; 36: 2509-2515. doi: 10.1007/s00268-012-1674-1.
25. Vaitis KD, Anagnostis P, Veneti S, Papavramidis TS, Goulis DG. Preoperative vitamin d deficiency is a risk factor for postthyroidectomy hypoparathyroidism: a systematic review and meta-analysis of observational studies. *The Journal of Clinical Endocrinology & Metabolism.* 2021; 106: 1209-1224. Available in: <https://doi.org/10.1210/clinem/dgab039>
26. Xing T, Hu Y, Wang B, Zhu J. Role of oral calcium supplementation alone or with vitamin D in preventing post-thyroidectomy hypocalcaemia: a meta-analysis. *Medicine (Baltimore).* 2019; 98: e14455. doi: 10.1097/MD.00000000000014455.
27. Sanabria A, Rojas A, Arevalo J. Meta-analysis of routine calcium/vitamin D3 supplementation versus serum calcium level-based strategy to prevent postoperative hypocalcaemia after thyroidectomy. *Br J Surg.* 2019; 106: 1126-1137. doi: 10.1002/bjs.11216.
28. Rowe CW, Arthurs S, O'Neill CJ, et al. High-dose preoperative cholecalciferol to prevent post-thyroidectomy hypocalcaemia: A randomized, double-blinded placebo-controlled trial. *Clin Endocrinol (Oxf).* 2019; 90: 343-350. doi: 10.1111/cen.13897.
29. Khatiwada AS, Harris AS. Use of pre-operative calcium and vitamin D supplementation to prevent post-operative hypocalcaemia in patients undergoing thyroidectomy: a systematic review. *J Laryngol Otol.* 2021; 135: 568-573. doi: 10.1017/S0022215121001523.
30. Khan Bhattani M, Rehman M, Ahmed M, Altaf HN, Choudry UK, Khan KH. Role of pre-operative vitamin D supplementation to reduce post-thyroidectomy hypocalcaemia; cohort study. *International Journal of Surgery.* 2019; 71: 85-90. Available in: <https://doi.org/10.1016/j.ijsu.2019.08.035>
31. Ramouz A, Hosseini M, Hosseinzadeh SS, Rasishashemi SZ. Preoperative vitamin D supplementation in patients with vitamin D deficiency undergoing total thyroidectomy. *The American Journal of the Medical Sciences.* 2020; 360: 146-152. Available in: <https://doi.org/10.1016/j.amjms.2020.04.036>
32. Cooper DS, Doherty GM, Haugen BR, et al. Revised American Thyroid Association management guidelines for patients with thyroid nodules and differentiated thyroid cancer: the American Thyroid Association (ATA) guidelines taskforce on thyroid nodules and differentiated thyroid cancer. *Thyroid.* 2009; 19: 1167-1214. doi: 10.1089/thy.2009.0110.
33. Wells SA, Asa SL, Dralle H, et al. Revised American Thyroid Association guidelines for the management of medullary thyroid carcinoma: the American Thyroid Association guidelines task force on medullary thyroid carcinoma. *Thyroid.* 2015; 25: 567-610. doi: 10.1089/thy.2014.0335.
34. Bible KC, Kebebew E, Brierley J, et al. 2021 American thyroid association guidelines for management of patients with anaplastic thyroid cancer: American Thyroid Association anaplastic thyroid cancer guidelines task force. *Thyroid.* 2021; 31: 337-386. doi: 10.1089/thy.2020.0944.
35. Lorente-Poch L, Sancho JJ, Ruiz S, Sitges-Serra A. Importance of in situ preservation of parathyroid glands during total thyroidectomy. *Br J Surg.* 2015; 102: 359-367. doi: 10.1002/bjs.9676.
36. Lorente-Poch L, Sancho J, Muñoz JL, Gallego-Otaegui L, Martínez-Ruiz C, Sitges-Serra A. Failure of fragmented parathyroid gland autotransplantation to prevent permanent hypoparathyroidism after total thyroidectomy. *Langenbecks Arch Surg.* 2017; 402: 281-287. doi: 10.1007/s00423-016-1548-3.
37. El-Sharaky MI, Kahalil MR, Sharaky O, et al. Assessment of parathyroid autotransplantation for preservation of parathyroid function after total thyroidectomy. *Head Neck.* 2003; 25: 799-807. doi: 10.1002/hed.10278.
38. Hermann M, Alk G, Roka R, Glaser K, Freissmuth M. Laryngeal recurrent nerve injury in surgery for benign thyroid diseases: effect of nerve dissection and impact of individual surgeon in more than 27,000 nerves at risk. *Annals of Surgery.* 2002; 235: 261-268. doi: 10.1097/00000658-200202000-00015.
39. Ecker T, Carvalho AL, Choe J-H, Walosek G, Preuss KJ. Hemostasis in thyroid surgery: harmonic scalpel versus other techniques--a meta-analysis. *Otolaryngol Head Neck Surg.* 2010; 143: 17-25.
40. Yao HS. Prospective clinical trials of thyroidectomy with LigaSure vs conventional vessel ligation: a systematic review and meta-analysis. *Arch Surg.* 2009; 144: 1167.
41. Upadhyaya A, Hu T, Meng Z, et al. Harmonic versus LigaSure hemostasis technique in thyroid surgery: a meta-analysis. *Biomed Rep.* 2016; 5: 221-227.
42. Contin P, Gooben K, Grummich K, Jensen K, Schmitz-Winnenthal H, Buchler MW, et al. ENERgized vessel sealing systems versus

- CONventional hemostasis techniques in thyroid surgery--the ENERCON systematic review and network meta-analysis. *Langenbecks Arch Surg.* 2013; 398: 1039-1056.
43. Kim WW, Cho J, Jeon YS, et al. Prospective, randomized, comparative, multicenter study of the hybrid ultrasonic advanced bipolar device and the ultrasonic coagulating shears in open thyroidectomy. *Surg Innov.* 2021; 28: 41-47.
 44. Cirocchi R, Arezzo A, D'Andrea V, et al. Intraoperative neuromonitoring versus visual nerve identification for prevention of recurrent laryngeal nerve injury in adults undergoing thyroid surgery. *Cochrane Database Syst Rev.* 2019; 1: CD012483. doi: 10.1002/14651858.CD012483.pub2.
 45. Yang S, Zhou L, Lu Z, Ma B, Ji Q, Wang Y. Systematic review with meta-analysis of intraoperative neuromonitoring during thyroidectomy. *Int J Surg.* 2017; 39: 104-113. doi: 10.1016/j.ijssu.2017.01.086.
 46. Wong KP, Mak KL, Wong CKH, Lang BHH. Systematic review and meta-analysis on intra-operative neuromonitoring in high-risk thyroidectomy. *Int J Surg.* 2017; 38: 21-30. doi: 10.1016/j.ijssu.2016.12.039.
 47. Kim DH, Kim SW, Hwang SH. Intraoperative neural monitoring for early vocal cord function assessment after thyroid surgery: a systematic review and meta-analysis. *World J Surg.* 2021; 45: 3320-3327. doi: 10.1007/s00268-021-06225-x.
 48. Samraj K, Gurusamy KS. Wound drains following thyroid surgery. *Cochrane Database Syst Rev.* 2007; 2007: CD006099. doi: 10.1002/14651858.CD006099.pub2.
 49. Soh TCF, Ong QJ, Yip HM. Complications of neck drains in thyroidectomies: a systematic review and meta-analysis. *The Laryngoscope.* 2021; 131: 690-700. doi: 10.1002/lary.29077.
 50. Almquist M, Hallgrímsson P, Nordenstrom E, Bergenfelz A. Prediction of permanent hypoparathyroidism after total thyroidectomy. *World J Surg.* 2014; 38: 2613-2620. doi: 10.1007/s00268-014-2622-z.
 51. Mercante G, Anelli A, Giannarelli D, et al. Cost-effectiveness in transient hypocalcemia post-thyroidectomy. *Head Neck.* 2019; 41: 3940-3947. doi: 10.1002/hed.25934.
 52. Graff AT, Miller FR, Roehm CE, Prihoda TJ. Predicting hypocalcemia after total thyroidectomy: parathyroid hormone level vs. serial calcium levels. *Ear Nose Throat J.* 2010; 89: 462-465.
 53. Aluffi P, Aina E, Bagnati T, Toso A, Pia F. [Prognostic factors for definitive hypoparathyroidism following total thyroidectomy]. *Acta Otorrinolaringol Esp.* 2008; 59: 321-324.
 54. Hermann M, Ott J, Promberger R, Kober F, Karik M, Freissmuth M. Kinetics of serum parathyroid hormone during and after thyroid surgery. *Br J Surg.* 2008; 95: 1480-1487. doi: 10.1002/bjs.6410.
 55. Hallgrímsson P, Nordenstrom E, Almquist M, Bergenfelz AOJ. Risk factors for medically treated hypocalcemia after surgery for Graves' disease: a Swedish multicenter study of 1,157 patients. *World J Surg.* 2012; 36: 1933-1942. doi: 10.1007/s00268-012-1574-4.
 56. Edafe O, Antakia R, Laskar N, Uttley L, Balasubramanian SP. Systematic review and meta-analysis of predictors of post-thyroidectomy hypocalcaemia. *Br J Surg.* 2014; 101: 307-320. doi: 10.1002/bjs.9384.
 57. Mathur A, Nagarajan N, Kahan S, Schneider EB, Zeiger MA. Association of parathyroid hormone level with post-thyroidectomy hypocalcemia: a systematic review. *JAMA Surg.* 2018; 153: 69-76. doi: 10.1001/jamasurg.2017.3398.
 58. Inversini D, Rausei S, Ferrari CC, et al. Early intact PTH (iPTH) is an early predictor of postoperative hypocalcemia for a safer and earlier hospital discharge: an analysis on 260 total thyroidectomies. *Gland Surg.* 2016; 5: 522-528. doi: 10.21037/gland.2016.09.08.
 59. Lee DR, Hinson AM, Siegel ER, Steelman SC, Bodenner DL, Stack BC. Comparison of intraoperative versus postoperative parathyroid hormone levels to predict hypocalcemia earlier after total thyroidectomy. *Otolaryngol Head Neck Surg.* 2015; 153: 343-349. doi: 10.1177/0194599815596341.
 60. Arer IM, Kus M, Akkapulu N, et al. Prophylactic oral calcium supplementation therapy to prevent early post thyroidectomy hypocalcemia and evaluation of postoperative parathyroid hormone levels to detect hypocalcemia: a prospective randomized study. *Int J Surg.* 2017; 38: 9-14. doi: 10.1016/j.ijssu.2016.12.041.
 61. Xing T, Hu Y, Wang B, Zhu J. Role of oral calcium supplementation alone or with vitamin D in preventing post-thyroidectomy hypocalcaemia: a meta-analysis. *Medicine (Baltimore).* 2019; 98: e14455. doi: 10.1097/MD.00000000000014455.
 62. Fatemi S, Ryzen E, Flores J, Endres DB, Rude RK. Effect of experimental human magnesium depletion on parathyroid hormone secretion and 1,25-dihydroxyvitamin D metabolism. *J Clin Endocrinol Metab.* 1991; 73: 1067-1072.
 63. Allgrove J, Adams S, Fraher L, Reuben A, O'Riordan JL. Hypomagnesaemia: studies of parathyroid hormone secretion and function. *Clin Endocrinol (Oxf).* 1984; 21: 435-449.
 64. Cherian AJ, Gowri M, Ramakant P, Paul TV, Abraham DT, Paul MJ. The Role of Magnesium in Post-thyroidectomy Hypocalcemia. *World J Surg.* 2016; 40: 881-888.
 65. Luo H, Yang H, Zhao W, Wei T, Su A, Wang B, et al. Hypomagnesemia predicts postoperative biochemical hypocalcemia after thyroidectomy. *BMC Surg.* 2017; 17: 62.
 66. Wang W, Meng C, Ouyang Q, Xie J, Li X. Magnesium: an independent risk factor of hypocalcemia after thyroidectomy. *Cancer Manag Res.* 2019; 11: 8135-8144.
 67. Brophy C, Woods R, Murphy MS, Sheahan P. Perioperative magnesium levels in total thyroidectomy and relationship to hypocalcemia. *Head & Neck.* 2019; 41: 1713-1718.
 68. Garrahy A, Murphy MS, Sheahan P. Impact of postoperative magnesium levels on early hypocalcemia and permanent hypoparathyroidism after thyroidectomy. *Head Neck.* 2016; 38: 613-619.
 69. Wang X, Zhu J, Liu F, Gong Y, Li Z. Postoperative hypomagnesaemia is not associated with hypocalcaemia in thyroid cancer patients undergoing

- total thyroidectomy plus central compartment neck dissection. *Int J Surg*. 2017; 39: 192-196.
70. Chen Z, Zhao Q, Du J, Wang Y, Han R, Xu C, et al. Risk factors for postoperative hypocalcaemia after thyroidectomy: a systematic review and meta-analysis. *J Int Med Res*. 2021; 49: 300060521996911.
 71. Miccoli P, Materazzi G, Rossi L. Levothyroxine therapy in thyroidectomized patients. *Front Endocrinol (Lausanne)*. 2021; 11: 626268. doi: 10.3389/fendo.2020.626268.
 72. Wartofsky L. 2005 Levothyroxine therapy for hypothyroidism: should we abandon conservative dosage titration? *Arch Intern Med* 165: 1683-1684.
 73. Pecina J, Garrison GM, Bernard M. Levothyroxine dosage is associated with stability of TSH values. *Am J Med*. 2014; 127: 240-245.

Correspondence:

David Velázquez-Fernández, MSc, PhD

E-mail: velazquezmerlin2004@yahoo.com.mx

Global surgery in Mexico: a cross-sectional analysis of the “Extramural Surgery Campaigns”

Cirugía global en México: análisis transversal de las “Campañas de Cirugía Extramuros”

David Olvera-Pérez,^{*} Vicente González-Ruiz,[‡] Guillermo López-Espinoza,[§] Bernardo Medina-Portillo,[¶] Eric Romero-Arredondo[¶]

Keywords:

global surgery,
Mexican Association
of General Surgery,
Social Service
Commission.

Palabras clave:

cirugía global,
Asociación Mexicana
de Cirugía General,
Comisión de Servicio
Social.

ABSTRACT

Introduction: “Global Surgery” has recently been introduced into the medical lexicon. A frequently quoted definition states that global surgery “prioritizes improving and achieving equity in health for all people on the planet who are affected by surgical conditions or require surgery.” **Material and methods:** a cross-sectional analysis of the results of the extramural surgery campaigns carried out by the Social Service Committees of the Mexican Association of General Surgery A.C. (AMCG) and the Mexican Association of Endoscopic Surgery A.C. (AMCE) during the period from 2004 to 2012, was carried out. **Results:** 143 campaigns were performed nationwide from 2004 to 2012. The average number of procedures per campaign was 71. Overall mortality was two patients in 10,082 procedures (0.02%). There were 36 bile duct injuries in 6,146 laparoscopic cholecystectomies (0.58%). The procedures performed were laparoscopic cholecystectomies 6,146 (60%), inguinal hernia repair 2,351 (23%), umbilical hernia repair 1,212 (12%), and 489 other procedures (5%), including gynecological surgeries, fundoplication, bowel resections, and appendectomies. **Conclusions:** our global surgery program was successful and safe, with low morbidity and mortality compared to usual hospital surgeries. Only two deaths were reported in more than 10,000 patients, equivalent to 0.02% (serious complications). Likewise, the biliary tract injury rate was 0.58%, which is within normal parameters, and only 0.04% of the trans-operative bleeding required blood transfusion (moderate complication). The retribution on the part of our society was of value, correcting the surgical needs of the less solvent Mexican society.

RESUMEN

Introducción: el término de “Cirugía Global” se ha introducido recientemente al léxico médico. Una definición citada frecuentemente señala que la cirugía global “pone como prioridad el mejorar y lograr equidad en la salud para todas las personas sobre el planeta que están afectadas por condiciones quirúrgicas o bien tienen la necesidad de una cirugía”. **Material y métodos:** se realizó un análisis transversal de los resultados de las campañas de cirugía extramuros realizadas por los Comités de Servicio Social de la Asociación Mexicana de Cirugía General A.C. (AMCG) y de la Asociación Mexicana de Cirugía Endoscópica A.C. (AMCE), durante el periodo comprendido de 2004 a 2012. **Resultados:** se realizaron 143 campañas a nivel nacional de 2004 a 2012. El promedio de procedimientos por campaña fue de 71. La mortalidad global fue de dos pacientes en 10,082 procedimientos (0.02%). Hubo 36 lesiones de la vía biliar en 6,146 colecistectomías laparoscópicas (0.58%). Los procedimientos realizados fueron: colecistectomías laparoscópicas 6,146 (60%), reparación de hernias inguinales 2,351 (23%), reparación de hernias umbilicales 1,212 (12%) y 489 de otros procedimientos (5%), entre los que se incluyen cirugías ginecológicas, funduplicaturas, resecciones de intestino y apendicetomías. **Conclusiones:** nuestro programa de cirugía global fue exitoso y seguro con morbilidad baja comparado con cirugías hospitalarias habituales. En más de 10,000 pacientes sólo se reportaron dos defunciones, lo que equivale a 0.02% (complicaciones graves). Asimismo, el índice de lesión de la vía biliar fue de 0.58% que está dentro de parámetros habituales y sólo 0.04% de los sangrados transoperatorios requirieron de transfusión sanguínea (complicación moderada). Consideramos que la retribución por parte de nuestra sociedad fue de valía, corrigiendo las necesidades de cirugía de la sociedad mexicana menos solvente.

* General Surgery.
Hospital Angeles
Mexico.

‡ General Hospital of
Mexico “Dr. Eduardo
Liceaga,” SSA.

§ Tijuana General
Hospital.

¶ General Surgery.
Hospital Angeles
Metropolitano.

Received: 06/09/2023
Accepted: 07/08/2023



How to cite: Olvera-Pérez D, González-Ruiz V, López-Espinoza G, Medina-Portillo B, Romero-Arredondo E. Global surgery in Mexico: a cross-sectional analysis of the “Extramural Surgery Campaigns”. *Cir Gen.* 2023; 45 (3): 152-159. <https://dx.doi.org/10.35366/112924>

INTRODUCTION

The term “Global Surgery” has recently entered the medical lexicon. One frequently cited definition state that global surgery “prioritizes improving and achieving equity in health for all people on the planet who are either affected by surgical conditions or require surgery.”¹

Global surgery is complex and has multiple determinants, so solutions require a collaborative effort among institutions and stakeholders, who bring diverse resources, experience, and knowledge.² Global surgery stakeholders are defined as individuals or organizations operating nationally or internationally with the primary intent of improving health.³

Surgery saves lives and promotes economic development. Timely surgical care can treat up to one-third of the global disease burden, and therefore, improving access to surgical care is critical, especially in low-income countries or areas. Health system strengthening includes improvements in infrastructure, equipment, and surgical workforce. Global surgery aims to provide timely access to quality surgical care for all, improving quality of life and well-being.⁴ However, populations requiring surgery will only benefit if they have appropriate access to a system that can meet their needs and if the care provided is of sufficient quality. Access to a poor-quality system result in significant mortality and imposes an excessive economic burden on society.⁵

This paper aims to report the outcome of the procedures performed by the AMCG extramural surgery group from 2004 to 2012 and to show the degree of safety achieved solely with national resources.

MATERIAL AND METHODS

Cross-sectional analysis of the results of the extramural surgery campaigns carried out by the Social Service Commission of the Mexican Association of General Surgery A.C. from 2004 to 2012.

RESULTS

Fifty-one campaigns were performed nationwide by the group coordinated by Dr.

David Olvera-Pérez from 2004 to 2012, 91 campaigns by Dr. Guillermo López’s group from 2008 to 2012 in the state of Baja California Norte and one by Dr. Alejandro Inda-Toledo in the state of Chiapas during 2005 (*Table 1*). The average number of procedures per campaign was 71. Overall mortality was two patients in 10,082 procedures (0.02%). In 6,146 laparoscopic cholecystectomies, 36 biliary tracts were injured (0.58%). The procedures performed were laparoscopic cholecystectomies 6,146 (60%), inguinal hernias 2,351 (23%), umbilical hernias 1,212 (12%) and other 489 procedures (5%), which included gynecological surgeries, fundoplication, bowel resections and appendectomies.

DISCUSSION

Mexico is the fifteenth largest economy in the world regarding gross domestic product. However, it is a country of great social contrasts. Approximately 50% (59.5 million inhabitants)⁶ of the population has access to the welfare of an advanced society, which includes adequate medical care through health institutions (Mexican Social Security Institute, Institute of Security and Social Services for State Workers or Ministry of Health) or private care. However, the remaining 50% (out of a total population of 126 million) need more coverage for their health needs and, due to the prohibitive economic cost, much less for surgical pathology care. In this dichotomy, we find, on the one hand, a properly trained surgical workforce (anesthesiologists, surgical nurses, and surgeons) and, on the other hand, an unprotected population. The conjunction of wills results in local Global Surgery programs called “Extramural Surgery” campaigns.

In October 2003, the AMCG became part of the Colegio de Postgraduados en Cirugía General, A.C. (General Surgery Postgraduate College) to acquire the rights assumed by the professional associations through the Dirección General de Profesiones (General Directorate of Professions) and assume legal representation of surgeons before the authorities. As a result, the associations, or societies of surgeons from the different states of the Republic were promoted to integrate and consolidate as duly recognized

Table 1: Table of campaigns carried out from 2007 to 2012.

