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Does obesity influence morbidity and mortality in laparoscopic cholecystectomy?

¿Influye la obesidad en la morbimortalidad de la colecistectomía laparoscópica?

Federico Roesch-Dietlen,[*] Alfonso Gerardo Pérez-Morales,[‡] Julio Roberto Ballinas-Bustamante,[§] Yolopsi de Jesús Sánchez-Maza,[¶] Arturo Triana-Romero,[*] Fernando Díaz-Roesch[‖]

Keywords: laparoscopic cholecystectomy, obesity, complications.

Palabras clave: *colecistectomía laparoscópica, obesidad, complicaciones.*

ABSTRACT

Introduction and objective: cholecystectomy is the treatment of choice for gallbladder lithiasis, which is not free of complications (2-5%) related to mastery of the technique, inflammation of Calot's triangle, or anatomical variants. Recently, obesity has been considered a risk factor, so we decided to carry out the present study in two hospitals in southeastern Mexico. **Material and methods:** a prospective, multicenter, comparative study in patients submitted to laparoscopic cholecystectomy by surgeons with more than 15 years of experience, classified into three groups: A) normal weight, B) overweight, and C) obesity. Variables analyzed: anthropometric characteristics, comorbidities, surgical time, days/stay, complications, and mortality. Statistical analysis: the results were analyzed by descriptive and inferential statistics with the SPSS 24.0 program. **Results:** 317 patients underwent laparoscopic cholecystectomy. Group A: 134 cases, mean age 45.78 ± 14.6 years, women 83.58%, body mass index (BMI) 22.6 ± 4.56 kg/m^2, comorbidities 17.16%, surgical time 54.07 ± 14.10 minutes, days/stay 1.96 ± 2.23, no complications or deaths. Group B: 89 patients, mean age 51.26 ± 13.23 years, female sex 85.39%, BMI 28.6 ± 4.50 kg/m^2, comorbidities 23.59%, surgical time 56.72 ± 9.17 minutes, days/stay 1.89 ± 3.4, complications 3.68%, no mortality. Group C: 94 patients, mean age 58.5 ± 9.8 years, female sex 77.78%, BMI 32.50 ± 6.87 kg/m^2, surgical time 63.16 ± 12.4 minutes, days/stay 2.84 ± 3.42, complications 10.63%, no death (p = 0.0001). **Conclusions:** in our study, the highest number and severity of complications occurred in patients with BMI > 34 kg/m^2, so obesity should be considered in patients undergoing laparoscopic cholecystectomy. However, a more significant number of cases is required to confirm this hypothesis.

RESUMEN

Introducción y objetivo: *la colecistectomía es el tratamiento de elección de la litiasis vesicular, la cual no está exenta de complicaciones (2-5%) relacionadas con dominio de la técnica, inflamación del triángulo de Calot o variantes anatómicas. Recientemente se ha considerado la obesidad como un factor de riesgo, por lo que decidimos realizar el presente estudio en dos hospitales del sureste de México.* ***Material y métodos:*** *estudio prospectivo, multicéntrico, comparativo en pacientes sometidos a colecistectomía laparoscópica por cirujanos con más de 15 años de experiencia, clasificados en tres grupos: a) peso normal, b) sobrepeso y c) obesidad. Variables analizadas: características antropométricas, comorbilidades, tiempo quirúrgico, días/estancia, complicaciones y mortalidad. Análisis estadístico: los resultados fueron analizados mediante estadística descriptiva e inferencial, con el programa SPSS 24.0.* ***Resultados:*** *fueron sometidos a colecistectomía laparoscópica 317 pacientes. Grupo A: 134 casos, edad promedio 45.78 ± 14.6 años, mujeres 83.58%, índice de masa corporal (IMC) 22.6 ± 4.56 kg/m^2, comorbilidades 17.16%, tiempo quirúrgico 54.07 ± 14.10 minutos, días/estancia 1.96 ± 2.23, sin complicaciones ni defunciones. Grupo B: 89 pacientes, edad promedio 51.26 ± 13.23 años, sexo femenino 85.39%, IMC 28.6 ± 4.50 kg/m^2, comorbilidades 23.59%, tiempo quirúrgico 56.72 ± 9.17 minutos, días/estancia 1.89 ± 3.4, complicaciones 3.68%, sin mortalidad. Grupo C: 94 pacientes, edad promedio 58.5 ± 9.8 años, sexo femenino 77.78%, IMC 32.50 ± 6.87 kg/m^2, tiempo/quirúrgico 63.16 ± 12.4 minutos, días/estancia 2.84 ± 3.42, complicaciones 10.63%, ninguna defunción. (p = 0.0001).* ***Conclusiones:*** *en nuestro estudio el mayor número y gravedad de las complicaciones se presentaron en pacientes con IMC > 34 kg/m^2, por lo que la obesidad debe considerarse en enfermos que serán sometidos a colecistectomía laparoscópica. Sin embargo, se requiere mayor número de casos para confirmar esta hipótesis.*

