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Results of a national survey on the preparation, management and monitoring of colonic anastomosis

Resultados de una encuesta nacional sobre la preparación, manejo y vigilancia de anastomosis colónica

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ABSTRACT

Introduction: In colorectal surgery, every surgeon must know the anatomical and functional characteristics of colon and rectum. Also to date guides and techniques must be used in order not to expose the patient to life-threatening complications. **Objective:** This study aims to review the way colorectal surgery is performed, the surgical techniques, and prevention measures in Mexico. **Material and methods:** This is a cross-sectional survey, the study applied to members of the Mexican Association of General Surgery from July of 2017 to August of 2018. **Results:** 1,216 surgeons answered the survey. Out of 10 anastomoses performed, 612 surgeons (50.3%) reported not presenting anastomotic leaks events, 489 surgeons (40.2%) reported to have one anastomosis leak, 80 surgeons (6.6%) reported 2 events, and 6 surgeons (0.5%) reported three or more events of anastomosis leak. Eight hundred nineteen surgeons (67.3%) prescribe antibiotics a day before the surgical event. **Conclusion:** To know the tendency of colorectal surgery performed by the members of the Mexican Association of General Surgery in regards to colic anastomosis reveals the need to improve the patient selection and their proper pre-surgical preparation.

RESUMEN

Introducción: *En la cirugía colorrectal se deben conocer las características anatómicas y funcionales del colon y recto. También seguir las guías y técnicas actualizadas, ya que de no ser así se expone a los pacientes a complicaciones que podrían llegar a poner en riesgo la vida.* ***Objetivo:*** *El estudio explora a través de una encuesta las formas en que se realiza la cirugía de colon en México, medidas de prevención y técnicas quirúrgicas.* ***Material y métodos:*** *Estudio transversal de encuesta, aplicado a médicos cirujanos y residentes miembros de la Asociación Mexicana de Cirugía General, del periodo de julio de 2017 a agosto de 2018.* ***Resultados:*** *1,216 cirujanos contestaron la encuesta. De cada 10 anastomosis realizadas, 612 cirujanos (50.3%) respondieron que no presentaron ninguna fuga, 489 cirujanos (40.2%) reportaron una fuga de anastomosis, 80 cirujanos (6.6%) reportaron tener dos y finalmente seis cirujanos (0.5%) reportaron tres o más fugas anastomóticas. 819 cirujanos (67.3%) prescriben antibioticoterapia un día previo a la cirugía.* ***Conclusión:*** *Conocer las tendencias llevadas a cabo por los miembros de la "Asociación Mexicana de Cirugía General", en la anastomosis colónica nos revela la necesidad de mejorar la selección de los pacientes y su adecuada preparación preoperatoria.*

INTRODUCTION

In colorectal surgery, anatomical and functional characteristics must be known. It is important to follow the most updated guidelines and techniques, otherwise, patients are exposed to complications that can be life-threatening. Nowadays, there are more and better diagnostic methods, medicines, anesthesia and surgical techniques that help to

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reduce the risks of complications of the different procedures performed.[1]

Colorectal anastomosis (CA) is an essential technique in digestive surgery that is performed after the resection of a portion of the colon and/or rectum to monitor the bowel continuity (BC), which is allowed by the suture in the submucosa.[2]

Main complications of CA

The incidence of post-surgical complications in colon and rectal surgery is between 10 and 30%. The main complications are abdominal sepsis, post-surgical ileus, hemorrhage, evisceration, ureteral injury, large vessel lesions, and anastomotic dehiscence; the latter is the most frequent since it occurs between 2 and 19% of all colorectal surgeries.[3]

Risk factors of anastomotic leakage (AL)

Risk factors to be considered before this procedure are smoking, obesity, alcoholism, corticosteroid use, transfusions, preoperative nutritional status, male gender, advanced age, and assessment of the patient's condition with the American Society of Anesthesiologists (ASA) scale. Other important factors to consider are the experience of the surgeons, the use of staplers or sutures, the use of adhesives, surgical technique, preoperative and postoperative management, and the use of tests or studies to verify the status of the CA.[2,3]