Extramural surgery 2004 2012											
Headquarters	Month and year	Laparo- cholecys- tectomy	Inguinal hernia	Um- bilical hernia	Hyster- ectomy	Hiatus surgery	Other surge- ries	Compli- cations	Mortal- ity	Patient number	Procedure number
Zamora, Mich.	May, 2004	0	69	19	0	0	3	2	0	91	102
Tuxtla Gtz, Chis.	March, 2005	24	28	0	1	0	5	1	0	58	59
Chetumal Q. Roo	June, 2005	17	20	9	2	0	2	0	0	47	50
Cuernavaca, Mor.	June, 2005	33	14	8	0	0	1	1	0	56	57
Zacatecas, Zac.	September, 2005	43	15	0	0	0	2	0	0	62	62
Tuxtla Gtz, Chis.	December, 2005	19	13	0	0	0	4	4	0	32	36
Tuxtla Gtz, Chis.	February, 2006	22	12	0	0	0	0	0	0	34	34
Ixtapa Zihuatanejo, Gro.	April, 2006	36	40	8	0	1	2	2	0	78	88
Morelia, Mich.	June, 2006	21	9	3	0	0	0	0	0	30	33
Jojutla, Mor.	August, 2006	0	11	0	0	1	0	0	0	11	12
Poza Rica and Tuxpan, Ver.	December, 2006	85	70	44	1	0	0	5	0	200	218
Tijuana-Rosarito, BCN.	March, 2007	162	49	23	0	0	0	1	0	234	238
Torreón, Coah.	March, 2007	23	20	12	0	0	0	0	0	52	55
Puerto Veracruz, Veracruz, Ver.	May, 2007	342	92	34	0	0	0	3	0	478	492
Tapachula, Chis.	July, 2007	30	35	18	0	0	4	1	0	87	88
Tulancingo, Hgo.	August, 2007	29	16	6	0	0	0	1	1	51	54
Yanga, Veracruz	March, 2008	168	35	8	0	0	0	0	0	83	83
Merida, Yucatan	June, 2008	57	17	8	0	0	0	0	0	77	82
Cd. del Carmen and Campeche	June, 2008	102	0	0	0	0	2	4	1	104	105
Mexicali, BCN.	September, 2008	60	0	0	0	0	0	0	0	60	60
Durango, Durango	September, 2009	26	12	8	0	0	0	0	0	42	46
Tapachula, Chis.	March, 2009	45	29	10	0	0	13	0	0	91	97
Sisoguichi, Chihuahua	June, 2009	16	5	0	0	0	4	4	0	22	24
Acapulco, Guerrero	October, 2009	54	16	4	0	0	0	0	0	74	75
Oaxaca, Oaxaca	November, 2009	18	16	12	0	0	2	0	0	48	48
Tijuana, BCN	December, 2009	48	20	4	0	0	0	1	0	72	73
Tuxtla Gtz, Chis.	January, 2010	156	40	14	0	0	0	0	0	210	216
Cd. del Carmen and Campeche	February, 2010	100	40	10	0	2	0	0	0	150	152
Valladolid-Tizimín, Yuc.	March, 2010	60	30	15	0	0	0	1	0	105	108
Cancun, Q. Roo	May, 2010	30	10	2	0	0	0	0	0	42	43
Huitzuco, Gro.	May, 2010	6	6	2	0	1	0	3	0	14	15
Temixco, Morelos	June, 2010	0	16	6	0	0	0	0	0	22	23
Pachuca, Hidalgo	July, 2010	38	12	31	0	0	0	0	0	53	56
Tuxtla Gtz, Chis.	August, 2010	156	40	14	0	0	0	2	0	210	216
San Luis Potosi, SLP.	September, 2010	42	0	0	0	0	0	0	0	42	44
Aguascalientes, Ags.	September, 2010	30	30	10	0	0	1	0	0	70	71
Jalapa, Veracruz	November, 2010	89	0	0	0	0	0	0	0	89	89

Continue Table 1: Table of campaigns carried out from 2007 to 2012.

Extramural surgery 2004 2012											
Headquarters	Month and year	Laparo- scopic cholecys- tectomy	Inguinal hernia	Um- bilical hernia	Hyster- ectomy	Hiatus surgery	Other surge- ries	Compli- cations	Mortal- ity	Patient number	Procedure number
Temixco, Morelos	January, 2011	0	31	4	0	0	0	0	0	35	36
Tijuana, BCN	February, 2011	52	13	15	0	0	22	0	0	102	103
Tapachula, Chis.	March, 2011	100	75	0	1	0	0	0	0	175	175
Tizimín, Yucatán	May, 2011	50	0	0	0	0	0	0	0	50	50
Veracruz	June, 2011	511	523	443	0	0	0	0	0	1,477	1,477
San Luis Potosi, SLP.	August, 2011	43	13	2	0	0	0	1	0	58	58
Campeche, Campeche	September, 2011	85	7	4	0	0	0	0	0	96	96
Acapulco, Gro.	September, 2011	48	12	4	0	0	0	0	0	64	64
Iguala, Guerrero	November, 2011	19	12	8	0	0	0	0	0	37	39
Córdoba, Veracruz	August, 2012	41	16	0	0	0	0	0	0	57	57
Rio Blanco, Veracruz	August, 2012	25	22	0	0	0	0	0	0	47	47
Mexicali, BCN.	February, 2012	0	0	0	5	0	14	0	0	19	19
San Luis Potosi, SLP.	September, 2012	25	15	0	0	0	0	0	0	40	40
Campeche, Campeche	November, 2012	79	25	0	0	1	0	0	0	105	105
Total, CDMX		3,126	1,651	822	10	5	81	36	2	5,622	5,741
Associated groups:											
Chetumal, Q. Roo	2005	20	0	0	0	0	0	0	0	20	20
Chiapas	2005	0	120	0	0	0	0	0	0	20	20
Baja California North	2008-2012	3,000	580	390	100	0	300	0	0	4,390	4,390
Total (CDMX, BCN, Chiapas)		6,146	2,351	1,212	110	5	381	12	2	10,052	10,171

colleges and subsequently form the Mexican Federation of Colleges of Specialists in General Surgery (FMCECG).

One of the obligations of the professional associations of the Mexican Republic is to give back to the population with an activity called "social service." During Dr. Roberto Bernal Gómez's term as president of the AMCG/FMCECG (2003-2004), the Social Service Committee was formed. As a college of surgical professionals, the responsibility was to protect the population through surgical procedures and education.

The first campaign was scheduled for May 2004. The criteria for the call for participating surgeons were that they should be members of the AMCG, certified by the Mexican Council of General Surgery, and with professional

recognition. The anesthesiologists and nursing staff were those who usually worked with these surgeons. The participating hospital was selected based on a local contact. The selection criteria for the type of patient, pathology, and surgical anesthetic risk were established, and the routine to be followed from that moment on was systematized. Only abdominal cavity hernia defects were solved in this campaign, and 91 patients were operated on. There was limited participation of the local personnel, and the lack of commitment of this body to participate in these events was a lesson learned. The most important aspect of this campaign was that the process to be followed was structured.

In the beginning, only one hospital was selected, and short-stay surgeries were performed with minimal complications

(umbilical and inguinal hernias, which can also be performed under local anesthesia). The response of surgeons, anesthesiologists, and nurses who specialized in minimally invasive surgery also made it possible to start laparoscopic cholecystectomies in one or two operating rooms. Working in two or even three hospitals simultaneously in the same city was possible in a short time. Subsequently, the ambition and great desire to bring health to more patients resulted in simultaneous campaigns in several hospitals in different cities and states until reaching the grand campaign of 1,000 surgeries performed in Veracruz, surpassing this goal with more than 500 procedures, as can be seen in the official report of the health services of that state.

Little by little, enthusiast people began to gather. The future venues were usually arranged with the state secretaries of health, who also provided resources (hospitals and lodging) agreed upon with the Ministry of Health. The states undertook to cover lodging, transportation, and logistical support. Initially, there was economic support from the AMCG. Attempts were made to obtain other donations from Mexican companies without success; however, it is essential to mention the unrestricted support of the CARSO group.

Quantifying the amount paid to the population with extramural surgery campaigns is complicated. As a reference, there is a study published in the IMSS Medical Journal⁷ where at 2011 prices, it was considered that the approximate cost in public hospitals of a cholecystectomy by laparoscopy was \$12,507 Mexican pesos, which multiplied by the number of procedures performed by the group would give a total amount of \$75 million Mexican pesos. This altruistic contribution to society would not seem to have a great value, but if we consider that the average monthly income of the population of our country is approximately \$2,000 Mexican pesos,⁸ a patient would have to invest the total of his or her income for six months to be able to pay for this procedure.

One of the inherent guarantees of global surgery programs is to offer patients high-quality procedures. If this objective is not achieved, the personal cost and the economic impact on society make them prohibitive. There are

several classifications to quantify the degree of complications; when two of them were compared, the most comprehensive one was not feasible to apply in the global surgery setting in low-income countries due to the frequent lack of resources. The ISOS (International Surgical Outcomes Study) classification divides complications into mild (temporary damage not requiring intervention), moderate (more serious damage but not resulting in permanent damage or functional limitation but frequently requiring clinical treatment), and major (resulting in prolonged hospitalization and leaving functional limitations or death).⁹ It is the most useful because of its simplicity in referring specifically to the surgical event, and we consider that in our setting it is the easiest to apply. It should be remembered that the usual complication parameters that are recorded specify the procedure performed, for example, the rate of residual lithiasis or the rate of recurrence of a hernia. Although these parameters are still valid, because of how global surgery campaigns are designed and executed, these events occur when the group is no longer in charge of the patients. In our case, as the campaigns were programmed with the local health secretariat and the patients were clinically monitored pre- and late postoperatively by them, these evolved through direct notification.

It was necessary to transfuse trans-operatively only four patients in 51 campaigns. In Mexico, especially in the interior of the Republic, transfusion is a complex process to structure, so it never goes unnoticed. Three of the four procedures were for bleeding during a cholecystectomy and one for a hernia. One of the four patients died. Trans-operative bleeding is likely underreported in our study since, as in Pearse's study, it was the most frequent complication and present in 11.6%.⁹ However, in our cases, it had little clinical impact, compensated by the patients usually having a low anesthetic surgical risk or because the surgical team effectively controlled the bleeding.

There was a low rate of biliary tract injury during the campaigns, limited to only 0.58%. Suppose the percentage of this injury worldwide ranges between 0.4 and 1.5%. In that case,¹⁰ is likely the result of several factors, among which

the surgical capacity of the surgeons involved in the program stands out.

The American Society of Gastrointestinal and Endoscopic Surgeons (SAGES), through the AMCG, has initiated a training program to ensure that there are experts in laparoscopic cholecystectomy in the country. These experts will then train other surgeons. Although this scenario is generous, it needs to be aware of the capacity of national surgeons. This procedure has been performed regularly in the country since its introduction in 1990, so the proper training of surgeons is not the limiting factor. Material resources and increased altruistic interests are needed.

The number of abdominal wall defect repairs was significantly lower than that of cholecystectomies, a curious situation since this surgery is the most frequently performed nationally and worldwide. In all cases of inguinal and abdominal wall hernias, prosthetic material was used, mainly non-lightened polypropylene mesh. In umbilical hernias, this material was used only if they were larger than 3 cm in diameter and at the discretion of the treating surgeon. Unfortunately, it was impossible to perform an adequate follow-up of the patients to determine the recurrence rate. However, if the worst-case scenario is considered and if it had been greater than 10%, 3,207 patients would have been cured.

CONCLUSIONS

We consider the most critical points to be:

1. Our global surgery program was successful and safe, with low morbidity and mortality compared to usual hospital conditions. Only two deaths were reported in more than 10,000 patients, equivalent to 0.02% (serious complications). Likewise, the biliary tract injury rate was 0.58%, which is within the usual parameters, and only 0.04% of the trans-operative bleeding required blood transfusion (moderate complication).
2. We believe that the management model to establish an extramural surgery program within national boundaries, requires:
 - a. Leadership: this is the most important character for the program's success.

He/she must have the desire, but fundamentally, the time to dedicate to this program. He/she is responsible for managing the economic and human resources. As duties, he/she must select the site for the next campaign, the characteristics of the patients to be treated, summon the participating doctors and nurses; he/she must also coordinate transportation and lodging, collect material and economic resources, supervise the development of the campaign, and finally, record the procedures carried out with all their vicissitudes. It requires permanent secretarial support and possibly a support committee.

- b. Health professionals: Surgeons, anesthesiologists, and surgical nurses. All must be experienced and duly qualified. Since they sometimes work in non-optimal conditions, experience compensates for deficiencies. While surgical or anesthesia residents' participation is convenient, they should avoid assuming a leading role in developing the campaign.
- c. Dynamics of the campaign: these are initiated by requests for support from state surgeons, hospital directors, the state health secretary through his extramural surgery coordinator, municipal presidents, and others. This request is sent to the campaign coordinator, the Undersecretariat for Sectoral Coordination, and the General Directorate for Extension of Coverage. This request is sent to the coordinator of the campaigns or through the Undersecretary of Sectoral Coordination and the General Directorate of Extension of Coverage.¹¹ Three months before the campaign, a hospital visit is made to set the date, goals, availability of operating rooms, laparoscopy equipment, anesthesia, staff, and other things. Based on this data, the campaign coordinator and the state authorities request the corresponding supplies through their state extramural surgery coordinator.

Depending on the goals, the campaign coordinator invites anesthesiologists, nurses, and surgeons to participate. A request for transportation is sent to the Director General of Health Services Management. Campaigns are usually held over two or three days on weekends, so the participating group arrives a day early. Patients are screened and scheduled for surgery by local surgeons. It is not feasible for the extramural surgery group to provide pre-surgical consultation; their work is only surgical. These guidelines may only apply to Mexico.

- d. Registration instruments: it is necessary to develop documents to manage, program, report events, and follow up on the campaigns. Many of the data from these campaigns have yet to be recorded due to the lack of a correct administrative methodology.
- e. Sponsors and participants: the main sponsors are the state and municipal governments through the health services, the state Integral Development for the Family (DIF), and national industry foundations. Major pharmaceutical and surgical technology companies should participate. The surgical associations that should support the project are the Mexican Association of General Surgery/Mexican Federation of Colleges of General Surgery Specialists, the Mexican Association of Endoscopic Surgery, and medical colleges from different hospitals and states.

The strategy for recruiting sponsors should be refined, and this obligation should fall to the AMCG's Social Service Committee. The industry and sponsors would be more likely to participate if donations were tax deductible.

ACKNOWLEDGMENTS

Anesthesiologists

Bernardo Rueda, Carlos Barrientos, Carlos José Enríquez-López, Claudia Olguín-Ramírez, Cesar Augusto Reséndiz-Ramírez, Eduardo Nuche-

Cabrera, Elizabeth Pineda-Zagal, Gabriela Márquez-Aldama, Gabriela Patricia Avena-Sánchez, Gerardo Jiménez-Bustos, Griselda Lira-González, Ignacio Buendía-Muñoz, Ivana Ponce, Jazmín Reynoso-Montecino, Jesús Sánchez-Calderón, Jorge Reyes-Mendiola, Juan Manuel Estrada-Rodríguez, Laura Concepción Citalán-Moreno, Lourdes Iliana Briones-Sánchez, Luis Vidaña-Marrufo, Manuel Toledo-Couturet, María de Jesús Reynoso-Sánchez, Mario Leyva, Miriam Valencia-Godínez, Óscar Peña-Becerra, Roberto Gallegos-Arzola, Rosa María Sandoval-Trejo, Rubén Cecilio García-Mar, Sandra Naranjo, Sergio González-Flores, Samantha Meza-Cejudo, Víctor Rodríguez-Brambila.

Surgeons

Agustín Pérez-Rodríguez, Alberto Arturo Alarcón-Ramírez, Alberto Chusleb-Kalach, Alejandro Elizalde-DiMartino, Alejandro Escobar-Monroy, Alejandro Inda-Toledo, Amanda Castañeda-Rodríguez Cabo, Antonio Albarrán-García, Augusto César Reséndiz-Ramírez, Carlos Gutiérrez-Valle, Carlos López-Hernández, Carlos Melgoza-Ortiz, César Villa-Jirash, David Ángel Banderas-Garibay, David Castillejos-Badwell, David Lasky-Marcovich, David Valdez-Méndez, Fausto Dávila-Ávila, Fernando Rodríguez-Salgado, Francisco Ocampo-Benítez, Gregorio Villareal-Treviño, Guillermo López-Espinosa, Héctor Espino-Cortes, Héctor Leonardo Pimentel-Mestre, Humberto Guzmán, Hugo Lino Andrade-López, Isaac Zaga-Minian, Javier Guevara, Javit Kuri^(†), Jorge D. Muñoz-Hinojosa, Jorge Luis Razo-Valencia, Jorge Pérez-Castro y Vázquez, Jorge Zalpa-Morales, José Luis Anaya-Rocha^(†), Juan Antonio López-Corvalá, Juan Bernardo Medina-Portillo, Juan Enrique Valdez-Ruiz, Juan Hurtado-Gorostieta, Juan Luis Flores-Hernández, Juan Silva-Téllez, Lilia Cote-Estrada, Luis Alfonso Avilés-Heredia, Luis Castro, Luis Enrique Ordoñez-Capuano, Luis G Menchaca-Ramos, María Graciela Zermeño-Gómez^(†), Manuel Muñoz-Juárez, Rafael Contreras-Ruiz Velazco, Roberto Bernal-Gómez, Romeo Ocampo-Domínguez^(†), Samuel Shuchleib-Chava, Saúl Humberto Méndez-Luna, Sergio Lee-Rojo, Víctor Hernández-Carballo.

Nurses

Adriana Torres-Hernández, Alejandro Ramírez, Andrés Buendía-García, Antonia Josefina Santos-Rosales, Araceli Revilla-Flores, Arlen Fuentes-Santillán, Asunción Contreras-Contreras, Bárbara Campos, Bárbara Ruth Martínez, Beatriz González-Ávila, Cecilia Osornio, Enrique Araujo, Fabiola Hernández, Griselda Lira-González, Guadalupe Méndez-González, Guadalupe Romero, Guillermina Regalado, Jazmín Reynoso-Montesinos, Jessica García, José Valdés, Laura Labourdette-Gómez, Lourdes Pérez, Luis Fernando Pérez-Guzmán, Mareli Moreno, Margarita Zamora-García, María Elena Viguera-Natera, María Eugenia Rojas-Rangel, María Lucila Ramos-Pérez, Martha Hernández-Telcuiatl, Óscar Peña-Becerra, Pablo Weber, Patricia Carreño, Perla Vickers, Petra Barrob-Martínez, Piedad Verónica Fernández-Pliego, Rocío Ángeles Rinconillo, Rocío Cruz-Hernández, Rocío López, Rosalía Olvera-Cordero, Ruth Bárbara Martínez, Sandra Vivan, Susana Cruz-Gaytán, Teresa Díaz-García, Teresa Morales, Teresa Vega-Real, Vicenta García-Soto, Yazhuko Virginia Chinney-Casango.

Because of their efforts, the results obtained were possible. None of them received any payment, and many canceled lucrative activities, too. For this reason, they should be mentioned.

REFERENCES

1. Dare AJ, Grimes CE, Gillies R, et al. Global surgery: defining an emerging global health field. *Lancet*. 2014; 384: 2245-2247. doi: 10.1016/S0140-6736(14)60237-3.
2. Beaglehole R, Bonita R. What is global health? *Glob Health Action*. 2010; 3. Available in: <https://doi.org/10.3402/gha.v3i0.5142>
3. Hoffman SJ, Cole CB. Defining the global health system and systematically mapping its network of actors. *Glob Health*. 2018; 14: 1e19.
4. Tamlyn Mac Quene, Lynn Bust, Johnelize Louw, Michael Mwandri, Kathryn M. Ch. Global surgery is an essential component of global health. *Surgeon*. 2022; 20: 9-15. doi: 10.1016/j.surge.2021.10.001.
5. Michael Bath, Tom Bashford, J E Fitzgerald. What is 'global surgery'? Defining the multidisciplinary interface between surgery, anaesthesia and public health. *BMJ Global Health*. 2019; 4: e001808. doi:10.1136/bmjgh-2019-001808.
6. Employment and occupation. Available at: <https://www.inegi.org.mx/temas/empleo>
7. Salinas-Escudero G, Zurita-Saldaña VR, Hernández-Garduño AG, Padilla-Zárate MP, Gutiérrez-Vega R, Sastré N, et al. Direct costs of open and laparoscopic cholecystectomies (unam.mx). *Rev Med Inst Mex Seguro Soc*. 2011; 49: 353-360.
8. Percentage of the population with labor income below the cost of the food basket. Available at: <https://www.coneval.org.mx/coordinacion/entidades/DistritoFederal/Paginas/itlp.aspx>
9. Pearse RM. Prospective observational cohort study on grading the severity of postoperative complications in global surgery research. *BJS*. 2019; 106: e73-e80. doi: 10.1002/bjs.11025.
10. Nicola de 'Angelis. 2020 WSES guidelines for the detection and management of bile duct injury during cholecystectomy. *World J Emerg Surg*. 2021; 16: 30. doi: 10.1186/s13017-021-00369-w
11. Trigos-Micoló I, Barquín-Donnadieu M, Gutiérrez-Soriano L. National Program of Extramural Surgery of the SSA 1994-2000. *Ciruj*. 2001; 69: 160-166.

Ethical considerations and responsibility: data privacy. According to the protocols established in our work center, we declare that we have followed the protocols on patient data privacy and preserved their anonymity.

Funding: financial support still needs to be received to prepare this work.

Disclosure: none of the authors have a conflict of interest in the conduct of this study.

Correspondence:

Eric Romero-Arredondo

E-mail: era1954@live.com.mx

Surgical versus medical management in cutaneous loxoscelism: systematic review and update

Manejo quirúrgico versus tratamiento médico en loxoscelismo cutáneo: revisión sistemática y actualización

Aldo Israel Olan-De Los Santos,^{*} Hilda Alejandra Manzo-Castrejón,[‡]
Enrique Corona-Díaz,[§] Grecia Fernanda Hurtado-Miranda,^{*} Leonel Eduardo Franco-Ponce,^{*}
Juan Daniel Arreola-Pérez,[¶] Uriel Esaid Arellano-Romero,^{*} Juan Manuel Alanís-Nava,^{*}
Jonathan Javier Ortiz-Márquez,^{*} Iván San Pedro-Rodríguez[¶]

Keywords:

loxoscelism,
loxosceles, brown
recluse spider,
treatment, systematic
review.