[*] Institute of Medical-Biological Research, Universidad Veracruzana, Veracruz, Mexico.
[‡] School of Medicine, Universidad Veracruzana, Veracruz, Mexico.
[§] Naval Hospital, Navy of Mexico, Veracruz, Mexico.
[¶] Hospital General "Dr. Eduardo Liceaga", Secretaría de Salud, Mexico City, Mexico.
[‖] Hospital Español, Mexico City, Mexico.

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INTRODUCTION

Laparoscopic cholecystectomy is currently the best therapeutic resource for gallbladder stone disease. In recent decades, this technique has increased due to its safety and advantages.[1,2] It is also one of the most frequently performed surgical procedures in general hospitals worldwide; in the United States alone, in 2014, 750,000 cholecystectomies were performed.[3-7]

In the last three decades, lifestyle modifications in our population, consisting of excessive food consumption and a sedentary lifestyle, have led to an increase in body mass index (BMI),[8-11] and our country has not escaped this trend: as of 2014, obesity is occupying the second place worldwide.[12-15] This means that a large number of patients with obesity will require a surgical solution for gallbladder lithiasis disease.

Recently, publications have appeared that point to obesity as an additional risk factor for the presentation of complications of the laparoscopic procedure,[12-16] so we decided to conduct a study to determine whether obesity influences morbidity and mortality in patients undergoing laparoscopic cholecystectomy.

MATERIAL AND METHODS

Type of study: prospective, multicenter, observational, and comparative. **Study universe:** consecutive patients submitted to laparoscopic cholecystectomy in two hospitals in the city of Veracruz, one of the public system (*Hospital Naval de la Secretaría de Marina*) and the other of private care (*Hospital Español de Veracruz*), during the period from January 2017 to December 2019. Patients were classified into three groups, according to the World Health Organization (WHO) Criteria for classifying obesity, taking into account the weight range and body mass index (BMI); group A: patients with normal weight (BMI 18.5 and 24.9 kg/m^2); group B: patients with overweight BMI (25 and 29.9 kg/m^2); and group C: patients with obesity (BMI 30 or more kg/m^2). This last group, in turn, was subdivided into: type I obesity (BMI 30-34.9 kg/m^2), type II obesity (BMI 35-39.9 kg/m^2), type III obesity (BMI 40-49.9 kg/m^2) and type IV obesity (BMI ≥ 50 kg/m^2). **Variables analyzed:** age, sex, BMI, risk factors, surgical time, average days/hospital stay, postoperative complications, and mortality. **Statistical analysis:** absolute and relative frequencies were used to describe nominal variables, and mean, and standard deviation were used for their distribution. SPSS version 25.0 statistical software (SPSS, Inc, Chicago, ILL) was used.

RESULTS

During the period studied, 317 patients underwent laparoscopic cholecystectomy; the average age of the entire group was 45.78 ± 13.28 years (range 12-87 years); of these, 192 cases (84.21%) were female, and 36 (15.79%) were male; the BMI was 32.87 ± 6.02 kg/m^2 (range 18-44 kg/m^2).