Implicated factors to prevent the risk of AL

Some factors can alter the course of normal healing in CA, the most important being tissue ischemia, which can result from extensive dissection and vascularization or excess tension at the anastomosis site, and should, therefore, be avoided at all costs. Some strategies help to some extent to prevent colorectal leaks, for example, using rectal probe air insufflation, dye instillation, and direct colonoscopic vision for verification.[3-6]

In colorectal anastomosis AL can result in a high mortality and morbidity rate, due to its high rate of infection with hematogenous spread, which can lead to sepsis if not properly managed; therefore, patients should be promptly identified for surgical reintervention and/or the initiation of antibiotic therapy.[6]

MATERIAL AND METHODS

Design: Transversal polling survey.
Objective: To analyze the data obtained through a survey on the way colon surgery is performed in Mexico, its prevention measures, and surgical techniques.
Instrument: A survey of 30 reagents was carried out, including demographic questions, gender, age and years of surgical experience, in addition to various multiple-choice questions that provided information on various aspects of medical practice in colon surgery such as the number of anastomotic leaks, type of nutrition, smoking cessation, colon preparation, use of oral antibiotics, surgical technique and post-surgical indications. The survey was validated by a group of experts in the field.
Sample: The survey was answered by 1,216 physicians, surgeons, and residents, members of the Mexican Association of General Surgery in the period July 2017 to August 2018.
Data analysis: Descriptive analysis included the presentation of results with raw numbers, proportions, central tendency measures, and dispersion. Data were analyzed using Statistical Package for Social Sciences Version (SPSS) 23 for Windows.

RESULTS

The population included 1,216 surgeons and residents, of whom 1,041 (85.5%) were men and 147 (12.1%) were women; 28 (2.3%) did not answer the question about their gender. The mean age was 47.25 ± 12.4 years. The mean age of the male participants was 48.4 ± 12.3 years and the mean age of the female participants was 39.2 ± 9.8 years. In terms of years of experience, there were 508 (41.2%) with less than 20 years of experience, 478 (38.8%) surgeons with more than 20 years of experience, 74 (6%) surgical residents, and 156 (12.8%) did not to answer the question. When asked how many colonic and colorectal

anastomoses they perform altogether per year on average, 418 surgeons (34.3%) perform from none to five, 412 (33.9%) five to 10 procedures, 242 (19.9%) 10 to 20 colonic anastomoses, and 118 (9.7%) more than 20 per year; 26 surgeons (2.1%) did not answer this question.

Anastomotic leaks

For every 10 anastomoses performed, 612 surgeons (50.3%) responded that they had no leakage, 489 surgeons (40.2%) reported one anastomotic leakage, 80 surgeons (6.6%) reported two, and six surgeons (0.5%) reported three or more anastomotic leakage events; 29 surgeons (2.4%) chose not to answer this reagent.

After a colonic or colorectal anastomosis 1,086 surgeons (89.3%) do not routinely request an imaging study to rule out a leak. Of those who do, the most commonly used procedure was the contrasted abdominal CT scan in 58 cases (44.6%), followed by the enema colon study in 31 cases (23.8%), abdominal ultrasonography in 26 cases (20%), and abdominal radiography in 15 cases (11.5%).

Nutrition

We asked whether formal nutritional assessments were made in all patients who will undergo some type of intestinal anastomosis, and obtained that in 894 patients (73.5%) the assessment was made, while in 300 (24.7%) it was not, and 22 (1.8%) did not answer. When asked if any type of special nutrition was used before the surgical event in patients with malnutrition, 462 surgeons (38%) indicated protein-calorie supplementation, 367 surgeons (30.2%) did not indicate any type of special nutrition, 300 surgeons (24.7%) offered intravenous parenteral nutrition, 59 surgeons (4.9%) indicated an immunomodulatory diet and 28 (2.3%) did not answer the question.