Palabras clave:

loxoscelismo,
loxosceles, araña
reclusa marrón,
tratamiento, revisión
sistemática.

^{*} Third-year resident
of General Surgery,
Hospital General Tacuba,
Instituto de Seguridad
y Servicios Sociales de
los Trabajadores del
Estado, Mexico City.

[‡] Attending
physician, Plastic and
Reconstructive Surgery,
Hospital General Tacuba,
Instituto de Seguridad
y Servicios Sociales de
los Trabajadores del
Estado, Mexico City.

[§] First-year resident
of Internal Medicine,
Centro Médico Nacional
La Raza, Instituto
Mexicano del Seguro
Social, Mexico City.

ABSTRACT

Background and objective: to perform a systematic review on the management of cutaneous loxoscelism to analyze the effectiveness of current therapies in managing this pathology by comparing the effectiveness of medical and surgical management. **Methods:** through systematic search in different databases, we carried out a compilation and synthesis using the PRISMA method for those studies that evaluate a therapeutic intervention; we discarded those that do not make any reference to the validation of a therapeutic strategy for the bite of a spider by the genus *Loxosceles*. **Results:** nineteen studies, including six randomized clinical trials, three non-randomized clinical trials, two cohorts, two systematic reviews, and six case series were chosen. In areas of necrosis greater than 1 cm, surgical excision within the first week to 10 days after the bite is ideal, with significant complications described in less than 48 hours, a protocol with decompressive fasciotomies, necrosectomies, and subsequent coverage with flaps and grafts should be applied for the prevention of compartment syndromes. Pretreatment with dapsone for 14 days reduced the incidence of surgical wound complications compared to chlorphenamine. Hyperbaric oxygen (HBO) therapy at 2.5 atmospheres significantly reduced wound diameter at ten days, even two to three months after the failure of other treatments; however, it did not differ significantly concerning lesion size compared to other treatments. The anti-loxosceles serum reports less probability of developing necrosis and resolution in 97% of the cases. **Conclusions:** there is a period in which the surgical approach benefits patients, after the first 48 hours and before ten weeks. Medical therapy seems to have more evidence for using dapsone and anti-loxosceles serum to avoid the progression

RESUMEN

Antecedentes y objetivo: realizar una revisión sistemática acerca del manejo del loxoscelismo cutáneo para analizar la efectividad de las terapias actuales sobre el manejo de esta patología con la comparación de la efectividad del manejo médico y quirúrgico. **Métodos:** a través de las búsquedas en diferentes bases de datos de manera sistemática se llevó a cabo una recopilación y síntesis por medio del método PRISMA para aquellos estudios que evalúan una intervención terapéutica, descartamos aquellos que no hacen alguna referencia a la validación de una estrategia terapéutica para la mordedura de una araña por el género *Loxosceles*. **Resultados:** diecinueve estudios, entre ellos seis ensayos clínicos aleatorizados, tres ensayos clínicos no aleatorizados, dos cohortes, dos revisiones sistemáticas y seis series de casos. En áreas de necrosis mayores a 1 cm la extirpación quirúrgica dentro de la primera semana a 10 días después de la mordedura es lo ideal, con mayores complicaciones descritas en un periodo menor a 48 horas, se debe aplicar un protocolo con fasciotomías descompresivas, necrosectomías y posteriores coberturas con colgajos e injertos para la prevención de síndromes compartimentales. El pretratamiento con dapsone por 14 días redujo la incidencia de complicaciones de la herida quirúrgica, al compararla con clorfenamina. El oxígeno hiperbárico (HBO) a 2.5 atmósferas reduce significativamente el diámetro de la herida a los 10 días, incluso dos a tres meses después del fracaso de otros tratamientos; sin embargo, no difiere significativamente con respecto al tamaño de la lesión en comparación con otros tratamientos. El suero anti-loxosceles reporta menor probabilidad de desarrollar necrosis y resolución en 97% de los casos. **Conclusiones:** parece existir un periodo



How to cite: Olan-De Los Santos AI, Manzo-Castrejón HA, Corona-Díaz E, Hurtado-Miranda GF, Franco-Ponce LE, Arreola-Pérez JD, et al. Surgical versus medical management in cutaneous loxoscelism: systematic review and update. *Cir Gen.* 2023; 45 (3): 160-174. <https://dx.doi.org/10.35366/112925>

† Second-year resident of General Surgery, Hospital General Tacuba, Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, Mexico City.

Received: 04/10/2023
Accepted: 06/28/2023

of cutaneous lesions; in general, few conclusive studies allow establishing therapeutic indications.

en el que el abordaje quirúrgico resulta benéfico en los pacientes y éste se encuentra después de las primeras 48 horas y antes de las 10 semanas. La terapia médica parece tener mayor evidencia al uso de la dapsona y el suero anti-loxosceles para evitar la progresión de las lesiones cutáneas, de forma general existen pocos estudios contundentes que permitan establecer indicaciones terapéuticas.

INTRODUCTION

Justification and objectives: the number of clinical research studies on this subject is continuously increasing; therefore, we undertook the task of synthesizing in an orderly manner and under scientific criteria the existing information to date in order to develop a consensus on the management of loxosceles spider bite; however, there are several limitations: for example, most of them are elaborated with a low level of evidence and degree of recommendation, there are few controlled clinical trials or with a reliable methodological design to give clinical recommendations on the effectiveness of medical versus surgical management for cutaneous loxoscelism in humans for its applicability in daily clinical practice.

The brown recluse spider, also known as the fiddler spider, belongs to the genus *Loxosceles*.¹ Despite more than 42,000 spider species in the world,² only a few can produce severe cases of poisoning in humans,³ among them 33 species of *Loxosceles* in Mexico.^{4,5} Their bite produces loxoscelism, derived from the venom with hemolytic, vasculitic, and coagulant necrotizing characteristics;⁶ it causes clinical conditions that may present as localized cutaneous loxoscelism or systemic loxoscelism, less frequently and more severe.⁷ The first symptoms in the cutaneous picture start with pruritus and erythema, progressing to severe pain and evolving into a more severe dermonecrotic form⁸ (Figures 1-3). Early diagnosis of loxoscelism, usually made by anamnesis and clinical findings, together with a multidisciplinary approach, can save a life or limb and prevent more severe conditions. Several treatments

have been described; however, it is still controversial due to the insufficient quality of the available evidence for developing a therapeutic consensus, and there needs to be a standardized treatment approach.⁹ Current literature on brown spider bites suggests anti-loxosceles serum, analgesia, antibiotic therapy, dapsona, antihistamines, ice, compression, elevation, hyperbaric oxygen therapy and local management with surgical debridement, and repeated healing of the lesion with or without application of skin graft. Therefore, knowledge of the morphological characteristics, habitat, and severity of the clinical picture caused by the toxicity of the poisons inoculated by each species is essential when distinguishing the severity of each event and deciding the corresponding therapy.¹⁰

MATERIAL AND METHODS

We elaborated this review through a systematic process that consisted of researching and critically reading the clinical studies with the highest methodological quality by searching different databases and search engines, including PubMed/Medline, UptoDate, Cochrane, Web of Science, Science Direct, among others; using a different combination of words such as "loxoscelism," "loxosceles," or "brown recluse spider"; subsequently, the search was supplemented with additional search engines such as Wiley online library, Ovid, Scielo and Google academic, and adding a new search word of "arachnidism." The search of the different sources of information consulted was performed with no publication date limit until March 2023. For eligibility, we chose a bibliography without language distinction,



Figure 1: 38-year-old male patient with a *loxosceles* spider bite, 12 hours of evolution with a livedoid plaque and necrosis area involving subcutaneous cellular tissue. **A)** Livedoid plaque on the dorsum of the thumb secondary to a *loxosceles* spider bite. Congestive areas and ecchymosis secondary to vasoconstriction and ischemia caused by the venom are seen in the periphery of the wound. **B)** A lesion with local ampules without systemic manifestations is observed after local and symptomatic management.



Figure 2: Dermonecrotic skin lesion due to probable *loxoscelism*.

including papers in Spanish, English, French, and Portuguese. Those explicitly mentioning a therapeutic intervention in the title or abstract were included to evaluate the full-text systematic review; we discarded those that did not reference the validation of a

therapeutic strategy for the bite of a spider of the genus *Loxosceles*. Details of the results of the different search engines, description, and selection of the articles are described in [Table 1](#).

Analysis of the studies

The distribution of articles initially evaluated for review of titles and abstracts, as well as those selected for full-text analysis. Those studies finally included to carry out the systematic review, which was done by using the PRISMA method (Preferred Reporting Items for Systematic Reviews and Meta-Analyses),¹¹ which consists of the critical analysis of each phase of the elaboration and is summarized in [Figure 4](#). The study selection and information extraction methodology comprised the studies' identification, review, eligibility, and inclusion. The identification process was carried out through the records identified by searching the databases above, carried out by all the authors of this review blindly and independently from August 2022 to April 2023, obtaining 22,318 records, among which those that in the title mentioned

other arachnids such as bites by the genus *Latrodectus* (black widow), tarantula, scorpion sting or snake bite were excluded. Only those that mentioned a spider of the genus *Loxosceles* in the title were included. We obtained 5,162 references for analysis of

titles and abstracts after eliminating duplicates through searches in the different sources of information cited, of which 175 were selected for full-text analysis. From this total of studies, and in order to evaluate the risk of bias of the included articles, the authors were given the

Figure 3:
Progression of a loxoscelism skin lesion when the patient herself manually manipulated the necrotic eschar.



Table 1: Databases, search engines, and keywords used, and results.		
PubMed/Medline	Up to Date	Cochrane
Loxoscelism: 45	Loxoscelism: 3	Loxoscelism: 0
Brown recluse spider: 371	Brown recluse spider: 10	Brown recluse spider: 5
Loxoscelism: 740	Loxoscelism: 3	Loxoscelism: 4
Loxosceles: 740	Loxosceles: 3	Loxosceles: 4
Arachnidism: 1,560	Arachnidism: 2	Arachnidism: 13
Wiley online library	Web of Science	Science Direct
Loxoscelism: 0	Loxoscelism: 2	Loxoscelism: 33
Brown recluse spider: 356	Brown recluse spider: 429	Brown recluse spider: 1,187
Loxoscelism: 120	Loxoscelism: 343	Loxoscelism: 543
Loxosceles: 352	Loxosceles: 752	Loxosceles: 1,442
Arachnidism: 4,210	Arachnidism: 232	Arachnidism: 5,907
SciELO	OVID	Academic Google
Loxoscelism: 52	Loxoscelism: 5	Loxoscelism: 1,110
Brown recluse spider: 8	Brown recluse spider: 688	Brown recluse spider: 9,140
Loxoscelism: 63	Loxoscelism: 478	Loxoscelism: 2,220
Loxosceles: 92	Loxosceles: 946	Loxosceles: 7,970
Arachnidism: 14	Arachnidism: 270	Arachnidism: 1,980

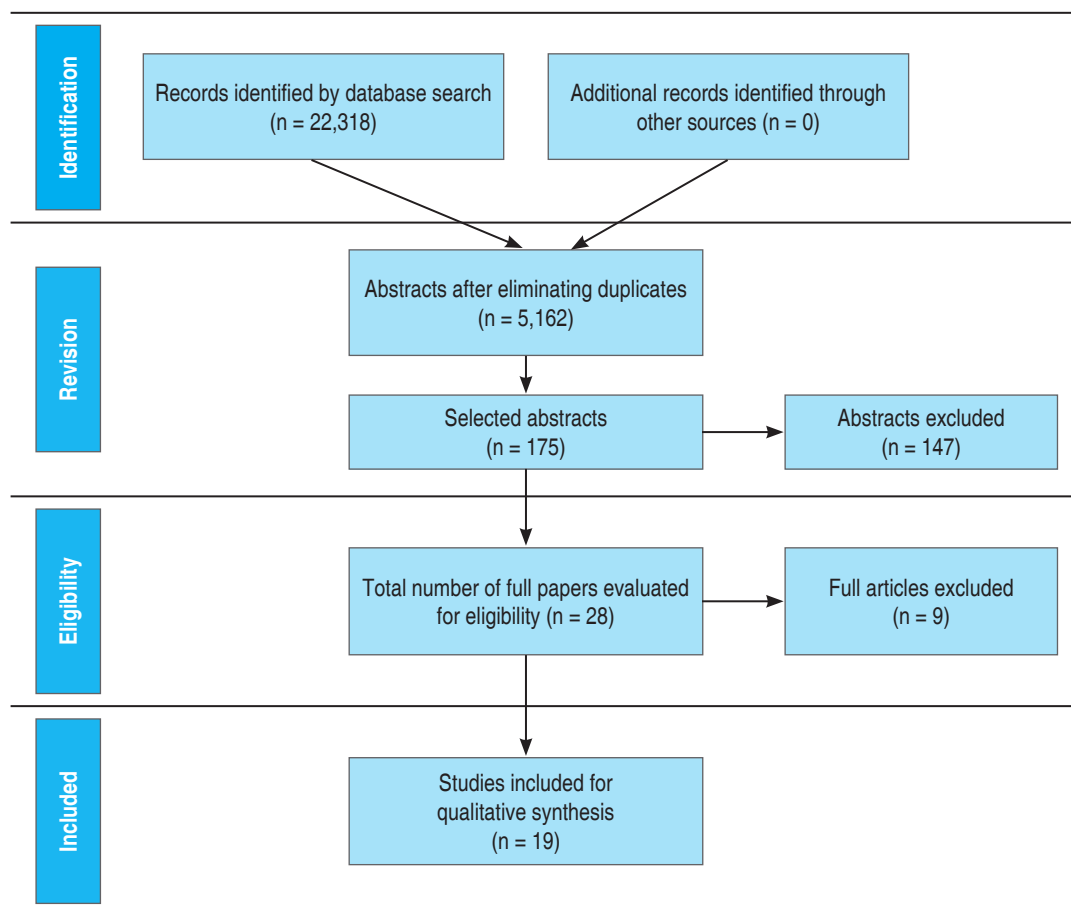


Figure 4:
The PRISMA
method.

task of classifying them according to the level of evidence, degrees of recommendation, and methodological quality based on the scale recommended by the National Health and Medical Research Council (NHMRC),¹² in which each author classified studies, and the independent classification of each author was subsequently submitted to peer review with one of the authors (OSAI). The articles searched and classified are summarized in [Table 2](#). Only 28 full articles were evaluated for eligibility; a peer review was conducted between one of the authors (OSAI) and each of the other authors to determine the studies included for qualitative synthesis. Data extraction was performed independently by each of the reports and publications authors.

To carry out this systematic review, we began the elaboration of the protocol, describing the specific research question, for which we used

the acronym PICO¹³ for the construction of the question:

- P.** *Study population:* the characteristics of interest of this study include a population of animals and humans of any age affected by the bite of a spider of the genus *Loxosceles*.
- I.** *Intervention to be evaluated:* [Table 3](#) compares the interventions such as anti-loxosceles serum, dapson, chlorphenamine, hyperbaric oxygen, surgical treatment, negative pressure, nanocrystalline silver, cyproheptadine, topical nitroglycerin, and vitamin C.
- C.** *Comparison of intervention:* The effectiveness of current medical therapies proposed for managing loxoscelism and the application of timely early surgical management are compared.

Table 2: Identification and review of the study selection and classification process by author.

Author	Full-text articles	Classified articles
Alanís Nava, JM	5	15
Arellano Romero, UE	1	25
Arreola Pérez, JD	2	25
Corona Días, E	25	10
Franco Ponce, LE	45	1
Hurtado Miranda, GF	10	15
Olán de los Santos, AI	74	38
Ortiz Márquez, JJ	11	15
San Pedro Rodríguez, I	1	31
Total	175	175

O. Outcomes: the results of the effect of the intervention will be presented, evaluating the complete cure of the condition, the presentation of sequelae, adverse effects, or treatment failure.

The exclusion criteria for the full-text studies evaluated for eligibility were isolated case reports, reviews, observational or descriptive studies, letters to the editor, and case series without analysis of treatment effectiveness.

The inclusion criteria for the studies selected for the qualitative synthesis were randomized and non-randomized clinical trials, and case series with analysis of treatment effectiveness, systematic reviews, and cohorts.

RESULTS

The search and selection processes followed the PRISMA 2020 flow chart adapted by Boers,¹⁴ Mayo-Wilson and collaborators,¹⁵ and Stovold and associates.¹⁶ From 22,318 records obtained through all databases. After eliminating duplicates, 5,162 references were obtained for title and abstract analysis, of which 175 were selected for full-text analysis. Only 28 full-text articles were evaluated for eligibility; by applying exclusion criteria, 19 studies were included in this review. Of these, six were randomized clinical trials,

three were non-randomized clinical trials, two were qualitative systematic reviews (without meta-analysis), two were cohorts, and six were case series, which evaluated the effectiveness of the application of anti-loxosceles serum, dapsone, chlorphenamine, hyperbaric oxygen, surgical treatment, negative pressure, nanocrystalline silver and cyproheptadine (Tables 4 and 5). The nine studies that met the inclusion criteria by evaluating new therapeutic strategies for loxosceles were finally excluded because they were isolated descriptive case reports on the evolution in single individuals or did not compare the safety and efficacy of the proposed treatment with any intervention already described.

Summary of results

Surgical management

Auer et al.¹⁷ were among the first to report the importance of surgical intervention in the management of loxosceles spider bites in a non-randomized clinical trial; surgical management was classified into three groups: early incision < 10 days after the bite with closure in a second surgical time by suture or graft, late incision three to ten weeks after the bite, and closure in a single surgical time. Ten days after the

Table 3: Interventions evaluated in the systematic review.

Dapsone (diamino diphenyl sulfone)
Chlorphenamine
Anti-loxosceles serum
Hyperbaric oxygen
Surgical management: early or late excision, decompressive fasciotomies, necrosectomies, and posterior coverage (flaps and grafts)
Negative pressure
Nanocrystalline silver
Cyproheptadine
Topical nitroglycerin
Vitamin C

Table 4: Description of the interventions of each study chosen with the results and outcomes obtained.

Study	Population (n)	Intervention	Outcomes
Auer Arthur I ¹⁷	33	<ul style="list-style-type: none"> • Early incision: <10 days + second-time closure with suture or grafting • Late incision: 3-10 weeks + closure • Late incision: 3-11 weeks + grafting 	<p>Cure, in most cases, 1 infection, 1 graft slippage with partial loss</p> <p>Cure in most cases, 1 late infection</p>
Rees Riley S ¹⁸	31	<ul style="list-style-type: none"> • Early surgical excision < 48 hours • Dapsone + late surgical excision 	<p>4 graft losses, 2 unsuccessful closures, 1 phlebitis</p> <p>6 cases of late healing, 3 infections, 1 ulnar nerve entrapment</p> <p>3 complete cures, 4 resolutions in 2 weeks, 2 in 3 weeks, 1 infection, 2 cellulitis. 3 nodulation</p>
Staneff John ¹⁹	7	Decompressive fasciotomies, necrosectomy, flap or grafting	Clinical recovery of patients in an average of 11 days
Maguiña Ciro ²⁰	39	<ul style="list-style-type: none"> • Dapsone 100 mg • Chlorphenamine 4 mg 	<p>Favorable outcome in 18 of 20 patients</p> <p>Favorable outcome in 10 of 19 patients</p>
Maguiña Ciro ²¹	39	<ul style="list-style-type: none"> • Dapsone 100 mg • Chlorphenamine 4 mg 	Infected ulcers treated with clindamycin 300 mg
Rees Riley S. ²²	16	<ul style="list-style-type: none"> • Dapsone 250 mg • Anti-loxosceles serum 2 mg/mL • Dapsone + Anti-loxosceles serum 	Healed in 20 ± 2 days, 2 cutaneous necroses in large ulcers
Borrasca-Fernandes Carla ²³	8	Anti-loxosceles serum 46 hours post-bite	Complete healing between 34 and 98 days in 6 patients
Malaque Ceila MS ²⁴	146	<ul style="list-style-type: none"> • 74 cases with anti-loxosceles serum • 72 cases without anti-loxosceles serum 	<p>Lower probability of developing necrosis</p> <p>Seven early adverse reactions, 4 early adverse reactions, 3 local infection</p>
Isbister Geoffrey K ²⁵	75	Anti-loxosceles serum	Complete response in 97%. 2 early allergic reactions and 1 case of serum sickness
Manriquez Juan J ²⁶	–	Dapsone, surgical treatment, chlorphenamine, anti-loxosceles serum	–
Hobbs Gregory D ²⁷	32	<ul style="list-style-type: none"> • Hyperbaric Oxygen At 2 atm for 2 hours • Dapsone 50 mg • HOB + dapsone 	Reduction of induration at days 7 and 14 in treatment with dapsone
Phillips Scott ²⁸	–	<ul style="list-style-type: none"> • Hyperbaric oxygen at 2.5 atmospheres • Dapsone 1.1 mg/kg • Cyproheptadine 0.125 mg/kg 	Decrease in the total size of the lesion
Maynor M. L ²⁹	41	<ul style="list-style-type: none"> • Without hyperbaric oxygen • Hyperbaric oxygen at 2.5 atmospheres with O₂ 100% • Normoxic hyperbaric oxygen 	Significant reduction in wound size at 10 days with 2.5 atmospheres with O ₂ 100%.
Hadanny Amir ³⁰	3	Hyperbaric oxygen 2 -3 months later	Full resolution
Del Puerto Constanta ³¹	17	Intravenous antibiotics, systemic corticosteroids, dapsone, dapsone, etc.	<p>Complete resolution in 50% with corticosteroids and dapsone</p> <p>Complete resolution in 3 patients on steroids</p>
Mold James W ³²	262	Corticosteroids, dapsone, topical nitroglycerin, and vitamin C	Slower healing with corticosteroids and dapsone
Schenone H ³³	216	Antihistamines, injectable corticosteroids, anti-loxosceles serum	Increased probability of healing with dapsone
Wong S. Lindsey ³⁴	8	Negative pressure (vacuum-assisted closure)	Local control at 12 noon
Chrysostomou D ³⁵	11	Topical nanocrystalline silver	Healing of all wounds
			8 complete healings in one week, 3 wounds sloughed

Table 5: Summary of the studies included for the qualitative review with methodology used and methodological quality.