Group A, patients with normal weight: was composed of 134 cases (42.28%), with an average age of 45.78 ± 14.6 (range 12-87), 112 (83.58%) female and 22 (16.42%) male, with average BMI of 22.6 ± 4.56 kg/m^2 (range 18.5-24). The anthropometric characteristics of this group compared with those with overweight or obesity were not statistically significant, except that most cases corresponded to the female sex (p = 0.001), as in the overweight and obesity groups. In this group, 23 (17.16%) patients had associated comorbidity: arterial hypertension in 15 (11.19) cases, diabetes mellitus in five (3.73%), asthma in two (1.49%) and cirrhosis in one (0.75%) *(Table 1)*. The mean operative time was 54.07 ± 14.10 minutes (range 35-120), and the mean days/hospital stay was 1.96 ± 2.23 days (range 1-3). No postoperative complications were reported or deaths *(Table 2)*.

Group B, overweight cases: consisted of 89 (39.03%) patients, with a mean age of 51.26 ± 13.23 years (range 21-78), female sex predominated with 76 (85.39%) cases, over male sex with 13 (14.61%) cases; mean BMI was 28.6 ± 4.50 kg/m^2 (range 18-29). The anthropometric characteristics did not show statistically significant differences compared to the normal weight group, except in the distribution by sex, since the female was predominant (p = 0.001). This group presented comorbidity in 21 (23.59%) cases: arterial hypertension in 17 (19.10%), diabetes mellitus

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Table 1: Demography and risk factors of the population studied.

Parameter	Normal weight n (%)	Overweight n (%)	Obesity n (%)	p
Population	134 (42.28)	89 (39.03)	94 (41.23)	
Demography				
Average age years [range]	45.78 ± 14.6 [12-87]	51.26 ± 13.23 [21-78]	58.5 ± 9.87 [28-78]	0.679
Sex				
Female	112 (83.58)	76 (85.39)	74 (77.78)	
Male	22 (16.42)	13 (14.61)	20 (22.28)	0.001
Risk factors				
Associated comorbidities	**23 (17.16)**	**21 (23.59)**	**44 (46.81)**	0.065
Diabetes mellitus	5 (3.73)	17 (19.10)	10 (10.64)	
High blood pressure	15 (11.19)	3 (3.37)	32 (34.04)	
Asthma	2 (1.49)	0	2 (2.13)	
Cirrhosis	1 (0.75)	0	0	
Venous insufficiency	0	1 (1.12)	0	

Table 2: Results of surgical intervention and morbidity and mortality in the groups studied.

Parameter	Normal weight n (%)	Overweight n (%)	Obesity n (%)	p
Population	134 (42.28)	89 (39.03)	94 (41.23)	
Surgical procedure results				
Surgical time [min] [range]	54.07 ± 14.10 [35-120]	56.72 ± 9.17 [37-120]	63.16 ± 12.4 [45-150]	0.235
Average days/stay [range]	1.96 ± 2.23 [1-3]	1.89 ± 3.4 [1-3]	2.84 ± 3.42 [3-21]	0.429
Complications	0	1 (3.68)	10 (10.63)	0.005
Wound infection	0	1 (1.31)	6 (6.38)	
Biloma	0	0	2 (2.13)	
Port hernia	0	0	1 (1.06)	
Biliary fistula	0	0	1 (1.06)	
Mortality	0	0	0	

in three (3.37%), and deep venous insufficiency in the lower extremities in one (1.12%) *(Table 1)*. The mean operative time was 56.72 ± 9.17 minutes (range 37-120). The mean days/stay was 1.89 ± 3.4 days (range 1-3). Only one case (1.31%) presented epigastric port wound infection; there were no significant complications or mortality *(Table 2)*.