Main author	Title	Level of evidence	Grade of recommendation	Type of study	Intervention
Auer Arthur I. ¹⁷	Surgery for necrotic bites of the brown spider	III-1	C	Non-randomized clinical trial	Surgical treatment*
Rees Riley S. ¹⁸	Brown recluse spider bites. A comparison of early surgical excision versus dapsone and delayed surgical excision	III-1	C	Non-randomized clinical trial	Surgical treatment* vs. dapsone
Staneff John ¹⁹	Presentation of an effective protocol for the treatment of myodermonecrosis due to cutaneous loxoscelism	IV	D	Case series	Surgical treatment
Maguiña Ciro ²⁰	Dapsone (DDS) in cutaneous loxoscelism	II	B	Randomized clinical trial	DDS (phaminodiphenyl-sulfone) vs chlorpheniramine
Maguiña Ciro ²¹	New therapeutic schemes in cutaneous loxoscelism in Lima, Peru	II	B	Randomized clinical trial	Dapsone (DDS) vs chlorphenamine
Rees Riley S. ²²	The diagnosis and treatment of brown recluse spider bites	II	B	Randomized clinical trial	Dapsone vs. anti-loxosceles serum
Borrasca-Fernandes Carla ²³	Temporal evolution of dermonecrosis in loxoscelism	III-2	C	Cohort	Anti-loxosceles serum
Malague Ceila M. S ²⁴	Impact of antivenom administration on the evolution of cutaneous lesion loxoscelism	III-2	C	Cohort	Anti-loxosceles serum
Isbister Geoffrey K. ²⁵	Funnel-web spider bite. A systematic review of recorded clinical cases	III-3	C	Systematic review	Anti-loxosceles serum
Manriquez Juan J. ²⁶	Cutaneous and cutaneous-visceral loxoscelism: a systematic review	III-3	C	Systematic review	Combination therapy [‡]
Hobbs Gregory D. ²⁷	Comparison of hyperbaric oxygen and dapsone therapy for Loxosceles envenomation	II	B	Randomized clinical trial	Hyperbaric oxygen vs. dapsone
Phillips Scott ²⁸	Therapy of brown spider envenomation. A controlled trial of hyperbaric oxygen, dapsone, and cyproheptadine.	II	B	Randomized clinical trial	Hyperbaric oxygen vs. dapsone vs. cyproheptadine
Maynor M. L. ²⁹	Brown recluse spider bites. Beneficial effects of hyperbaric oxygen	II	B	Randomized clinical trial	Hyperbaric oxygen
Hadanny Amir ³⁰	Non-healing wounds caused by brown spider bites: application of hyperbaric oxygen therapy	III-1	C	Non-randomized clinical trial	Hyperbaric oxygen
Del Puerto Constanta ³¹	Experience in cutaneous and visceral cutaneous loxocellularism	IV	D	Case series	Combination therapy [‡]

Continue Table 5: Summary of the studies included for the qualitative review with methodology used and methodological quality.

Main author	Title	Level of evidence	Grade of recommendation	Type of study	Intervention
Mold James W ³²	Management of brown recluse spider bites in primary care	IV	D	Case series	Combination therapy [‡]
Schenone H ³³	Loxoscelism in Chile: epidemiological, clinical and experimental studies	IV	D	Case series	Combination therapy [‡]
Wong S. Lindsey ³⁴	Loxoscelism and negative pressure wound therapy (vacuum-assisted closure): A clinical case series.	IV	D	Case series	Negative pressure (vacuum-assisted closure)
Chrysostomou D ³⁵	Spider bite wounds can silver help	IV	D	Case series	Nanocrystalline silver

* Surgical treatment: decompressive fasciotomies, necrosectomies, and posterior coverage (flaps and grafts). † Combined therapy: dapsone, chlorphenamine, systemic corticosteroids, antibiotics, antihistamines.

bite with closure in a second surgical time by suture or graft, another by late incision three to 10 weeks after the bite and closure in a single surgical time, and the last in late incision three to 11 weeks after the bite with graft placement in two surgical times. He presented 33 patients with *L. reclusa* spider bites. Of these, 11 cases were hospitalized and received conservative treatment; seven were managed by early exeresis, and the other 15 had late incisions. The authors concluded that early excision of lesions larger than 1 cm was the best treatment once an area of necrosis greater than 1 cm (0.39 inches) has developed and should be performed within the first week after the bite or whenever gangrene appears to be inevitable so that infection, disability, pain, drainage, and expense are minimized. The area of necrosis and underlying tissue (fat and fascia) should be excised early; secondary closure is usually best performed three to five days later using a partial-thickness graft—an identical wound healed in a few weeks.

Rees¹⁸ conducted a non-randomized clinical trial comparing 31 patients divided into two groups: 14 were treated with early surgical excision of the necrotic papule

followed by primary (n = 1) or delayed closure without (n = 3) or with skin grafting (n = 10); the other 17 were treated with the leukocyte inhibitor, dapsone, followed by late surgical excision. Late wound healing (n = 5) and objectionable healing (n = 7) occurred as complications in the first group. In the second group, pretreatment with dapsone decreased the incidence of wound complications (n = 1) and objectionable scarring (n = 1) (p < 0.05) while reducing the need for surgical excision (n = 1).

Staneff and collaborators,¹⁹ in a series of cases, described the use of surgical treatments based on decompressive fasciotomies, necrosectomies, and subsequent coverings with flaps and grafts in seven cases of patients with cutaneous loxoscelism accompanied by necrotizing fasciitis of the affected limb for the management of these complications. The authors recommended a clinical-surgical treatment protocol based on the prevention of compartment syndromes, hemodynamic monitoring and restitution, and measures that favor the regeneration of necrotic tissues since the protocol used had been effective and allowed the clinical recovery of the patients after an average of 11 days of hospitalization.

Medical treatment

Maguiña²⁰ conducted randomized clinical trials of 39 patients with cutaneous loxoscelism and divided them into two groups, time of illness > 24 hours, but < 5 days. One group of 20 patients received dapsone: 100 mg orally, one daily dose for five days. Another group of 19 patients received chlorphenamine maleate at a dose of 4 mg orally every eight hours. A favorable evolution was considered when the skin lesion at the end of the treatment did not present ulceration or necrosis, and an unfavorable evolution was defined when there was ulceration or skin necrosis to a variable degree. Treatment with dapsone allowed favorable evolution in 18 out of 20 patients, and treatment with chlorphenamine allowed favorable evolution in 10 out of 19 patients; 7.6% (3/39) received anti-loxosceles serum in the first six hours after the event, and 33% (12/39) had received other treatments between one and three doses. They concluded that the use of dapsone was statistically significant in the control of the skin lesion and with better clinical efficacy when compared to chlorphenamine at the dose mentioned. Subsequently, they reported using clindamycin 300 mg orally every eight hours to treat infected ulcers or cellulitis without ulcers for seven days.²¹

Likewise, Rees²² conducted a clinical trial in 16 patients randomized into three treatment groups: dapsone 250 mg orally once daily (n = 6), brown recluse spider antivenom 2 mg/ml intralesionally (n = 5), or combination therapy (n = 5). All patients were treated with erythromycin. In the results, all groups appear to have achieved equal efficacy; all lesions healed in 20 ± 2 days, except two patients who had significantly more extensive areas of skin necrosis at presentation. Dapsone treatment is less effective once necrosis has occurred; antivenom is more effective in patients who have not yet presented with the clinical lesion and less effective once the inflammatory reaction has developed. The combination of dapsone and antivenom seems to be the most effective therapy since they act through different mechanisms.

A retrospective cohort²³ reported a case series of eight patients with loxosceles with post-bite intervals between 15 and 216 hours. Seven patients were treated with anti-loxosceles serum (AV; median post-bite time = 46 hours). Topical treatment with papain (10 and 3%), an oily essential fatty acid lotion, and mechanical debridement were applied. Two patients were treated with oral prednisone for five days. Complete healing of the lesion ranged from 34 to 98 days after the bite in six patients (median 68 days).

Another prospective observational study²⁴ concluded that the probability of developing necrosis was significantly lower among patients admitted earlier and those who received anti-loxosceles serum (p = 0.0245) with a relatively low rate of adverse reactions. It included 146 patients with a mean time from the bite to the serum administration of 41.6 ± 27.4 hours; a polyvalent arachnid antivenom was administered in 74 (50.7%) cases and not in the other 72 (49.3%). Adjuvant treatment was used in 130 patients (90.9%) with corticosteroids, antihistamines, and analgesics. Among the 74 patients who received anti-loxosceles serum, early and late adverse reactions occurred in seven (9.5%) and four (5.4%).

A systematic review by Geoffrey K. Isbister²⁵ of a clinical case series evaluated the use of anti-loxosceles serum in 75 patients, including 22 children (range 1-17 years), with a complete response in 97% of the cases identified by experts. Three adverse reactions were recorded in adults: two early allergic reactions (one mild and one with severe systemic effects requiring adrenaline) and one case of serum sickness.

A systematic review²⁶ of clinical studies compared hyperbaric oxygen therapy, ice, anti-loxosceles serum, dapsone, antihistamines, antimicrobials, dextran, corticosteroids, heparin, nitroglycerin, surgery, acetylsalicylic acid, and exchange transfusion. Through three clinical trials, the author reported that dapsone was associated with fewer local complications than surgical treatment, that it was superior to chlorphenamine for skin lesions, and that there was no difference compared to the use of oral dapsone.

Hobbs²⁷ conducted a controlled clinical trial to compare the effectiveness of treatment with hyperbaric oxygen (HBO), dapson and combined management of hyperbaric oxygen with dapson in 32 piglets that received 15 μ l of venom intradermally, divided into four groups: group 1 received no treatment; group 2 received HBO at 2 atm for two hours on days 1-3; group 3 received 50 mg dapson orally on days 1-3; and group 4 received dapson 50 mg orally and HBO at 2 atm for two hours on days 1-3. Necrosis and induration were measured on days 1-7, 14 and 21. A difference in induration reduction was observed between group 3 and the control group up to days 7 and 14; the magnitude of the effect was clinically insignificant, whereas treatment with dapson or HBO or a combination offered little clinical benefit in *Loxosceles* envenomation.

A controlled clinical trial²⁸ in New Zealand White rabbits divided into four groups was conducted to determine whether hyperbaric oxygen (HBO) at 2.5 atmospheres absolute (ATA) for 65 minutes every 12 hours for two days, dapson 1.1 mg/kg every 12 hours for four days, or cyproheptadine 0.125 mg/kg every 12 hours for four days decreased the severity of skin lesions resulting from experimental *Loxosceles* poisoning. The groups did not differ significantly concerning lesion size, ulcer size, or histopathologic classification.

A randomized clinical trial²⁹ on hyperbaric oxygen (HBO) therapy with 41 New Zealand White rabbits that received intradermal injections of venom extract was divided into five groups: 1) no HBO (n = 15); 2) immediate HBO treatment at 2.5 ATA (O₂ 100%) (n = 6); 3) immediate HBO with ten treatments at 2.5 ATA (O₂ 100%) (n = 9); 4) HBO at 48 hours with ten sessions at 2.5 ATA (O₂ 100%) (n = 8); and 5) immediate HBO with regular PO inspired by ten treatments (O₂ 8.4%) (n = 3). The results and conclusions were that standard HBO significantly reduced wound diameter at ten days (p < 0.0001; ANOVA), whereas hyperbaric treatment with normoxic gas had no effect. Thus, HBO therapy within 48

hours reduces skin necrosis and results in a significantly minor wound.

Hadanny Amir et al.³⁰ presented an analysis with hyperbaric oxygen therapy (HBOT) with two absolute atmospheres of 100% oxygen per day for 13, 17, and 31 sessions in three healing brown spider bite patients two to three months after the failure of other treatments. All wounds were hypoxic (TcPO₂ G40 mmHg in room air) with marked improvement during HBOT (TcPO₂ 9,200 mmHg). In all three patients, it culminated in complete resolution with satisfactory healing, and no further surgical procedures were required. No patient had significant side effects. The authors conclude that HBOT benefits non-healing wounds when ischemia is the rate-limiting factor in tissue regeneration; with little evidence of other effective treatments, HBOT should be considered a valuable therapeutic tool for these ulcers.

There were three case series on combination therapy (antibiotic, dapson, systemic corticosteroids, topical nitroglycerin, and high-dose vitamin C). The first case series³¹ included 17 patients hospitalized with a diagnosis of loxoscelism, where 82.3% (n = 14) corresponded to cutaneous loxoscelism; an average of 2.5 days elapsed between the bite and hospitalization with a range between one and five days. All cases were managed with intravenous antibiotic therapy; 94% were treated with systemic corticosteroids (hydrocortisone or prednisone 0.5 to 1 mg/kg/day) for seven days; 64.7% with dapson 50-150 mg per day for four to six weeks. Fifty percent of patients with cutaneous loxoscelism who received concurrent corticosteroids and dapson had complete healing of the lesion at one month of treatment. Four patients received systemic steroid therapy without dapson, and 75% of them presented a complete resolution at one month of evolution. The authors recommend combined therapy with supportive measures, antimicrobials, systemic corticosteroids, and antihistamines. The second case series, published by James W Mold,³² analyzed four treatments (corticosteroids, dapson, topical

nitroglycerin, and high dose vitamin C) in 262 patients where systemic corticosteroids and dapsone were associated with slower healing. Predictors of healing were increased severity, necrosis, and diabetes. Dapsone was associated with a higher likelihood of healing. The mean time to healing was 22.1 ± 18 days, and the median and range of healing times were 17 days and 1 to 144 days, respectively. With practice, patient management was not significantly better ($p < 0.1061$). The third case series³³ involved 216 loxosceles patients under management with injectable antihistamines or corticosteroids and anti-loxosceles serum in two cases. The local and general manifestations attenuated within 12 hours after the start of treatment, so they recommend early initiation of treatment.

S. Lindsey Wong³⁴ published an eight-case series on negative pressure treatment using vacuum-assisted closure (VAC) in patients who developed an area of necrosis surrounded by erythema with progression to an open wound. All wounds stabilized and showed progressive healing after the institution of VAC. None of the wounds worsened or failed to respond once VAC treatment was initiated.

Chrysostomou D³⁵ presented 11 cases of suspected spider bites, to which he applied nanocrystalline silver (Acticoat™) to the affected area. Eight lesions showed favorable evolution, healing without scarring in one week; the remaining three evolved to a sphacelated wound that required additional wound treatment. The author recommended using nanocrystalline silver in arachnoid-inflicted wounds, as it has proven beneficial in achieving symptom control with shorter healing time and reduced or eradicated inflammation and pain.

DISCUSSION

Cutaneous loxoscelism continues to be a clinical entity with a wide margin of variation in therapeutic decisions made in healthcare centers and even in official literature such as seen in clinical practice guidelines. The present discussion aims to compare the scientific evidence published

so far, regardless of the frequency with which specific interventions are indicated in clinical practice.

Surgical management

Surgical treatment has been specifically addressed in two studies selected in our review. The first by Auer et al. compared early incision with late incision combined with closure or grafting; in both scenarios, most cases were cured; however, they reported a lower incidence of complications in the early incision scenario compared with late incision. These results support the performance of early surgical treatment within the first ten days of the onset of the clinical event; however, the study is not broadly descriptive in addressing the effectiveness of the intervention and neither the adverse effects derived from either intervention, which limits the strength of the reported data. A second study by Rees and associates compared the performance of an early surgical strategy versus an initial scheme of medical treatment followed by a delayed surgical approach. In the first scenario, they found a higher incidence of prolonged periods of wound healing exceeding six weeks and an argumentative healing process; in the second scenario, they found shorter healing times with better healing results. Both studies showed contradictory results; however, the cases included had specific essential differences. The first study used an early surgical approach to the incision within the first ten days, while the second one used it within the first 48 hours; the late surgical approach in the first study was considered from three to 10 weeks after the initial event, while in the second one, it was from 14 days onwards. The evidence offered by both studies seemed to show that there is a period in which the surgical approach is beneficial in patients, and this occurs after the first 48 hours and before ten weeks, a comprehensive period that requires lines of research focused on the establishment of a more precise period to establish a firm indication about when surgical therapy surpasses medical therapy in treating cutaneous variants of loxoscelism.

Medical treatment

Medical therapeutics in the included findings also appears to have a time-effectiveness relationship. The studies reviewed demonstrated positive effects with dapsone, especially in cases where it is indicated before completion of maturation process of the lesion, showing less remarkable effects once a necrotic eschar has been established. Critical adverse effects reported with dapsone include its hemolytic effects with secondary lowering of hemoglobin levels,³⁶ and somatic effects such as headache, asthenia, and abdominal discomfort.^{36,37} In patients with clinical stability and without hemolytic comorbidities, and with cutaneous variants of loxoscelism, it is the initial therapy that showed the most positive evidence. Its combination with other therapies had different results; in one of the studies, the combination of dapsone with antihistamines, steroids, and hyperbaric oxygen showed no difference in terms of lesion progression compared to cases treated with dapsone only; differently, the use of dapsone together with anti-loxosceles serum therapy showed better results compared to cases treated only with dapsone in another study by Rees and collaborators.¹⁸ The other interventions were reported to be useful in other ways, such as chlorphenamine controlling pruritus. The use of steroids in the results presented may be associated with long healing times; however, it is difficult to establish a clear relationship due to the low level of evidence shown in the studies used.

Overall, the therapeutics of loxoscelism have little strong quality evidence to establish safe recommendations for interventions. Surgical therapy may be harmful if performed too early but may be beneficial within a window of time that has not yet been specified. Medical therapy seems to have more evidence for using dapsone and anti-loxosceles serum to prevent the progression of skin lesions. In contrast, more studies are still needed to demonstrate better the benefit or risk of other therapeutic measures, such as antihistamines and steroids, as well as other therapies that have been used in the later period with a focus on improving the healing

of established wounds, such as hyperbaric oxygen or electrical therapy.

The review presented here shows certain limitations. First, the process was carried out ordinarily by the reviewers without using computer systems to facilitate the classification of the bibliography; therefore, the selection of the articles for this review is influenced by the human factor in the selection of the studies. In some cases, the selection was limited by language; most of the bibliography was included in Romance and English; however, the interpretation of texts in other languages was limited. We extend this line of research to the realization of clinical trials that compare the effectiveness of early surgical management. The establishment of medical therapies reported to date or, in its absence, the elaboration of descriptive clinical guides, for example, the current Mexican Clinical Practice Guide for Diagnosis and Treatment of Venomous Spider Bites³⁸ has been updated more than ten years, something very similar is seen at an international level, especially in the treatment section, without transparent management in cases of cutaneous loxoscelism.

CONCLUSIONS

Cutaneous loxoscelism is a pathology that requires effective and timely management. However, most published studies correspond to a low level of evidence and degree of recommendation, and few studies have been performed to date that allow the development of a therapeutic strategy; due to the methodological characteristics, the study is limited to making recommendations based on contrasted evidence against other therapeutic strategies, since there are few documented clinical trials performed so far.

Whether there is concrete evidence comparing the effectiveness of surgical management over medical treatment depends on the time of evolution, the presence of necrosis, and the size of the ulcer. The available evidence on surgical management guidelines is reported in cases of necrotic ulcers or gangrene measuring equal to or larger than 1 cm. Ideally, early surgical

excision, decompressive fasciotomies, and necrosectomies are recommended in the first surgical stage in these cases to prevent the appearance of compartment syndromes and later evaluate, depending on the area of necrosis, the application of flaps and grafts.

In terms of evolution, the effectiveness of surgical management offers better results in not less than 48 hours due to the complications presented. However, it shows better results within the first week or in less than ten days when dapsone can be applied to reduce the appearance of surgical wound complications or the need for surgical excision.

Among the available information, the combination of initial simultaneous management between dapsone and anti-loxosceles serum with or without application of hyperbaric oxygen at 2.5 atmospheres with 100% O₂ seems beneficial since no significant differences in the size of the ulcer are documented in an early period; even so, HBO is beneficial in this sense two to three months later or, in open wounds, the application of a negative pressure system. Chlorphenamine was documented to be less effective in the treatment of skin lesions. Nanocrystalline silver can be used simultaneously with other measures, as well as supportive measures, antimicrobials, systemic corticosteroids, and antihistamines to manage symptoms to decrease healing time, inflammation, and pain.