Group C, obese patients: 94 patients (41.23%), the average age of the group was 58.5 ± 9.87 years (range 28-78), the predominant sex was female with 74 (77.72%) cases, over male with 20 (22.28%) cases. The mean BMI was 32.50 ± 6.87 kg/m^2 (range 30-40). The risk factors found were: arterial hypertension in 32 (34.04%) cases, diabetes mellitus in 10 (10.64%), and asthma in two (2.13%) *(Table 1)*. The mean operative time was 63.16 ± 12.4 minutes (range 45-150), and the mean days/stay was 2.84 ± 3.42 days (range 3-21). In this group, ten complications (10.63%) were reported (p = 0.005), which were: surgical wound infection in six (6.38%) cases, biloma in two (2.13%), epigastric port hernia in one (1.06%) case and external biliary fistula in another (1. 06%), which corresponded to a patient with grade III obesity with acute cholecystitis, who underwent subtotal cholecystectomy with drainage of the subhepatic space and required hospitalization for 21 days. The three major complications were resolved satisfactorily, and there was no death.

DISCUSSION

Laparoscopic cholecystectomy is the best treatment option for gallbladder stone disease with a perioperative complication rate that ranges from 2 to 5%, of which 3 to 15% are usually severe and are associated with a mortality rate of 0.7 to 1.5%; they usually occur in elderly patients with associated comorbidities, and in immunocompromised patients.[1,17-19] Postoperative complications have been attributed to the learning curve of the laparoscopic technique, the surgeon's inexperience, inadequate patient selection and, recently, also to the degree of obesity.[20-24]

At the Hospital General "Dr. Gaudencio Gonzalez" in Mexico,[19] when evaluating post-laparoscopic cholecystectomy complications, Ramirez observed that they occurred more frequently in women with an average age of 47.8 years and BMI over 24.8 kg/m^2. Similar results obtained by Hussien at the Walles Hospital in Belfast, New Ireland,24 Banz at the University of Bern in Switzerland[5] and Aziz at the University of Arizona in the United States of America,[25] corroborate that the greater the degree of obesity the greater the number of complications; also pointing out that, although the disease is more frequent in women, the most significant complications usually occur in men;[26-29] recommending that in such severe cases, subtotal cholecystectomy can be performed to avoid injury to the biliary tract.[30-33]

The results of our study confirm what is reported in the world literature, cholelithiasis was more frequent in the female sex (84.21%) than in the male sex (15.79%) (p = 0.001), with an average age for the whole group of 45.78 ± 13.28 years and BMI of 32.87 ± 6.02 kg/m^2.

Although 28.29% had associated comorbidity (arterial hypertension, type 2 diabetes, asthma, cirrhosis, and deep venous insufficiency in the lower extremities), this did not constitute a significant risk factor in the surgery results.

The surgical time employed in patients with normal weight and overweight was similar (55.84 ± 8.23 minutes), and in cases with obesity, it was slightly higher (63.16 ± 12.4). However, there was no statistical significance between the three groups (p = 0.235).

As can be seen in *Table 2*, the highest number of complications occurred in patients with obesity, compared to the normal weight or overweight group, with statistical significance (p = 0.005). The most severe complications (biloma and biliary fistula) occurred in patients with grade II and III obesity, which fortunately were satisfactorily resolved with conservative management.17,25

The mean days/stay was 1.91 ± 3.37 days in the first two groups and 2.84 ± 3.42 in the obese patients, but without a significant statistical difference (p = 0.429). However, one of the male patients with type III obesity, who underwent subtotal cholecystectomy, presented the most severe complications and remained

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hospitalized for 21 days, requiring support from the Intensive Care Unit.

CONCLUSIONS

Our study shows the results of the experience in managing gallbladder stones in a population of southeastern Mexico. The learning curve was eliminated since the participating surgeons in the two institutions had more than ten years of experience performing laparoscopic cholecystectomy. Although the cohort of cases is small, it allows us to conclude that the most severe complications occur in patients with grade II and III obesity, so it should be considered a risk factor, especially for incidental lesions of the biliary tract.

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Correspondence:
Federico Roesch-Dietlen
E-mail: federicoroesch@hotmail.com

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