REFERENCES

- Kose A, Abaci E, Bozkurt Babus S, et al. Skin necrosis, diffuse urticaria, and cellulitis due to presumed loxosceles spider bite. *Wilderness Environ Med.* 2021; 32: 198-203.
- Hallak A, Mohanakrishnan BPE, Dharmaraj J, et al. Hold the Chemo! Leukostasis, a Presentation of Brown Recluse Spider Bite: A Case Report. *J Investig Med High Impact Case Rep.* 2021; 9: 23247096211039949.
- De Roodt AR, Salomón OD, Lloveras SC, et al. Poisoning by spiders of the genus *Loxosceles*. *MEDICINA (Buenos Aires)* 2002; 62: 83-94.
- Nentwig W, Pantini P, Vetter RS. Distribution and medical aspects of *Loxosceles rufescens*, one of the most invasive spiders in the world (Araneae: Sicariidae). *Toxicon.* 2017; 132: 19-28.
- Oliveira-Mendes BBR, Chatzaki M, Sales-Medina DF, et al. From taxonomy to molecular characterization of brown spider venom: An overview focused on *Loxosceles similis*. *Toxicon.* 2020; 173: 5-19.
- Abdelazeem B, Eurick-Bering K, Ayad S, et al. A case report of brown recluse spider bite. *Cureus.* 2021; 13: 1-5.
- Aguirre-Rodríguez C, Hernández-Martínez N, Sánchez-Ortega C. *Loxosceles rufescens* spider bite on the finger of a hand: a case report. *Actualidad Médica* 2020; 105: 55-57.
- Navarro Caballero Ascensión. *Loxosceles* bite wound treated with a synthetic polymer matrix. *Rev ROL Enferm.* 2015; 38: 374-381.
- Guglielmetti A, Jahr C, Compertz-Mattar M. Autologous fibroblasts for treating cutaneous loxoscelism: first experience. *Int Wound J.* 2019; 16: 1503-1505.
- Saracco AS. Guide to diagnosis and treatment of arachnid poisonings. Department of Toxicology. Ministry of Health, Social Development and Sports. Government of Mendoza, Argentina. pp. 1-21.
- Pagea MJ, McKenzie JE, Bossuyt PM, et al. PRISMA 2020 statement: an updated guideline for the publication of systematic reviews. *Rev Esp Cardiol.* 2021; 74: 790-799.
- Merlin T, Coleman K, Norris S, et al. NHMRC levels of evidence and grades for recommendations for developers of guidelines. Canberra: National Health and Medical Research Council. 2009, pp. 1-23.
- Sinha A, Menon GR, John D. Beginner's guide for systematic reviews: a step by step guide to conduct systematic reviews and meta-analysis. Indian Council of Medical Research. 2022, pp. 16-20.
- Boers M. Graphics and statistics for cardiology: designing effective tables for presentation and publication. *Heart.* 2018; 104: 192-200.
- Mayo-Wilson E, Li T, Fusco N, et al. Practical guidance for using multiple data sources in systematic reviews and meta-analyses (with examples from the MUDS study). *Res Synth Methods.* 2018; 9: 2-12.
- Stovold E, Beecher D, Foxlee R, et al. Study flow diagrams in Cochrane systematic review updates: an adapted PRISMA flow diagram. *Syst Rev* 2014; 29: 3-54.
- Auer AI, Hershey FB. Surgery for necrotic bites of the brown spider. *Arch Surg.* 1974; 108: 612-618.
- Rees RS, Altenbern DP, Lynch JB, et al. Brown recluse spider bites. A comparison of early surgical excision versus dapsone and delayed surgical excision. *Ann Surg.* 1985; 202: 659-663.
- Staneff J, Alarcón ASV, Haedo PF, et al. Presentation of an effective protocol for the treatment of myodermonecrosis due to cutaneous loxoscelism. *Argentine Journal of Plastic Surgery.* 2017; 23: 100-102.
- Maguiña C, Gotuzzo E, Alvarez H, et al. Dapsone (DDS) in cutaneous loxoscelism. *Rev Farmacol Terap (Lima).* 1994; 4: 76-78.
- Maguiña VC, Gotuzzo HE, Alvarez H. New therapeutic schemes in cutaneous loxoscelism in Lima, Peru. *Folia Dermatol Peru.* 1997; 8: 1-14.
- Rees R, Campbell D, Rieger E, et al. The diagnosis and treatment of brown recluse spider bites. *Annals of Emergency Medicine.* 1987; 16: 945-949.
- Borrasca-Fernandes CF, Prado CC, Capitani EM, et al. Temporal evolution of dermonecrosis in loxoscelism

- assessed by photodocumentation. *Rev Soc Bras Med Trop.* 2022; 55: e0502.
24. Malaque CMS, Novaes CTG, Piorelli RO, et al. Impact of antivenom administration on the evolution of cutaneous lesions in loxoscelism: A prospective observational study. *PLoS Negl Trop Dis.* 2022; 16: e0010842.
 25. Isbister GK, Gray MR, Balit CR, et al. Funnel-web spider bite: a systematic review of recorded clinical cases. *Med J Aust.* 2005; 182: 407-411.
 26. Manríquez JJ, Silva S. Cutaneous and cutaneous-visceral loxoscelism: systematic review. *Rev Chil Infect.* 2009; 26: 420-432.
 27. Hobbs GD, Anderson AR, Greene TJ, et al. Comparison of hyperbaric oxygen and dapsone therapy for loxosceles envenomation. *Acad Emerg Med.* 1996; 3: 758-761.
 28. Phillips S, Kohn M, Baker D, et al. Therapy of brown spider envenomation: a controlled trial of hyperbaric oxygen, dapsone, and cyproheptadine. *Ann Emerg Med.* 1995; 25: 363-368.
 29. Maynor ML, Moon RE, Klitzman B, et al. Brown recluse spider envenomation: a prospective trial of hyperbaric oxygen therapy. *Acad Emerg Med.* 1997; 4: 184-192.
 30. Hadanny A, Fishlev G, Bechor Y, et al. Non-healing wounds caused by brown spider bites: application of hyperbaric oxygen therapy. *Adv Skin Wound Care.* 2016; 29: 560-566.
 31. Del Puerto C, Saldías-Fuentes C, Curi M, et al. Experience in cutaneous and visceral cutaneous loxoscelism of hospital management: clinical, evolution and therapeutic proposal. *Rev Chilena Infectol.* 2018; 35: 266-275.
 32. Mold JW, Thompson DM. Management of brown recluse spider bites in primary care. *J Am Board Fam Pract.* 2004; 17: 347-352.
 33. Schenone H, Saavedra T, Rojas A, et al. Loxoscelism in Chile. Clinical and experimental epidemiological studies. *Rev Inst Med Trop S Paulo.* 1989; 31: 403-415.
 34. Wong SL, Defranzo AJ, Morykwas MJ, et al. Loxoscelism and negative pressure wound therapy (vacuum-assisted closure): a clinical case series. *Am Surg.* 2009; 75: 1128-1131.
 35. Chrysostomou D. Spider bite wounds can silver help. *Wound Healing Southern Africa.* 2012; 5: 6-10.
 36. Swanson DL. Loxoscelism. *Clin Dermatol.* 2006; 24: 213-221.
 37. Maguiña VC, Figueroa VV, Pulcha UR, et al. Update on management of araneism in Peru. *Rev Med Hered.* 2017; 28: 200-207.
 38. CENETEC. Diagnosis and treatment of poisonous spider bites.

Funding: the study has not received any financial contribution.

Disclosure: the authors declare no conflicts of interest.

Correspondence:

Aldo Israel Olán-De Los Santos

E-mail: aldoi27@hotmail.com

Conservative management of severe hepatic injury by firearm projectile

Manejo conservador de lesión hepática severa por proyectil de arma de fuego

Jorge Octavio Gutiérrez-Pérez,* Cristina Grado-Limas,†
Yazmín Cabello-Aguilar,§ Luis Cruz-Benítez¶

Keywords:

liver injury, severe, conservative treatment.

Palabras clave:

lesión hepática, severa, tratamiento conservador.

ABSTRACT

Introduction: the liver is the solid intra-abdominal organ most susceptible to injury by abdominal trauma. The lack of evidence on the ideal treatment of solid organ injuries by firearm projectiles is problematic when non-surgical management of hepatic trauma is possible. It is debatable due to the lack of a consensus that is pressing given the increasing incidence of severe liver injury by firearm projectiles. How we manage liver trauma evolves as access to resources such as equipped emergency services, intensive care units, laboratory, continuous availability of health personnel, highly specialized surgeons, computerized tomography, operating room, and blood bank improves. When everything is available, non-surgical management of liver trauma should be the standard treatment in the hemodynamically stable patient without peritoneal irritation and injury to other organs. **Objective:** to present the case of a female patient with severe hepatic injury by firearm projectile with successful non-surgical management of hepatic trauma. **Case report:** a patient with severe hepatic injury due to a firearm projectile was successfully managed conservatively. **Conclusions:** non-surgical management of a patient with severe hepatic injury due to a firearm projectile was possible in our hospital.

RESUMEN

Introducción: el hígado es el órgano sólido intraabdominal más susceptible de lesión por traumatismo abdominal. La falta de evidencia en el tratamiento idóneo de las lesiones de órganos sólidos por proyectil de arma de fuego es problemática cuando el manejo no quirúrgico del trauma hepático es posible. Discutible por la falta de un consenso que resulta apremiante ante la incidencia creciente de lesión hepática severa por proyectil de arma de fuego. La manera cómo manejamos el trauma hepático evoluciona conforme mejora el acceso a recursos como servicios de urgencias equipados, terapia intensiva, laboratorio, disponibilidad continua del personal de salud, cirujanos altamente especializados, tomografía computarizada, quirófano y banco de sangre. Cuando todo está disponible, el manejo no quirúrgico del trauma hepático debe ser el tratamiento estándar en el paciente hemodinámicamente estable, sin irritación peritoneal y sin lesión de otros órganos. **Objetivo:** presentar el caso de una paciente con lesión hepática severa por proyectil de arma de fuego con manejo no quirúrgico exitoso del trauma hepático. **Caso clínico:** paciente con lesión hepática severa por proyectil de arma de fuego fue manejada conservadoramente con éxito. **Conclusiones:** el manejo no quirúrgico de una paciente con lesión hepática severa por proyectil de arma de fuego fue posible en nuestro hospital.

* Attending Physician, Colon and Rectal Surgery.

† Attending Physician, General Surgery.

§ Attending Physician, Radiology, and Imaging Services.

¶ Chief of Service, General Surgery.

Hospital Regional de Alta Especialidad de Ixtapaluca, Secretaría de Salud, México.

Received: 10/28/2022
Accepted: 06/13/2023



INTRODUCTION

Due to its anatomical position and dimensions, the liver is the solid intra-abdominal organ most susceptible to injury by abdominal trauma. The lack of high-level evidence on the ideal treatment of solid organ

injuries due to penetrating firearm projectile trauma (PAF) is a problem when non-surgical management of liver trauma (NSTLT) is feasible, so a consensus on this issue is urgent given the increasing incidence of severe liver injury due to firearm projectile trauma (LHSPPAF) in our environment.¹

How to cite: Gutiérrez-Pérez JO, Grado-Limas C, Cabello-Aguilar Y, Cruz-Benítez L. Conservative management of severe hepatic injury by firearm projectile. Cir Gen. 2023; 45 (3): 175-179. <https://dx.doi.org/10.35366/112926>

In 1902, Pringle reported on the management of difficult-to-access liver injury with suprahepatic tamponade.² How we manage liver trauma continues to evolve due to improved hospital accessibility to resources such as better-equipped emergency departments, intensive care units, serial hemoglobin monitoring, highly specialized surgeons, computed tomography (CT), angiography, operating room availability, and blood bank.³ NSTLT with severe PAF injury (grade IV and V of the American Association for the Surgery of Trauma [AAST] classification) has been part of this evolution. NSTLT should be chosen when the above resources are available in a hemodynamically stable (HS) patient, without peritoneal irritation and injury to any other organ demonstrated by CT,¹ since the evaluation with focused ultrasound for trauma (FAST) is not sufficient due to its sensitivity of 60 to 94%, with limited usefulness in the presence of intraperitoneal free fluid levels less than 100 ml and in the detection of retroperitoneal fluid.⁴

We present the case of a patient with AAST grade 4 LHSPPAF, without lesion of any other organ according to CT, HS, and without peritoneal irritation, successfully treated by NSTLT.



Figure 1: Entry wound of a firearm projectile in the right breast, penetrating the abdomen without penetrating the thorax.



Figure 2: Foreign body (metal density) lodged in the right paravertebral line. No pulmonary lesion is seen.

PRESENTATION OF THE CASE

A 17-year-old patient was admitted to the emergency department and reported having suffered a penetrating abdominal FAP trauma. She had only mild chest pain at the PAF entry site, so she was prescribed paracetamol 1 g every 8 hours, as well as ceftriaxone 1 g every 12 hours, both intravenously.

On physical examination, her vital signs were as follows: heart rate of 74 beats/minute; blood pressure of 98/67 mmHg; respiratory rate of 19/min; temperature of 36.0 C; and oxygen saturation of 98%. The chest showed a PAF entry orifice in the upper outer quadrant of the right breast (*Figure 1*), and the lung fields were well-ventilated. The abdomen was flat, with peristalsis, soft and painless to palpation. The blood cytology reported a hemoglobin of 12.8 g/dL, hematocrit of 36.4%, and white blood cells of 6,400/ml. The chest X-ray ruled out pneumothorax (*Figure 2*). A CT scan of the thorax and abdomen showed a metallic foreign body lodged in the right parasagittal line at the level of the 12th thoracic vertebra (*Figure 3*), without pulmonary or diaphragmatic lesion (*Figures 4 and 5*); in the abdomen, a PAF tract was observed with a 12 cm by 2.3 cm grade IV liver lesion in segments IV, VII and VIII of Couinaud (*Figure 5*), scarce free fluid, without lesion of any other organ (*Figures 3, 5 and 6*). Twenty-four hours later, a control

CT scan was performed, showing the liver lesion without subcapsular collection or active extravasation on the application of contrast medium, without an increase of free fluid. Given the correlation of these findings with clinical stability, the patient was discharged on the fourth day of her admission. She did not have any complications one month after her discharge.

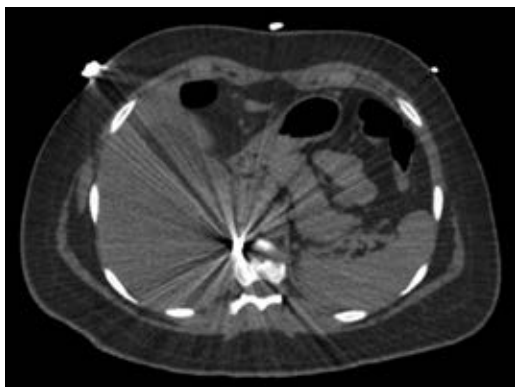


Figure 3: Firearm projectile lodged in the right parasagittal line at the level of the 12th thoracic vertebra.



Figure 4:
A firearm projectile entry wound is identified in the right mammary gland through subcutaneous cellular tissue of the costal region without a costal or diaphragmatic lesion.



Figure 5: Hepatic injury by firearm projectile penetrating segment VII and VIII and passing through Couinaud's segment IV without diaphragmatic or costal lesion.

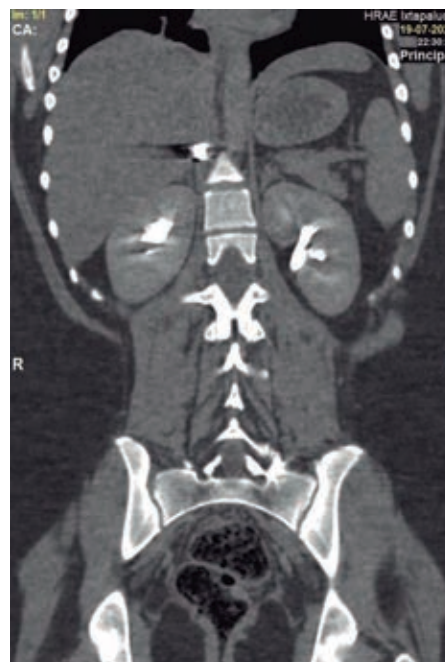


Figure 6: Hepatic injury by firearm projectile, without involvement of any other abdominal or retroperitoneal organ.

DISCUSSION

In abdominal trauma, the liver is the most frequently affected solid organ due to its location and size. Five percent of patients admitted to a hospital trauma center present severe liver injury, 10 to 30% of all of them with a mortality of 40 to 80%.⁵ Despite this, evidence on the ideal management of liver trauma remains scarce. Until the late 1970s, treatment was exclusively surgical. Subsequently, NSTLT was introduced and established as the gold standard in patients with blunt, non-penetrating, hemodynamically stable liver injury in hospitals with an interventional radiology service, with a success rate of up to 90%.¹ Nevertheless, LHSPPAF, i.e., grades IV and V, remains one of the most significant challenges for the surgeon when deciding on the ideal management option.

The treatment of penetrating abdominal injuries with liver injury has begun to change, opting for a conservative selective approach and leaving aside the idea of routine or obligatory laparotomy in the face of penetrating abdominal trauma due to PAF, as it has been noted that the rates of unnecessary exploratory laparotomy (EL), white EL, or non-therapeutic trauma vary from 23 to 53% and that morbidity rates range from 2.5 to 41% with a 5% increase in the mortality rate, so this exclusively surgical strategy should be abandoned as it is not free of risks of complications, including intestinal occlusion, pneumothorax, ileus, delirium, surgical site infection, myocardial infarction, visceral injury, hernia, wound dehiscence and even death secondary to unnecessary EL.⁶ However, the surgical treatment that most surgeons still consider is the standard method for the management of penetrating abdominal trauma by PAF with solid organ injury, leaving selective non-surgical management largely unexplored, taking into account that the decision to choose NSTLT carries great responsibility, backed by the surgeon's experience and the resources at his/her disposal; because the delay in identifying intra-abdominal injuries can cause early death due to bleeding if we

consider that initially 77% of patients with liver trauma are hemodynamically stable on arrival at the hospital, or late due to injury to a hollow viscera.⁵

CT is a tool that provides the option of NSTLT due to its sensitivity of more than 98% and specificity greater than 96% to identify significant intra-abdominal lesions, including hollow viscera lesions, when examining the entire abdomen from the thorax to the symphysis pubis. When performed with triple contrast, CT has a sensitivity of 100%, a specificity of 96%, a negative predictive value of 100%, and 97% accuracy in predicting the need for ELE. Lenin Enriquez-Dominguez and colleagues reported that 18% of patients with penetrating abdominal trauma by PAF who underwent EL due to lack of CT had isolated liver injury, i.e., without damage to other organs.⁷ Thus, it is advisable to take into account the NSTLT in hospital centers where access to diagnostic aids has been optimized, including a radiology service equipped with CT and with sufficient resources for interventional therapeutic procedures;⁸ an adequate coordination between emergency, surgery, radiology, laboratory, and operating room services, and the immediate availability of a blood bank. Also, it should be considered that mortality in patients with hemorrhage is 46%, as reported by Harvin and colleagues.⁹

In hospitals where these resources are not available, EL should be performed on patients with penetrating PAF injury.¹⁰ Suen and colleagues described the shift to NSTLT over 15 years through the gradual implementation of protocols, including angiographic embolization, improved resuscitation strategies, and damage control principles, achieving an increase in the NSTLT rate from 51% to 67% and a decrease in mortality from 18.8% at protocol initiation to 3.6% at the end of the study period.¹¹

The selective NSTLT approach to LHSPPAF has several proven advantages, including avoiding non-therapeutic laparotomies, reducing intra-abdominal complications, reducing transfusion requirements,¹² shorter hospital stays, and reducing hospital care costs.¹³

CONCLUSIONS

With the present clinical case, we demonstrated that the NSTLT of patients with hemodynamically stable LHSPPAF, without peritoneal irritation and injury to any other organ, is possible in hospitals such as ours. Our algorithms concerning this conservative therapeutic alternative are on par with those established in first-world countries. We always have the material and human resources necessary for close monitoring of the patient and the change from traditional to surgical management if required.

REFERENCES

1. Gaarder C, Gaski IA, Naess PA. Spleen and liver injuries: when to operate? *Curr Opin Crit Care* Volume. 2017; 23: 520-526.
2. Roberts DJ, Ball CG, Feliciano DV, Moore EE, Ivatury RR, Lucas CE, et al. History of the innovation of damage control for management of trauma patients: 1902-2016. *Ann Surg*. 2017; 265: 1034-1044.
3. Coccolini F, Coimbra R, Ordonez C, Kluger Y, Vega F, Moore EE, et al. Liver trauma: WSES 2020 guidelines. *World J Emerg Surg*. 2020; 15: 24.
4. Dubina ED, Emigh B, Grigorian A, Inaba K. Critical decision points in the management of acute trauma: a practical review. *Int Anesthesiol Clin*. 2021; 59:1-9.
5. Vargas AAL, Campos BJA, Pérez SA, Castillejos MYS, Vargas FJ, Ávila RJL. Management of perforating liver injury with Bakri balloon. Presentation of a case. *Cir Gen*. 2019; 41: 47-53.
6. Akkoca M, Balas S, Yilmaz KB, Tatar IG, Akinci M, Tokgoz S, et al. CT-guided tractography is a safe and complementary diagnostic tool in the management of penetrating abdominal trauma. *Asian J Surg*. 2019; 42: 148-154.
7. Enriquez DL, Castillo MJR, Herrera RF, Diaz RJD. Hepatic trauma due to stab and firearm wounds. Our experience in Ciudad Juárez. *Surgeon General*. 2011; 33: 21-25.
8. Olthof DC, Joosse P, van der Vlies CH, Haan RJ, Goslings JC. Prognostic factors for failure of non-operative management in adults with blunt splenic injury: a systematic review. *J Trauma Acute Care Surg*. 2013; 74: 546-557.
9. Harvin JA, Maxim T, Inaba K, Martinez AMA, King DR, Choudhry AJ, et al. Mortality following emergent trauma laparotomy: a multicenter, retrospective study: mortality after emergent trauma laparotomy. *J Trauma Acute Care Surg*. 2017; 83: 464-468.
10. Diaz RJD, Arriaga CJM, Enriquez DL, Castillo MJR, Dr. Montes CJG. Penetrating abdominal trauma: comparative morbidity and mortality in firearm and stab wounds. *Cir Gen*. 2010; 32: 24-28.
11. Suen K, Skandarajah AR, Knowles B, Judson R, Thomson BN. Changes in the management of liver trauma leading to reduced mortality: 15-year experience in a major trauma centre. *ANZ J Surg*. 2016; 86: 894-899.
12. Reed BL, Patel NJ, McDonald AA, Baughman WC, Claridge JA, Como JJ. Selective non-operative management of abdominal gunshot wounds with isolated solid organ injury. *Am J Surg*. 2017; 213: 583-585.
13. Noyola VHF, Loera TMA, Jiménez CE, Núñez CO, García NLM, Arcaute VFF. Non-operative treatment of liver injuries due to non-penetrating trauma: review article. *Cir Cir*. 2016; 84: 263-266.

Ethical considerations and responsibility: not required for clinical cases.

Financing: this work did not require external funding.

Disclosure: the authors declare no conflicts of interest.

Correspondence:

Jorge Octavio Gutiérrez-Pérez

E-mail: cirujano-octavio@hotmail.com

Anal melanoma: the importance of its diagnosis

Melanoma anal: la importancia en su diagnóstico

Yoselin Julisa Sarabia-Pérez,* Cheryl Zilahy Díaz-Barrientos,‡
Mónica Heredia-Montaño,§ Jorge Miguel García-Salazar,¶ Omar Sosa-Sánchez||

Keywords:

anal canal, melanoma,
anal neoplasms,
rectum, bleeding,
colorectal surgery.

Palabras clave:

canal anal,
melanoma, neoplasias
del ano, recto,
hemorragia, cirugía
colorectal.

ABSTRACT

Anal melanoma constitutes less than 1% of malignant colorectal tumors, the vast majority of which are diagnosed late due to their presentation without specific clinical symptoms, which leads to poor therapeutic results and a consequent decrease in the survival rate. We present the case of a female patient with no relevant history, whose main symptom was the presence of a painful anal mass and rectal bleeding; a colonoscopy was performed with a histopathological report of anal melanoma, so she underwent surgery by laparoscopic abdominoperineal resection. The importance of this neoplasm lies in the fact that it represents a tremendous diagnostic and therapeutic challenge for the surgeon, being fundamental to an adequate clinical history and exhaustive physical examination.

RESUMEN

El melanoma anal constituye menos de 1% de tumores malignos colorrectales, en la gran mayoría con un diagnóstico tardío debido a su presentación sin síntomas clínicos específicos, lo que conlleva pobres resultados terapéuticos y consecuente disminución en la tasa de supervivencia. Se presenta el caso de un paciente femenino sin antecedentes de importancia, cuyo síntoma principal fue presencia de masa anal dolorosa y rectorragia, se realiza colonoscopia con reporte histopatológico de melanoma anal, por lo que es intervenida quirúrgicamente mediante resección abdominoperineal por vía laparoscópica. La importancia de esta neoplasia radica en que representa un gran reto diagnóstico y terapéutico para el cirujano, siendo fundamental una adecuada historia clínica y exhaustiva exploración física.

INTRODUCTION

Anal tumors are rare neoplasms of the digestive tract; anal cancer accounts for 4% of all malignant neoplasms of the lower gastrointestinal tract.¹ Approximately 80% are of squamous origin, 10% are adenocarcinoma, and the remaining percentage is distributed in other types of malignant tumors such as sarcoma, lymphoma, and melanoma.² The latter, which may or may not be pigmented, is found in any part of the body, but its most common occurrence is in the skin, followed by the eye and the anus.

As for the location of rectal melanomas, most lesions are seen at the level of the dentate line of the anal canal and tend to extend into the submucosa, and only 20-30% are found

in the rectum.³ It is commonly confused with other benign perianal pathology because it manifests clinically with rectal bleeding, pain, or perianal lumpiness, commonly attributed to hemorrhoidal disease.⁴ Less frequently, this tumor debuts with palpable inguinal adenopathy or even distant metastasis, presenting a late diagnosis.⁵ Physical examination by digital rectal examination together with anoscopy is the basis for an adequate diagnosis. Colonoscopy is fundamental for diagnosis since it allows us to biopsy suspicious lesions and thus regulate therapeutic conduct.⁶

The treatment of choice is surgical resection, although the type of surgery and the extent of resection remain controversial.⁷ According to staging, it has been classified into three stages: stage I is a localized disease, stage II involves

* Second-year resident of General Surgery.

‡ Attending physician to Coloproctology.

§ Attending physicians to General Surgery.

¶ Physician assigned to Anatomic Pathology.

|| Second-year resident Physician of General Surgery.

Received: 05/05/2023
Accepted: 07/18/2023



How to cite: Sarabia-Pérez YJ, Díaz-Barrientos CZ, Heredia-Montaño M, García-Salazar JM, Sosa-Sánchez O. Anal melanoma: the importance of its diagnosis. Cir Gen. 2023; 45 (3): 180-183. <https://dx.doi.org/10.35366/112927>

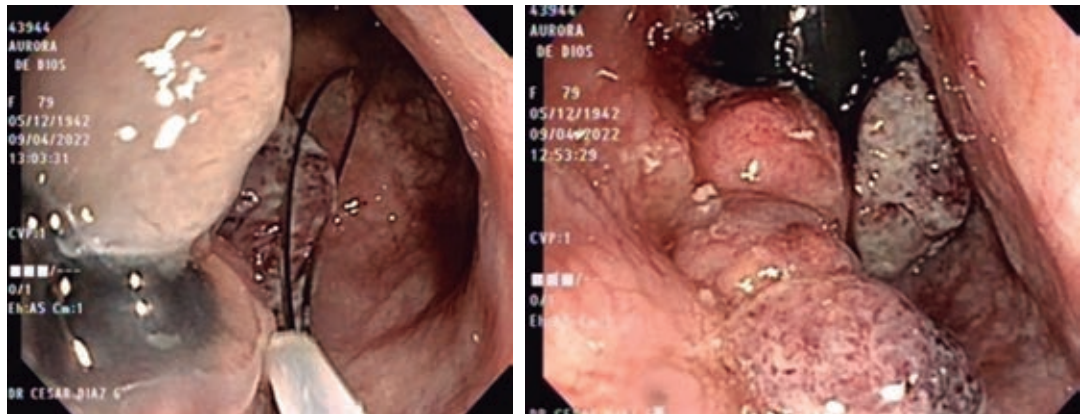


Figure 1: Colonoscopy showing an elevated tumor in the rectal ampulla of polypoid aspect of approximately 20 mm, with hyperemic, edematous, and friable mucosa.

regional lymphatic infiltration, and stage III is a disease with distant metastases.⁸ Inguinal lymphadenectomy has not been shown to improve prognosis, and, in addition, it involves high morbidity. Therefore, techniques such as selective sentinel lymph node biopsy seem promising, although experience is still limited.⁹ As for non-surgical treatment, some partial improvements have been reported recently, especially in palliative or salvage treatment after surgery.¹⁰ There is no standard treatment for these patients, mainly because of the low incidence and devastating prognosis, with an overall survival rate of five years of 20%.¹¹

PRESENTATION OF THE CASE

A 79-year-old female patient with no previous history of importance went to the general medicine outpatient clinic for presenting transrectal bleeding and diarrheal bowel movements of approximately one week of evolution, which was managed as hemorrhoidal disease, and topical treatment was provided for two months. However, she persisted with the same symptomatology in addition to the sensation of an anal mass and pain at the same level, so she went to the coloproctology service, where a physical examination found a typical perianal region without evidence of lesions; rectal examination revealed an induration of approximately 5 × 5 centimeters in the anal canal at left lateral level, so a colonoscopy was

performed that showed evidence of an elevated tumor in the rectal ampulla of polypoid appearance of approximately 20 mm with hyperemic, edematous and friable mucosa. A biopsy was taken with a polypectomy loop (*Figure 1*), with a histopathological report of undifferentiated and ulcerated malignant neoplasm of the anorectal region; an immunohistochemistry study was performed with positive results for Melan A and HMB 95, and a diagnosis of an ulcerated malignant melanoma was made. Extension studies were performed with simple thoracoabdominal-pelvic computed tomography scan and intravenous contrast, without evidence of metastatic disease or inguinal adenopathies, reporting thickening of the walls of the rectum up to 50 mm with annular morphology. An MRI showed a lesion in the lower rectum/anal canal, without changes in perirectal fat, without alterations in adjacent mucosa.

It was decided to schedule for surgical resolution by abdominoperineal resection. Before the procedure, a biopsy of the right sentinel inguinal node was performed with a negative report of malignant neoplasm, and abdominoperineal resection was performed. A laparoscopic approach was chosen, performing a diagnostic laparoscopy without evidence of distant tumor activity, proceeding to dissection of the mesorectum together with dissection of the inferior mesenteric artery and vein with advanced energy and

cutting at the level of the vascular pedicle with stapler, performing colostomy at the proximal end without complications. In the perineal phase, sphincter muscles, ligaments, and perirectal fat were sectioned, completing the rectum dissection in the perineal portion without placing drains facing in planes. The anatomopathological study of the rectosigmoid resection specimen (*Figure 2*) confirmed the presence of a malignant nodular melanoma of anorectal mucosa, with a diameter greater than five centimeters, infiltrating up to the submucosa and with metastatic lesions in two of ten lymph nodes of the mesorectum;



Figure 2: Product of abdominoperineal resection. Nodular tumor with a diameter greater than five centimeters of anorectal mucosa.

surgical margins were free of neoplasia. The histopathology image showed spindle-shaped cells with atypical nuclei and melanic pigment inside (*Figure 3*). The patient was sent to medical oncology, indicating that she was a candidate for immunotherapy with adjuvant pembrolizumab; however, the treatment was not authorized, so she was only kept under periodic surveillance. Currently, eight months after surgery, she continues to be followed up by the Coloproctology service, with adequate evolution without showing alterations at the colostomy level and free of disease.

DISCUSSION

Anorectal melanoma is a rare neoplasm with a poor prognosis. An adequate clinical history is necessary and physical examination of the anal region should not be avoided in patients with symptoms of perianal disease due to its significant importance in making an early diagnosis and allowing an optimal surgical treatment. When a patient has a rapidly growing, pigmented anal mass associated with transrectal bleeding, a high suspicion of anal melanoma should be considered. The evaluation should always include a biopsy of the lesion and a search for advanced disease by computed tomography (CT) extension studies of the chest, abdomen, and pelvis, as the liver, lung, and bone are the most frequent

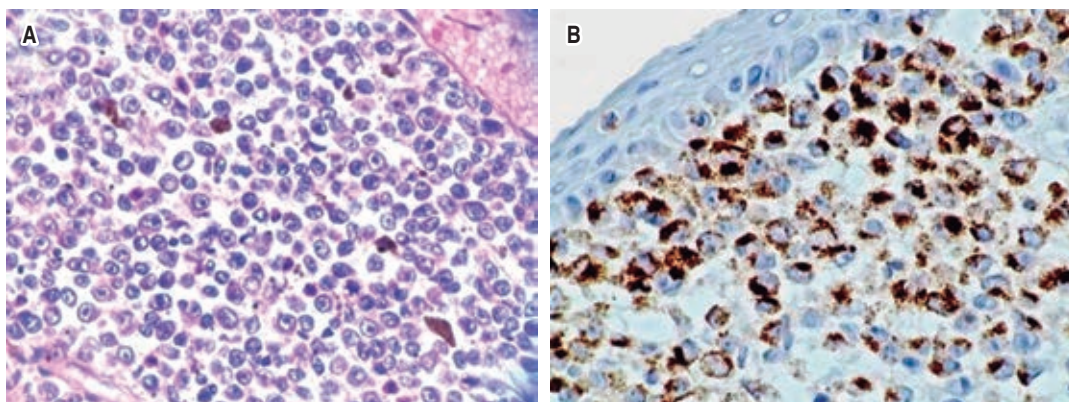


Figure 3: Histology images. **A)** Diffuse submucosal infiltration by neoplasm composed of spindle cells with atypical nucleus and melanotic pigmentation. **B)** Immunohistochemistry with positivity for Melan A and HMB95 in the cytoplasm of cells.

dissemination sites.¹⁰ In this case, there was a delay in diagnosis approximately three months from the onset of symptoms; however, it did not present as an advanced disease, and surgical intervention was achieved. Surgical treatment options include abdominoperineal resection, wide local excision, biopsy-fulguration, or both, although no statistically significant survival differences have been found.⁶ According to a study by Brady and collaborators, local recurrence was 8% in the group with abdominoperineal amputation and 20% in the group treated locally; therefore, they recommended abdominoperineal amputation as the treatment of choice in these cases.⁴ In the case presented, the patient underwent surgery by laparoscopic abdominoperineal resection, with subsequent referral to the medical oncology department, where she remains under surveillance. According to Wong and colleagues, they conclude that adjuvant therapy, either by radiotherapy, chemotherapy, or immunotherapy, has not shown changes in the survival rate,¹⁰ so the treatment of choice is surgical treatment, with abdominoperineal resection as the best choice in controlling locoregional recurrence of the disease and allowing a better quality of life.⁹

CONCLUSIONS

Melanoma is an aggressive neoplasm. Its anorectal location is the most infrequent, accounting for < 4% of colorectal malignant neoplasms; however, this does not exempt the importance of an adequate clinical history and exhaustive physical examination. In the first contact consultation, it can be easily underdiagnosed because it presents with symptoms like those of benign anal pathology, with transrectal bleeding, anal pain, and the presence of a palpable mass in the same region, making it a clinical presentation compatible with hemorrhoidal disease or, in general, with benign perianal pathology. The objective of this report was to highlight the importance of the anorectal physical examination; if it is not ignored, patients can be referred to the specialist in time and form for an adequate

protocolization through colonoscopy and biopsy, being able to offer the best surgical treatment for each patient.

REFERENCES

1. Sosa H, Fernández H, Hernández L. Melanoma of the anal canal: a case report. *Rev Med Electron*. 2019; 2: 757-762.
2. Dabán P, Gallart C, Pérez C, Dabán E, Mirón B. Anal melanoma, an infrequent diagnosis in anorectal pathology. *Cirugía Andaluza*. 2018; 29: 537-540.
3. Young A, Jacob E, Willauer P, Smucker L, Monzon R, Ocegüera L. Anal cancer. *Surg Clin North Am*. 2020; 100: 629-634.
4. Martínez D. Anal melanoma, the importance of differential diagnosis with the benign anal disease. *Colombian Journal of Surgery*. 2017; 4: 330-334.
5. Arriola M, Pazos X, Rodríguez M, Figuerido O. Anal melanoma, an infrequent pathology. Report of a case. *An Facultad Med*. 2019; 6: 51-57.
6. Ford M, Kauffmann R, Geiger T, Hopkins M, Muldoon R, Hawkins A. Resection for anal melanoma: is there an optimal approach? *Surgery*. 2018; 164: 466-472.
7. Temperley HC, O'Sullivan NJ, Keyes A, Kavanagh DO, Larkin JO, Mehigan BJ, et al. Optimal surgical management strategy for treatment of primary anorectal malignant melanoma- a systematic review and meta-analysis. *Langenbecks Arch Surg*. 2022; 407: 3193-3200.
8. Mireira R, Santacruz C, Sierra E, Tarragona J, Olsina J. Anal melanoma, a pathology radically different from cutaneous melanoma, with an unfavorable prognosis. *Elsevier*. 2020; 98: 488-495.
9. Díaz M, Lagos A, López A, Mirón B. Rectal melanoma: infrequent histologic strain in an unusual location. *RAPD*. 2019; 42: 447-449.
10. Wong DL, Glazer ES, Tsao M, Deneve JL, Fleming MD, Shibata D. Impact of adjuvant therapies following surgery for anal melanoma. *Am J Surg*. 2022; 223: 1132-1143.
11. Mireia MR, Carlos CS. Anal melanoma: a rare perianal tumor with a poor prognosis. *Dis Colon Rectum*. 2020; 63: 573-576.

Ethical considerations and responsibility: data privacy. According to the protocols established in our work center, we declare that we have followed the protocols on patient data privacy and preserved their anonymity.

Funding: no financial support was received for the preparation of this work.

Disclosure: none of the authors have a conflict of interest in the conduct of this study.

Correspondence:

Yoselin Julisa Sarabia-Pérez

E-mail: yoselinsarabia@gmail.com

Reconstruction of skin defects on the penis after severe burns

Reconstrucción de defectos cutáneos en pene después de quemaduras severas

Paul Robledo-Madrid,* Nelson Niels Espinosa-Queb,* María Fernanda Álvarez-Alatraste,† Erik Agustín Márquez-Gutiérrez,§ Mario Vélez-Palafox¶

Keywords:

genital burns, penile burn, surgical debridement, scrotal flap.

Palabras clave:

quemaduras genitales, quemadura de pene, desbridamiento quirúrgico, colgajo de escroto.

* Resident Physician, Specialty Course in Plastic and Reconstructive Surgery, Instituto Nacional de Rehabilitación LGII, Mexico. Postgraduate Studies Division, School of Medicine, National Autonomous University of Mexico, Mexico.

† Undergraduate Medical Intern, Instituto de Estudios Superiores de Tamaulipas, Anahuac, Tamaulipas, Mexico.

§ Full-time Professor, Specialty Course in Plastic and Reconstructive Surgery, Instituto Nacional de Rehabilitación LGII, Mexico. Postgraduate Studies Division, School of Medicine, National Autonomous University

ABSTRACT

Genital burns have a variable clinical presentation and, when not treated promptly, can increase the risk of morbidity and mortality. The most affected anatomical area in the male is the shaft of the penis; these patients require extensive surgical debridement once the tissue affected by the burn has been delimited, subsequently presenting with complex and irregular skin defects. To reduce secondary tissue necrosis, penile skin defects after a severe burn should be treated early to minimize secondary tissue necrosis, preserve functional tissues, and recover the elastic texture of the skin. Regarding the experience of our surgical team with the use of thin partial thickness skin grafts and, in some cases, a scrotal flap with modification in the tip design, the results show that they can be helpful tools, provide a definitive skin coverage, sensitive function, and elasticity by using local tissue with similar characteristics, regarding the technique can be performed with minimal technical difficulty and minimal morbidity resulting, we always recommend long-term follow-up, to evaluate the functional aesthetic results and complications that may occur.

RESUMEN

Las quemaduras en genitales tienen una presentación clínica variable cuando no son tratadas oportunamente pueden aumentar el riesgo de morbilidad y mortalidad. El área anatómica comúnmente afectadas en el varón es el cuerpo del pene, estos pacientes requieren un desbridamiento quirúrgico extenso una vez delimitado el tejido afectado por la quemadura, presentando posteriormente defectos de piel complejos e irregulares. Los defectos de piel en el pene después de una quemadura severa deben tratarse tempranamente con el objetivo de reducir la necrosis tisular secundaria, preservar los tejidos funcionales y recuperar la textura elástica de la piel. Respecto a la experiencia de nuestro equipo quirúrgico con la utilización de injertos cutáneos de espesor parcial fino y en algunos casos un colgajo de escroto con la modificación en el diseño de la punta, los resultados muestran que pueden ser herramienta útiles, proporcionar una cobertura cutánea definitiva, función sensitiva y elasticidad al emplearse tejido local con características similares, respecto a la técnica se puede realizar con mínima dificultad técnica y mínima morbilidad resultante, siempre recomendamos llevar un seguimiento a largo plazo, para evaluar los resultados estéticos funcionales y complicaciones que puedan presentarse.

INTRODUCTION

Genital burns have a variable clinical presentation and, when not treated promptly, can increase the risk of morbidity and mortality.¹ The anatomical area commonly affected in males is the penile shaft; this

group of patients requires extensive surgical debridement once the tissue affected by the burn is delimited, presenting with complex and irregular skin defects.²

The goals for successful reconstruction in patients with penile shaft burns require tension-free surgical repair to allow sufficient



How to cite: Robledo-Madrid P, Espinosa-Queb NN, Álvarez-Alatraste MF, Márquez-Gutiérrez EA, Vélez-Palafox M. Reconstruction of skin defects on the penis after severe burns. *Cir Gen.* 2023; 45 (3): 184-189. <https://dx.doi.org/10.35366/112928>

of Mexico, Mexico.

† Adjunct Professor, Specialty Course in Plastic and Reconstructive Surgery, Instituto Nacional de Rehabilitación LGII, Mexico. Postgraduate Studies Division, School of Medicine, National Autonomous University of Mexico, Mexico.

Received: 05/14/2023

Accepted: 07/18/2023

length, adequate skin for unrestricted erections to allow acceptable sexual function, protective sensitivity to prevent chronic skin degeneration, ability to empty the corpora cavernosa spontaneously while standing, minimize tissue loss, maintain adequate penile shaft thickness, preserve voluntary urination, avoid scar retraction and present a good aesthetic appearance.³

The penile shaft is composed of skin, Colles' fascia, Buck's fascia, dorsal superficial vessels and nerves, tunica albuginea, and erectile tissue composed of paired corpora cavernosa and the corpus spongiosum around the urethra; burns in this anatomical area cause severe functional and aesthetic sequelae.⁴ The plastic surgeon faced with this clinical scenario must be clear about the reconstructive goals and focus on achieving successful reconstruction with the skin and tissue available after debridement.^{4,5} He or she must also consider that the burn promotes an inflammatory reaction that, depending on its extent, can be localized or systemic. Deep burns will transform the skin into eschar; this presents bacterial invasion to healthy tissue, causing greater release of proinflammatory elements such as tumor necrosis factor, interleukins, and cytokines, which causes damage to deep anatomical planes.⁶

Penile skin loss can occur after a variety of pathological processes, such as severe genital burns, genital lymphedema, soft tissue infection, and excessive skin removal after debridement.⁷ This results in severe functional and aesthetic disability for the patient, which can have a significant impact on their quality of life, requiring an individualized reconstructive surgical technique focused on the particular conditions of each patient.⁴ Skin coverage options include partial or full-thickness skin grafts, fascio-cutaneous flaps, pedicled flaps, microsurgical reconstruction, or a combination of these.²

We aim to demonstrate our expertise in treating penile skin defects after severe burns and the surgical techniques to provide successful skin coverage with acceptable aesthetic and functional results.



Figure 1: A full-thickness graft with manual fenestrations covers a defect in the anterior aspect of the penile shaft.

Case 1

A 19-year-old patient presented with a third-degree scald burn on the skin of the penile shaft. Physical examination revealed necrosis of the skin of the penile shaft, with no signs of hematuria or difficulty urinating. Debridement of the necrotic tissues was performed, presenting a cutaneous loss of the penile shaft, leaving the tunica albuginea and glans intact. In this case, the inner skin of the foreskin was preserved, and a full-thickness skin graft with fenestrations was performed to cover the defect immediately after debridement; the donor site was the left groin, which was managed with a primary closure. The patient had an uneventful postoperative course. A follow-up examination showed an integrated and sufficiently mobile skin graft with great flexibility (*Figure 1*).

Case 2

A 36-year-old male patient presented with a scald burn, and within a few hours, he showed local edema and necrotic skin on the shaft of the penis, accompanied by changes in color and temperature. He was diagnosed with a third-degree scald burn on the shaft of the penis. Urgent surgical debridement was performed, and once the necrotic tissue

was delimited, the resulting skin defect was evaluated. Physical examination documented a skin loss with irregular edges of 6 cm in length \times 4 cm in the base in the penile shaft and granulation tissue in Buck's fascia, with no evidence of an active infectious process. The reconstructive technique selected for skin coverage of the resulting defect required the design of a scrotal flap with modification of the distal part (Figure 2), of a scrotal skin longitudinal 12 cm in length \times 8 cm in the base, subsequently advanced to allow skin coverage of the anterior and lateral aspect of



Figure 2: 36-year-old male patient with residual skin defect on the shaft of the penis following extensive surgical debridement for scald.

the penile shaft (Figure 3). The vascularization of the flap comes from the external pudendal artery, which provides adequate vascular supply to the skin and subcutaneous tissue in the most distal region of the flap (Figure 4). The laxity of the scrotal skin allowed coverage of the entire skin defect without the need to mobilize the proximal third of the flap (Figure 5). He did not require splinting of the penis, only the placement of a jockstrap in the scrotal region (Figure 6). The patient started physical therapy 48 hours after surgery and was discharged from the hospital 14 days postoperatively. In the plastic surgery office follow-up, the patient presented stable skin coverage and sensitivity in the flap's skin, referring normal erections, and no functional limitation.

DISCUSSION

This paper describes two surgical techniques employed by our surgical team for reconstructing skin defects on the penile shaft, the technical advantages, and long-term results. In our center, patients with penile skin defects after a burn require an individualized surgical technique that considers the integrity of anatomical structures after surgical debridement, the detailed evaluation of the patient's characteristics, the resulting defect, and the available resources and infrastructure. The vascularity of this region

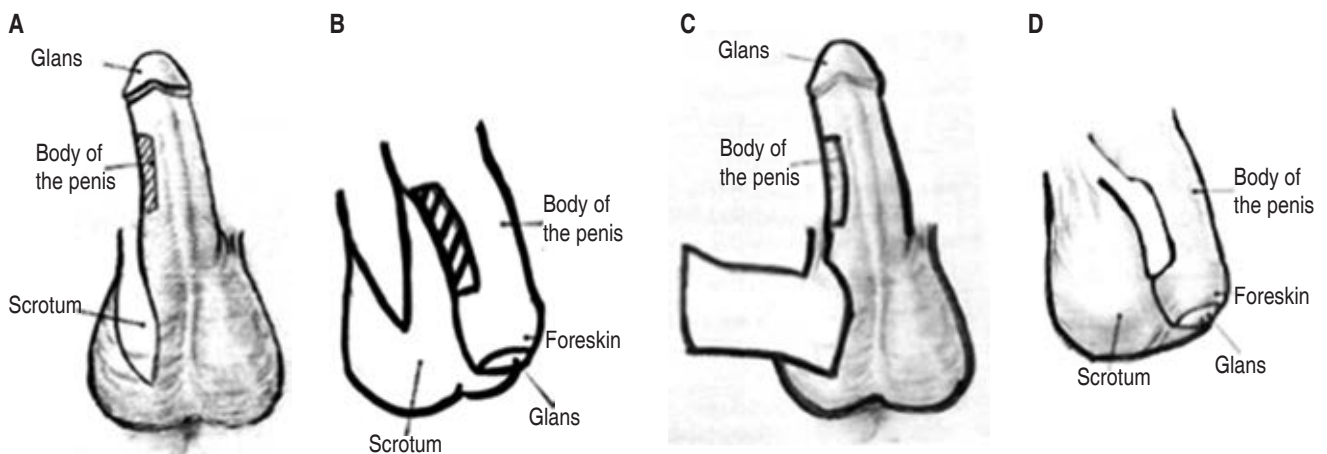


Figure 3: A) Initial design of the scrotal flap and delimitation of the defect with the penis in extension. B) Scrotal flap design in the usual penile situation. C) Movement of the scrotal flap to evaluate tension-free advancement. D) Resultant of the flap.

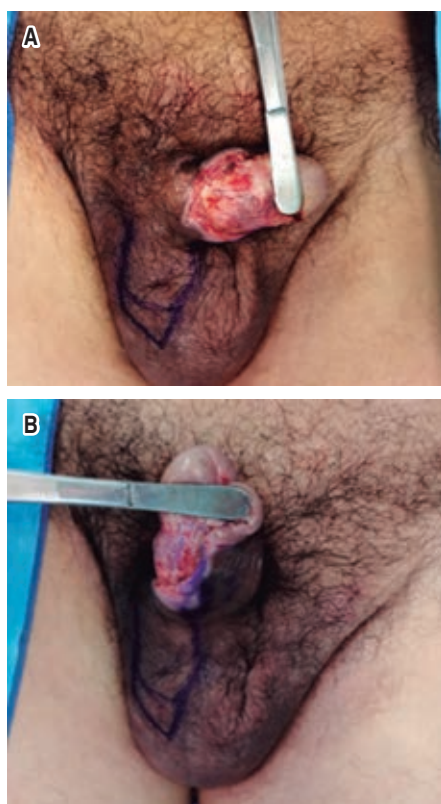


Figure 4: A) Scrotal flap design with modification of the distal part to end in a tip, allowing advancement. B) Evaluation of scrotal skin laxity to cover the penile shaft and its ability to return to its initial position.

allows the design of several local flaps to cover the penile skin defects, based on the principle that the blood supply system reduces the risk of necrosis. Thus, multiple surgical techniques can achieve acceptable aesthetic and functional skin coverage.¹

In the first clinical case, a full-thickness graft with fenestrations was performed to cover an important extension of the penile shaft without using tissue from the foreskin or scrotum, showing good postoperative evolution without complications in the donor area. This approach correlates with that reported by Chertin and collaborators regarding the application of laminated partial thickness skin grafts in children from 2 to 18 years of age with satisfactory functional and esthetic results.² Some other surgical groups report 15 years of experience in the performance of partial thickness skin grafts for male genital reconstruction with successful results for lesions of multiple etiology.³ We must remember that partial or full-thickness skin grafting is a simple surgical technique frequently related to secondary graft contraction and erection difficulty.⁴

In the second clinical case, a scrotal flap was performed, which allowed adequate skin coverage with skin identical to the injured skin and without leaving a residual skin defect.⁵ A base was designed with vascular

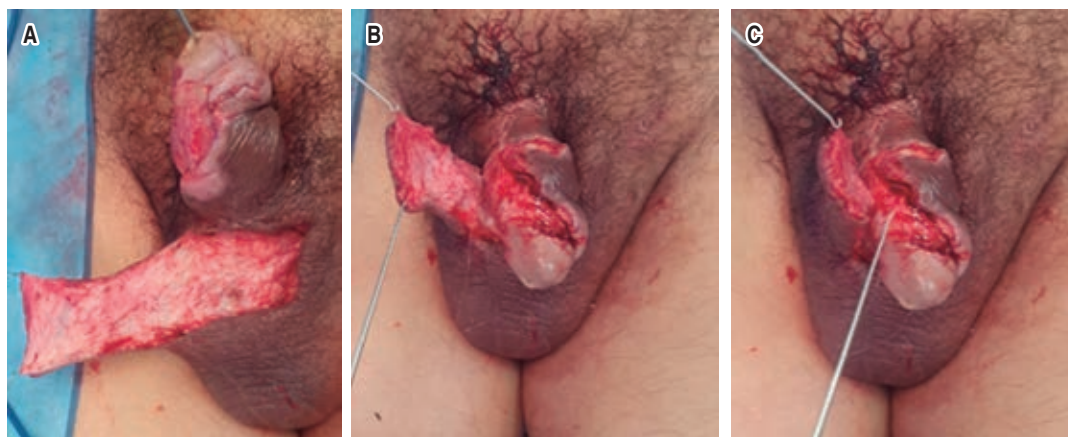


Figure 5: A) Residual skin defect in the scrotum after flap lifting. B) Final position of the penile shaft in the scrotum, evaluating tension-free stretching. C) Advancement of the scrotal skin flap for skin coverage of the anterior portion of the penile shaft.

contribution from the external pudendal artery; subsequently, the dissection of the flap was performed, which allowed the advancement in the form of a book page over the resulting skin defect in the penile shaft; mummification of the most distal part of the flap was performed so that it ended in a point, this configuration allowed skin coverage with tissue of similar diameter, color and sensitivity to the defect, and avoided the appearance of scar contracture.⁶ In the literature review, we have not found any reported cases of scrotal flaps with modifications of the tip design.⁷ Scrotal flaps provide a similar reconstruction with donor tissue, and a tension-free repair can be performed without increasing

days of hospitalization and with minimal sequelae in the donor area.⁸ Compared to skin grafting, the scrotal skin flap has several advantages, such as skin texture, less shrinkage, and better elasticity during an erection. However, little has been published on scrotal skin flaps covering severe skin defects. Pedicled flaps from adjacent areas, such as the groin, represent a reconstructive option with good sensory function and adequate vascularization. These characteristics allow the penis to regain its strength and elasticity but report drawbacks with scarring of the donor site and excessive bulging of the tissue in the recipient site.⁹

It is essential to point out that the study and detailed description of the anatomical characteristics of the genital region allow the performance of free microsurgical flaps, with the disadvantage of requiring a team of trained microsurgeons, specialized instruments, and infrastructure, close monitoring of the evolution of the flap, and follow-up of the morbidity generated in the donor area.¹⁰ High voltage electrical burns in the genitalia and perineum are very rare; there are only some case reports found in the literature. The devastating damage triggered by electrical injury to the penile skin, subcutaneous tissue, corpus cavernosum, and urethra requires treatment focused on preserving tissue and structures as much as possible and seeking the earliest possible skin coverage with tissue and abundant vascular supply to improve healing in conjunction with the use of adjuvant therapies such as hyperbaric chamber to improve local blood circulation and promotion of angiogenesis.

CONCLUSIONS

To reduce secondary tissue necrosis, penile skin defects after severe burns should be treated early to minimize secondary tissue necrosis, preserve functional tissues, and recover the elastic texture of the skin. Regarding our surgical team's experience, we suggest using tissue with similar characteristics and rich vascular supply and trying to carry out long-term follow-ups. We recommend individualizing the selection of the surgical technique and keeping in mind that inadequate choice for skin coverage may result

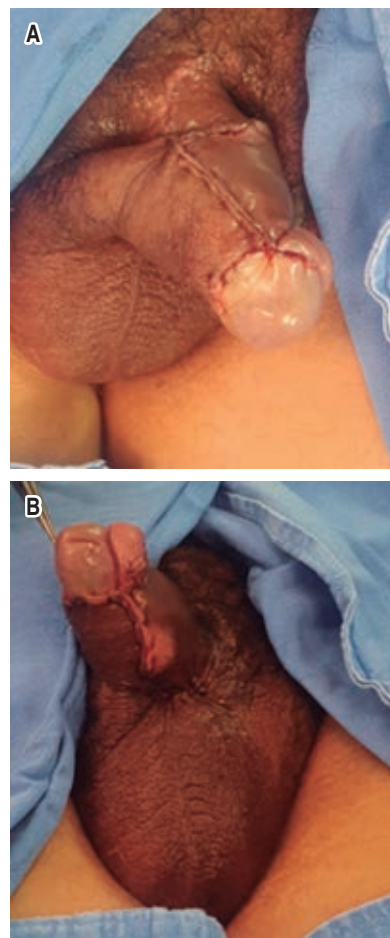


Figure 6: A) Resulting scrotal flap, achieving tension-free skin coverage, preserving the shape of the penile shaft and glans penis. B) Resultant after closure of the donor area of the flap.

in unwanted and difficult-to-treat complications such as penile contracture, limitation of sexual function, and changes in self-esteem and self-perception of the patient.

ACKNOWLEDGMENTS

To Dr. Mario Vélez Palafox, deputy director of CENIAQ, for the knowledge shared during the subspecialty training.

REFERENCES

1. Huayllani MT, Cheema AS, McGuire MJ, Janis JE. Practical review of the current management of Fournier's gangrene. *Plast Reconstr Surg Glob Open*. 2022; 10: e4191.
2. Guo L, Zhang M, Zeng J, Liang P, Zhang P, Huang X. Utilities of scrotal flap for reconstruction of penile skin defects after severe burn injury. *Int Urol Nephrol*. 2017; 49: 1593-1603.
3. Ferreira PC, Reis JC, Amarante JM, Silva AC, Pinho CJ, Oliveira IC, et al. Fournier's gangrene: a review of 43 reconstructive cases. *Plast Reconstr Surg*. 2007; 119: 175-184.
4. Makino Y, Matsumine H, Fujimaki H, Takagi M, Takeuchi M. Reconstruction of the necrotic scrotum with hydrosurgery system and pedicle diep flap. *Plast Reconstr Surg Glob Open*. 2020; 8: e3135.
5. Giuliani A, Colozzi S, de Santis G, Sista F, Cianca G, Gentile E, et al. Reconstruction of Scrotal Sac and Penis with Biological Prosthesis and Vacuum Therapy. *Plast Reconstr Surg Glob Open*. 2015; 3: e394.
6. García GJF, Vela LA, Ordóñez MJ, Segovia GM, Benito DP. Bilateral pudendal fasciocutaneous flap for penile shaft coverage: new design and indication. *Cir Plást Iberolatinoam*. 2021; 47: 297-300.
7. Adamyan RT, Aleshina ON, Abdeeva EI, Sinelnikov MY. Reconstructive surgery for high-voltage injury of genitoperineal area and upper extremities: the uromanual trauma concept. *Plast Reconstr Surg Glob Open*. 2021; 9: e3842.
8. Westbom CM, Talbot SG. An algorithmic approach to perineal reconstruction. *Plast Reconstr Surg Global Open*. 2019; 7: e2572.
9. Mericli AF, Martin JP, Campbell CA. An algorithmic anatomical subunit approach to pelvic wound reconstruction. *Plast Reconstr Surg*. 2016; 137: 1004-1017.
10. Alkahtani D, Mortada H, Rashidi M, Al Tamimi A. Traumatic degloving injury of penile and scrotal skin: a case report. *Plast Reconstr Surg Glob Open*. 2020; 8: e3024.

Correspondence:

Paul Robledo-Madrid, MD

E-mail: drpaulrobledo@gmail.com

The ABC of palliative care for the general surgeon

El ABC de los cuidados paliativos para el cirujano general

Sara Concepción Ortega-Espino,* Josefina Serrano-Pérez[†]

Keywords:

palliative care,
symptoms,
communication,
spirituality, end of
life.

Palabras clave:

cuidados paliativos,
síntomas,
comunicación,
espiritualidad, final
de vida.

ABSTRACT

There is a wide range of diseases that require palliative care attention, such as neoplastic, cerebrovascular, central nervous system, and other chronic degenerative diseases. With a focus on relieving severe illness's symptoms, pain, and stress, regardless of diagnosis or prognosis, palliative care aims to improve the quality of life for patients and their families or primary caregivers. Essential symptom management, discussion of prognosis, treatment goals, and end-of-life decisions are fundamental elements of palliative care that any physician should know and when to consult with the palliative care team.

RESUMEN

Existe una amplia gama de enfermedades que requieren atención de cuidados paliativos, tales como enfermedades neoplásicas, cerebrovasculares, del sistema nervioso central, entre otras enfermedades crónico-degenerativas. Con un enfoque en proveer alivio de los síntomas, dolor y estrés de una enfermedad severa, independientemente del diagnóstico o pronóstico, el objetivo de los cuidados paliativos es mejorar la calidad de vida tanto de los pacientes como de su familia o cuidadores primarios. El manejo básico de síntomas, la discusión del pronóstico, el abordaje de objetivos de tratamiento y decisiones al final de la vida, son elementos básicos de los cuidados paliativos que cualquier médico debería conocer, así como el momento en que debe realizar una consulta al equipo de cuidados paliativos.

INTRODUCTION

According to the World Health Organization (WHO), palliative care (PC) is the active and comprehensive care of patients who do not respond to curative treatments to improve the quality of life of patients and their families.¹ This definition has confined the care of patients with palliative needs only to those who cannot be offered curative therapeutic options or even in the terminal stage only, leaving unaccompanied all those patients in active treatment who live their illness not only with physical symptoms but also with a tremendous psychosocial and spiritual impact.

For this reason, the Center for Advanced Palliative Care (CAPC) defines palliative care as "care that is focused on providing relief from the symptoms, pain, and stress of severe illness, regardless of diagnosis or prognosis. The goal is

to improve the quality of life for both patients and their family or primary caregivers."²

There is a wide range of diseases that require palliative care. According to the second WHO Global Atlas of Palliative Care published in 2020, about 30% of the world's population between 20 and 70 years of age requires palliative care, whereas the adult population over 20 years suffer from chronic diseases such as HIV (22.2%), neoplastic conditions (28.2%), cerebrovascular disease (14.1%), dementia (12.2%), pulmonary diseases (5%), liver pathology (2.4%), among others.³ To meet these needs, a significant increase in the professional workforce trained in palliative care or at least with the basic knowledge of palliative care is required.

Palliative care consultation is less common in surgical patients than in cases with chronic diseases, postponing this care until the patient

* Specialist in Palliative Care, <https://orcid.org/0009-0000-6327-4701>

[†] Head of the Center for Educational Innovation in Medicine and Clinical Simulation of La Salle, <https://orcid.org/0000-0002-0451-5285>

Mexican School of Medicine, Universidad La Salle, Mexico.

Received: 06/26/2023
Accepted: 07/31/2023



How to cite: Ortega-Espino SC, Serrano-Pérez J. The ABC of palliative care for the general surgeon. *Cir Gen.* 2023; 45 (3): 190-193. <https://dx.doi.org/10.35366/112929>

is in the agonal phase; however, palliative care reaches its highest degree of effectiveness when considered at an early stage in the course of the disease, not only improving the quality of life of the patients but also reducing unnecessary hospitalizations and the use of health services, also decreasing the economic burden that these patients represent for the health system.^{4,5}

WHEN TO CONSIDER THE SUPPORT OF A PALLIATIVE CARE TEAM IN A HOSPITAL SETTING?

The CAPC considers that there are clinical situations that warrant consultation by a palliative care team, including:⁵

1. Prognosis of mortality in less than 12 months.
2. Frequent hospital admissions.
3. Use of health resources due to complex physical or psychological symptoms.
4. Need for complex care.
5. Decrease in function.
6. Stay in the Intensive Care Unit (ICU) for over seven days.

In the surgical area, the American College of Surgeons Task Force on Palliative Care has identified specific conditions that warrant the integration of palliative care specialists for the management of surgical patients, such as:⁵

1. Family or primary caregiver request.
2. Disagreements in decision-making and advance directives.
3. Diagnosis with survival of less than six months.
4. Carcinomatosis or unresectable malignancy.
5. Presence of advance care directives (in Mexico, known as the Advance Directive Law).
6. Glasgow Coma Scale less than 8 points for more than one week in patients older than 55.
7. Multiple organ failure.

ESSENTIAL SYMPTOM MANAGEMENT IN THE PATIENT WITH PALLIATIVE NEEDS

Although pain is one of the main symptoms present, not only in oncology patients but also

in those with advanced disease, it is not the only symptom that patients with a severe diagnosis may experience.⁶

The main symptoms associated with the disease or treatments that are evaluated and treated by palliative care specialists are nausea, fatigue, anorexia, constipation, dyspnea, increased secretions, sadness, and anxiety, among others.²

To evaluate these symptoms and their impact on daily life, it is advisable, for each symptom that the patient expresses, to ask the patient to rate the symptom on a scale of 1 to 10, with 10 being the most severe expression of the symptom; in addition, it is advisable to ask how the patient rates the symptom at the time of the evaluation and how much he/she considers the symptom to be a tolerable score.²

This assessment will allow the prioritization of the symptoms that impose the greatest burden on the patient and those that must be addressed immediately, as well as the development of a care plan for future visits.

PAIN MANAGEMENT

More than half of cancer patients experience pain related to the neoplastic process and the treatment; on the other hand, almost 90% of patients with advanced disease experience pain at any point of the disease, so it is essential to know basic pain management.⁶

It is recommended that, after maximizing non-opioid analgesics, treatment of severe chronic pain should include the use of weak opioid medications.² If adequate pain control cannot be achieved, the palliative care specialist should be consulted, as they are physicians trained in the management of different pain syndromes and have experience with the management of opioids, adjuvants, and non-pharmacologic therapies for pain control.⁶

In addition, because of the complexity of the psychosocial and spiritual aspects surrounding the severely ill patient, the palliative care specialist can address “total pain”, a term coined by Ciceley Saunders, the founder of modern palliative care; “total pain” is defined as the physical, social, psychological, and spiritual suffering experienced by a patient.⁶

Therefore, the surgical team must collaborate with palliative care teams to improve patients' clinical conditions.

COMMUNICATION AND DECISION-MAKING

Understanding how the disease affects the patient's life mentally and psychologically is extremely important. This understanding promotes better communication and doctor-patient relationships.

The use of natural language for the communication of a severe diagnosis, therapeutic options, prognosis, need for palliative care, goals of care, and advanced directives allows for better information processing and conscious decision-making.⁷

Although communication has been recognized as an essential part of medical training from the classroom to the clinical areas, addressing "bad news", prognosis, and end-of-life continue to present a significant challenge for healthcare professionals, both because of personal barriers and those present in their clinical environment, so it will be challenging to find a single way to improve communication.⁸

In general, communication skills involve eye contact, the use of appropriate body language such as an open posture, sitting close to the patient, performing active listening such as nodding or making noises of affirmation or encouragement to indicate understanding, reflecting empathy, and showing compassion using a warm, caring, and respectful attitude.⁹

For decision-making and advanced care guidelines, health professionals in our country must know the Law of Advance Directives, which, in its first article, indicates that "its purpose is to establish the rules to regulate the granting of the will of a person with capacity to exercise, to express their decision to be subjected or not to medical means, treatments, or procedures intended to prolong their life when they are in the terminal stage and, for medical reasons, it is impossible to maintain it naturally, protecting at all times the dignity of the person".¹⁰

The Advance Directive Law encompasses five main guidelines: cardiopulmonary resuscitation, mechanical respiration,

specialized nutritional support, medication for pain and other physical symptoms, and palliative sedation. This law is valid in Mexico City, Coahuila, Aguascalientes, San Luis Potosí, Michoacán, Hidalgo, Guanajuato, Guerrero, Nayarit, Estado de México, Colima, Oaxaca, Yucatán, and Tlaxcala. Through the Advance Directive Law, the patient's autonomy is protected and provides a care guide for the treating medical team.¹⁰

SPIRITUAL SPHERE

Spirituality is a multidimensional concept encompassing the meaning of life and transcendence. It is closely related to the patient's life history, personal satisfaction with life events, and beliefs in a higher power or God.¹¹ Addressing and understanding the spiritual sphere of the seriously ill patient helps the patient cope with suffering and mortality.

Key points that can be assessed during the consultation by the treating physician are faith, sense of belonging, and community, which can be done through the following questions:²

1. Do you practice any religion?
2. What are the components of your life that give it meaning?
3. Are your beliefs important in making decisions about your health?
4. Do you belong to any religious or spiritual community?

Spiritual symptoms are closely related to psychosomatic expressions in terminal illness, such as chronic pain, so offering spiritual assistance improves the quality of life, serenity, and the dying process.¹¹

CONCLUSIONS

Palliative care is expressly recognized in the context of the human right to health. It should be provided through integrated, person-centered health services, with particular attention to the individual's needs and preferences. Considering that surgical inpatients and outpatients are less likely to be referred to palliative care for symptom management and end-of-life decision-making and that the

number of palliative care specialists does not meet the demand for palliative needs in the population, surgical teams must be aware of the basic principles of palliative care, as well as the areas in which they can be supported to improve patient care.

REFERENCES

1. World Health Organization. WHO Definition of Palliative Care. (2015). [Consulted May 2023]. Available at: <http://www.who.int/cancer/palliative/definition/en/>
2. Ghosh A, Dzeng E, Cheng MJ. Interaction of palliative care and primary care. *Clin Geriatr Med*. 2015; 31: 207-218. Available in: <https://doi.org/10.1016/j.cger.2015.01.001>
3. Worldwide Hospice Palliative Care Alliance. Global Atlas of Palliative Care 2nd ed. London, UK. 2020.
4. Lynch T, Connor S, Clark D. Mapping levels of palliative care development: a global update. *J Pain Symptom Manage*. 2013; 45: 1094-1106. Available in: <https://doi.org/10.1016/j.jpainsymman.2012.05.011>
5. Ballou JH, Brasel KJ. Palliative care and geriatric surgery. *Clin Geriatr Med*. 2019; 35: 35-44. Available in: <https://doi.org/10.1016/j.cger.2018.08.004>
6. Strand JJ, Kamdar MM, Carey EC. Top 10 things palliative care clinicians wished everyone knew about palliative care. *Mayo Clinic Proc*. 2013; 88: 859-865. Available in: <https://doi.org/10.1016/j.mayocp.2013.05.020>
7. Kopecky KE, Florissi IS, Greer JB, Johnston FM. Palliative care interventions for surgical patients: a narrative review. *Ann Palliat Med*. 2022; 11: 3530-3541. Available in: <https://doi.org/10.21037/apm-22-770>
8. Brighton LJ, Bristowe K. Communication in palliative care: talking about the end of life, before the end of life. *Postgrad Med J*. 2016; 92: 466-470. doi: 10.1136/postgradmedj-2015-133368.
9. Clayton JM, Hancock KM, Butow PN, et al. Clinical practice guidelines for communicating prognosis and end-of-life issues with adults in the advanced stages of a life-limiting illness and their caregivers. *Med J Aust*. 2007; 186: S77-S105. Available in: <https://doi.org/10.5694/j.1326-5377.2007.tb01100.x>
10. Legislative Assembly of the Federal District. (2012). Ley de Voluntad Anticipada para el Distrito Federal. [Accessed May 2023]. Available in: <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://www.aldf.gob.mx/archivo-edfcbf4442b58c1cf761114a6a224fb1.pdf>
11. Evangelista CB, Lopes ME, Costa SF, Batista PS, Batista JB, Oliveira AM. Palliative care and spirituality: an integrative literature review. *Rev Bras Enferm*. 2016; 69: 591-601. doi: 10.1590/0034-7167.2016690324i.

Correspondence:

Sara Concepción Ortega-Espino

E-mail: dra.saraoe@gmail.com

Cirujano General is the official journal of the Asociación Mexicana de Cirugía General, A.C. (Mexican Association of General Surgery). The journal publishes original articles, clinical case reports, review topics, history, philosophy of medicine and bioethics, case studies, invited editorials, letters to the editor, and miscellaneous news. For acceptance, all articles are analyzed by at least two reviewers and finally ratified by the Editorial Committee.

Cirujano General accepts the guidelines the International Committee of Medical Journal Editors (ICMJE) established. The updated 2021 version of the Uniform requirements for manuscripts submitted to biomedical journals is available at www.icmje.org. A Spanish translation of this version of the "Uniform requirements for manuscripts submitted to biomedical journals" is available at: www.medigraphic.com/requisitos.

Submission of the manuscript implies that it is an unpublished paper (except in abstract form) and will not be submitted to any other journal. Accepted articles become the property of the **Cirujano General** and may not be published (either in whole or in part) elsewhere without the written consent of the editor.

The senior author should keep a complete copy of the original manuscript.

Articles should be sent to the Web Editor at the following e-mail address: <https://revision.medigraphic.com/RevisionCirGen/revistas/revista5/index.php>.

I. **Original article:** It can be basic or clinical research and has the following characteristics:

- a) **Title:** Representative of the study findings. Add a short title for internal pages (It is essential to identify whether it is a randomized or control study).
- b) **Structured abstract:** Must include an introduction, objective, material and methods, results, and conclusions; in Spanish and English, with keywords that must correspond to those accepted by PubMed in its MeSH section.
- c) **Introduction:** Describes the studies that allow understanding of the objective of the work, which is mentioned at the end of the introduction

(the objectives, hypothesis, and approaches are not written separately).

- d) **Material and methods:** Important part that must explain in detail how the research was developed and, especially, that it is reproducible (mention the type of study, observational or experimental).
- e) **Results:** In this section, according to the study's design, all the results should be presented; they are not commented on. If there are tables of results or figures (graphs or images), they should be presented separately, on the last pages, with figure captions.
- f) **Discussion:** Based on the updated bibliography supporting the results. Conclusions are mentioned at the end of this section.
- g) **Bibliography:** It should follow the specifications described below.
- h) **Number of pages or pages:** a maximum of 12. Figures: 5-7 maximum, which must be original.

II. **Clinical case report** 1 to 5 cases. Case series includes six or more clinical cases.

- a) **Authorship or authors:** It is recommended to include a maximum of five authors who have participated in the preparation of the article or manuscript and not only in the management of the patient. The others should be included in the list of acknowledgments.
- b) **Title:** Must specify whether it is a clinical case or a series of clinical cases.
- c) **Abstract:** With keywords and abstract with keywords. It should briefly describe the case and the importance of its publication.
- d) **Introduction:** The disease or attributable cause is discussed. The most relevant medical literature regarding the clinical case is summarized.
- e) **Presentation of the clinical case(s):** clinical description, laboratory and others. Mention the time in which these cases were collected. Figures or tables should be on separate sheets.
- f) **Discussion:** The most recent bibliographic references or those necessary to understand the

importance or relevance of the clinical case are discussed.

g) **Number of pages:** maximum 10. Figures: 5-8.

III. Review article:

- a) **Title:** specifying the subject to be dealt with.
- b) **Abstract:** In Spanish and English, with keywords.
- c) **Introduction and**, if necessary, subtitles: It may begin with the subject to be dealt with without division.

- d) **Bibliography:** Recent and necessary for the text.
- e) **Number of pages:** 20 maximum. Figures: 5-8 maximum.

- IV. **Letter to the Editor:** This section is for documents of social interest, normative, and complementary to one of the research articles. It does not have a unique format.
- V. **Article on the history, philosophy of medicine, and bioethics:** As in "letter to the editor," the author can develop his/her topic. A maximum of five images are accepted.

Manuscripts that are inadequately prepared or not accompanied by the checklist will not be accepted or submitted for review.

The requirements are shown in the checklist. The form is available at www.medigraphic.com/pdfs/cirgen/cg-instr.pdf (PDF). Authors should download it and check each section as each publication requirement is fulfilled.

CHECKLIST

GENERAL ASPECTS

- Articles should be submitted in electronic format. Authors should have a copy for reference.
- The manuscript should be typed in Arial 12-point font, double-spaced, in letter size, with 2.5 cm margins on each side. The standard page comprises 30 lines, 60 characters each (1,800 per page). Words in another language should be presented in italics.
- The text should be presented as follows: 1) title page, 2) abstract and keywords [in Spanish and English], 3) introduction, 4) material and methods, 5) results, 6) discussion, 7) acknowledgments, 8) references, 9) appendices, 10) text of tables, and 11) figure captions. Each section should start on a separate sheet. The format can be modified in review articles and clinical cases if necessary.
- Consecutive numbering of each page, starting with the title page.
- Write down the name, address, and telephone number of three probable reviewers not belonging to the working group to whom the article can be sent for review.

TEXT

Title page

- Includes:
 - 1) Title in Spanish and English, maximum 15 words and short title of no more than 40 characters,
 - 2) Name(s) of the authors in the order in which they will be published; if the paternal and maternal surnames are noted, they may appear linked with a short hyphen,
 - 3) Credits to each of the authors,
 - 4) Institution(s) where the work was performed.
 - 5) Address for correspondence: complete address, telephone, fax, and e-mail address of the responsible author.

Abstract

- In Spanish and English, with a maximum length of 200 words.
- Structured according to the order of information in the text:

- 1) Introduction,
- 2) Objectives,
- 3) Material and methods,
- 4) Results and
- 5) Conclusions.

- Avoid using abbreviations, but if their use is indispensable, their meaning should be specified the first time they are cited. Symbols and abbreviations of units of measurement in international use do not require specification of their meaning.
- Keywords in Spanish and English, without abbreviations, with a minimum of three and a maximum of six. They must correspond to those accepted by PubMed in its MeSH section.

Text

- The manuscript should not exceed ten pages and should be divided into subtitles to facilitate reading.
- The names, initials, or file numbers of the patients studied should be omitted.
- Abbreviations are accepted but must be preceded by what they mean the first time they are cited and the units of measurement of international use to which the Mexican government is subject.
- Drugs, medicines, and chemical substances should be named by their generic name, and the dosage and routes of administration should be indicated according to the international nomenclature.
- The statistical methods used should be described at the end of the Material and Methods section.

Acknowledgments

- Acknowledgments and details of support, drug(s), and equipment(s) provided should be cited before references. Send written permission from the persons to be cited by name.

References

- From 25 to 30 in original articles, 25 to 35 in review articles, and 10 to 15 in clinical cases. They are identified in the text with Arabic numerals and in progressive order according to the sequence in which they appear in the text.

- References cited only in tables or figure captions should be numbered according to the sequence in which the identification of the table or figure first appears in the text.
- Personal communications and unpublished data will be cited without footnote numbering.
- The title of periodicals should be abbreviated according to the recommendations of the INTERNATIONAL COMMITTEE of MEDICAL JOURNAL EDITORS (ICMJE) <http://www.icmje.org/recommendations/browse/manuscript-preparation/preparing-for-submission.html#g>. Complete information should be provided for each reference, including the article's title, abbreviated journal title, year, volume, and initial and final pages. When there are more than six authors, the first six should be listed, and the abbreviation et al. should be added.

Examples of articles from periodicals with up to six authors:

Ohlsson J, Wranne B. Noninvasive assessment of valve area in patients with aortic stenosis. *J Am Coll Cardiol.* 1986;7:501-508.

Seven or more authors:

San-Luis R, Munayer J, Aldana T, Acosta JL, Ramirez H, Campos A et al. Total anomalous pulmonary venous anomalous connection. Five years of experience. *Rev Mex Cardiol.* 1995; 6: 109-116.

Books, note edition if it is not the first one:

Myerowitz PD. *Heart transplantation.* 2nd ed. New York: Futura Publishing; 1987.

Book chapters:

Hardesty R, Griffith B. Combined heart-lung transplantation. In: Myerowitz PD. *Heart transplantation.* 2nd ed. New York: Futura Publishing; 1987. p. 125-140.

For more examples of reference formats, authors should consult:

www.nlm.nih.gov/bsd/uniform_requirements.html
www.icmje.org

Authors should avoid citing articles from predatory or pseudo-review journals.

Tables

- It does not have.
- Yes, it does.
Number (with a letter): _____
- The information they contain is not repeated in the text or figures. A maximum of 50 percent plus one of the total number of pages of text is accepted.
- They will be headed by the title and progressively marked with Roman numerals according to their appearance in the text.
- The title of each table alone will explain its contents and allow correlation with the dimensioned text.
- Articles citing “predatory” journals will not be accepted.

Figures

- It does not have.
- Yes, it does.
Number (with a letter): _____
- Photographs, drawings, graphs, and diagrams shall be considered as such. Professionals must design drawings. A maximum of 50 percent plus one of the total number of pages of text will be accepted.
- The information they contain is not repeated in the text or tables.
- They are identified progressively with Arabic numerals according to the order of appearance in the text, remembering that progressive numbering includes photographs, drawings, graphs, and diagrams. Titles and explanations are presented separately.
- The images appear in black and white in the printed version of the magazine. However, if the images submitted are in color, they will appear as such (in color) in the electronic version on the Internet. If the author wishes to have them also published in color in the printed version, he/she must pay the corresponding fee according to the publishing house.

Photographs

- It does not have.
- Yes, it does.
Number (with a letter): _____

In color: _____

- They must be of excellent quality, black and white or color. The images must be in JPG (JPEG) format, without compression, and in a resolution greater than or equal to 300 dpi. The dimensions should be at least postcard size (12.5 × 8.5 cm), (5.0 × 3.35 inches). Excessive contrasts should be avoided.
- Photographs showing identifiable patients must be accompanied by written permission for publication from the patient. If such permission is not possible, a portion of the patient’s face should be covered in the photograph.
- Each photograph will be numbered according to the number assigned to it in the text of the article.

Figure feet

- It does not have.
- Yes, it does.
Number (with a letter): _____
- They are marked with Arabic numerals corresponding to them according to the global sequence.

Ethical aspects

- The procedures in humans must comply with the principles established in the Declaration of Helsinki of the World Medical Association (WMA) and with the provisions of the General Health Law Title Five and Regulations of the General Health Law on Health Research, and NOM-012-SSA3-2012, which establishes the criteria for the execution of health research projects in humans, as well as with the rules of the Research Ethics Committee of the institution where they are carried out. In case of having a registration number, please provide it.
- Experiments on animals shall comply with the National Research Council’s standards, NOM-062-ZOO-1999, technical specifications for the production, care, and use of laboratory animals and those of the institution where they are performed.
- Any other situation considered of interest should be notified in writing to the editors.
- Disclosure of financial and non-financial relationships and activities, formerly known as conflict of interest.
- Disclosure of use of artificial intelligence (AI) or Chatbot (GhatGPT) for manuscript preparation.

**Copyright transfer letter.
Publication of an article in the journal Cirujano General, de
la Asociación Mexicana de Cirugía General, A.C.**

Article title:

Author(s):

Participation:

The authors certify that the article above is an original work and has not been previously published in any physical or digital media. They have obtained the necessary authorizations, licenses, or assignments for its publication with the entire agreement of the undersigned.

They also state that all authors participated in the creation of the article and that if accepted for publication in Cirujano General, the copyright will remain the property of the journal.

I (we), the undersigned, assign to the Asociación Mexicana de Cirugía General, A. C. and its journal Cirujano General, the printing and online dissemination rights of the article above to be published in the journal Cirujano General, as well as the right to adapt and reproduce it in printed or digital format, in any of its supports (Blu-ray, CD-ROM, DVD, Epub, PDF, etcetera), as well as to disseminate and publish it in digital networks, particularly on the Internet, or any other analogous, digital or electronic procedure, existing or future, applying the necessary protection systems, applying the necessary protection systems.), as well as to disseminate and publish it on digital networks, in particular on the Internet, or any other analogous, digital or electronic procedure existing or future, applying the necessary protection systems.

Name and signature of all authors

<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

Place and date:

The author or co-authors may not publish the article in other documents (journals, books, current or future physical or digital media) after its publication in the Cirujano General journal, respecting the copyright policy in force.

The authors declare that the signature is genuine and autographed.

The AMCG reserves the right to exploit it again at the initiative of current or future projects.

This assignment does not contemplate or imply the payment of royalties.

Send this signed document in original by mail to the AMCG address or scanned by e-mail to the AMCG editorial assistant (revista@amcg.org.mx), keeping the original.



CIRUJANO GENERAL

Asociación Mexicana de Cirugía General, A.C.

Libraries and Indexes in which the Journal Cirujano General has been registered and indexed

Medigraphic, literatura biomédica
<http://www.medigraphic.org.mx>

Free Medical Journals
<http://www.freemedicaljournals.com/f.php?f=es>

Biblioteca de la Universidad de Regensburg, Alemania
<https://ezb.uni-regensburg.de/>

Biblioteca del Instituto de Investigaciones
Biomédicas, UNAM
<http://www.revbiomedicas.unam.mx/>

Universidad de Laussane, Suiza
<http://www2.unil.ch/perunil/pu2/>

LATINDEX. Sistema Regional de Información
en Línea para Revistas Científicas de América
Latina, el Caribe, España y Portugal
<https://www.latindex.org/>

Biblioteca Virtual en Salud (BVS, Brasil)
<http://portal.revistas.bvs.br>

Biblioteca del Instituto de Biotecnología UNAM
<http://www.biblioteca.ibt.unam.mx/revistas.php>

Fundación Ginebrina para la Formación
y la Investigación Médica, Suiza
[https://www.gfmer.ch/Medical_journals/
Revistas_medicas_acceso_libre.htm](https://www.gfmer.ch/Medical_journals/Revistas_medicas_acceso_libre.htm)

PERIODICA (Índice de Revistas
Latinoamericanas en Ciencias) UNAM
<https://periodica.dgb.unam.mx>

Google Académico
<https://scholar.google.es>

Wissenschaftszentrum Berlin für
Sozialforschung, Berlin WZB
<https://www.wzb.eu/de/literatur-daten/bereiche/bibliothek>

Virtuelle Bibliothek Universität des Saarlandes, German
[https://ezb.uni-regensburg.de/ezeit/search.
phtml?bibid=SULB&colors=7&lang=de](https://ezb.uni-regensburg.de/ezeit/search.phtml?bibid=SULB&colors=7&lang=de)

Biblioteca electrónica de la Universidad
de Heidelberg, Alemania
[https://ezb.uni-regensburg.de/ezeit/search.
phtml?bibid=UBHE&colors=3&lang=de](https://ezb.uni-regensburg.de/ezeit/search.phtml?bibid=UBHE&colors=3&lang=de)

Biblioteca de la Universidad de Bielefeld, Alemania
<https://ub-bielefeld.digibib.net/eres>

FMV, Facultad de Medicina, Universidad de Buenos Aires
<https://www.fmv-uba.org.ar/biblioteca/Default.htm>

University of Washington Libraries
<http://guides.lib.washington.edu/ejournals>

Yeungnam University College of
Medicine Medical Library, Korea
[http://medlib.yu.ac.kr/journal/subdb1.asp?table=
totdb&Str=%B1%E2%C5%B8&Field=ncki_sub](http://medlib.yu.ac.kr/journal/subdb1.asp?table=totdb&Str=%B1%E2%C5%B8&Field=ncki_sub)

Journals for free
<http://www.journals4free.com/>

Research Institute of Molecular Pathology (IMP)/
Institute of Molecular Biotechnology (IMBA)
Electronic Journals Library, Viena, Austria
<https://cores.imp.ac.at/max-perutz-library/journals/>

Scielo México
<http://www.scielo.es>

Biblioteca de la Universidad de Ciencias Aplicadas
y Artes, Hochschule Hannover (HSH), Alemania
[https://hs-hannover.de/ueber-uns/organisation/bibliothek/
literatursuche/elektronische-
zeitschriften/?libconnect%5Bsubject%5D=23](https://hs-hannover.de/ueber-uns/organisation/bibliothek/literatursuche/elektronische-zeitschriften/?libconnect%5Bsubject%5D=23)

Max Planck Institute for Comparative
Public Law and International Law
[https://ezb.uni-regensburg.de/ezeit/index.
phtml?bibid=MPIV&colors=7&lang=en](https://ezb.uni-regensburg.de/ezeit/index.phtml?bibid=MPIV&colors=7&lang=en)

Library of the Carinthia University of
Applied Sciences (Austria)
[https://ezb.uni-regensburg.de/ezeit/fl.
phtml?bibid=FHTK&colors=7&lang=en](https://ezb.uni-regensburg.de/ezeit/fl.phtml?bibid=FHTK&colors=7&lang=en)

Biblat (Bibliografía Latinoamericana en revistas
de investigación científica y social) UNAM
<https://biblat.unam.mx>

Universitat de Barcelona. MIAR (Matriz de
Información para el Análisis de Revistas)
<https://miar.ub.edu/issn/1405-0099>