Smoking

It was found that 961 surgeons (79%) suggested their patients stop smoking before surgery, while 229 patients (18.8%) were not told and 26 (2.1%) did not answer. 663 surgeons (54.4%) recommended stopping smoking four weeks or less before the surgical procedure, as compared to 414 surgeons (34%) who suggested stopping smoking for more than four weeks. 139 surgeons (11.4%) did not answer this question.

Mechanical preparation of the de colon

Routinely 1,089 of the surgeons (89.5%) requested a mechanical colon preparation. 550 surgeons (50.5%) used laxatives and enemas, 411 surgeons (37.7%) used laxatives alone, 89 surgeons (8.1%) used enemas, and 39 (3.5%) used other methods.

Oral antibiotics

842 surgeons (69.2%) prescribed antibiotic therapy the day before surgery. Of these, 317 (37.6%) used metronidazole, 107 (12.7%) neomycin, 28 (3.3%) erythromycin, and 390 (46.3%) used a combination of antibiotics.

Manual versus stapling suture

In the case of a colonic or colorectal anastomosis, 866 surgeons (71.2%) prefer mechanical anastomosis with stapler, while 350 surgeons (28.7%) prefer manual anastomosis with suture. Regarding the use of stapler to perform an ileo-colonic anastomosis, 592 surgeons (68.3%) prefer of blue-purple staples, 133 surgeons (15.3%) white-tan staples, and 141 surgeons (16.28%) green-black staples. After a stapler anastomosis, 643 (74.3%) do not use any adhesive as a reinforcement, in contrast to 58 surgeons (6.7%) who do, while 165 surgeons (19%) did not answer this question.

When surgeons perform anastomosis with sutures, 32 (9.2%) use one layer, 302 (86.3%) use two layers, three surgeons (0.9%) use three layers, and 13 (3.6%) did not respond. For manual anastomosis, 226 surgeons (64.5%) prefer absorbable sutures, 93 surgeons (26.5%) use non-absorbable sutures and 14 surgeons (4.1%) use both types, and 17 (5%) surgeons did not respond. After suture anastomosis, 286 physicians (81.7%) do not use an adhesive as a reinforcement. When performing the

anastomosis, 273 surgeons (78%) were found not to use a barbed suture.

Colorectal anastomosis

After a colorectal anastomosis, 921 surgeons (75.7%) routinely perform a tightness test, while 270 surgeons (22.2%) do not, and 25 surgeons (2%) did not answer the question. Of those who perform the test, 725 surgeons (78.7%) prefer air insufflation through a rectal probe, 125 surgeons (13.5%) perform a dye instillation, and 71 surgeons (7.7%) use direct vision with a colonoscope.

After a colonic anastomosis 928 surgeons (76.3%) routinely leave a drain in the peritoneal cavity, 258 surgeons (21.2%) do not and 30 surgeons (2.5%) did not answer the question. Of the surgeons who leave a drain, the most used was the Penrose drain, by 596 surgeons (64.2%), followed by Blake drain, by 179 (19.2%), and Jackson-Pratts by 137 (14.7%), 16 surgeons (1.7%) use other types of drainage.

Prescriptions after surgery

In post-surgical prescriptions after colonic anastomosis, the most indicated analgesic is a non-steroidal anti-inflammatory drug (NSAID) preferred by 656 surgeons (53.9%), followed by NSAIDs plus opiates in 500 cases (41.1%), 31 (2.5%) used only opiates and 29 surgeons (2.4%) did not answer. After an anastomosis, 934 surgeons (76.8%) do not routinely leave a nasogastric tube in place, while 253 surgeons (20.8%) do; 29 surgeons (2.4%) did not answer this reagent. After an anastomosis, 849 surgeons (69.8%) routinely restart the oral route after three or more days, 209 (17.2%) do so after two days, 112 (9.2%) one day later, 17 (1.4%) on the same day of surgery, and 29 (2.4%) did not answer.

Comments on the results compared to the evidence-based literature can be found in *Table 1*.

DISCUSSION

Most of the respondents were males, with an average age of 48; 41.2% of the sample had more than 20 years of experience, a similar proportion had less than 20 years of exercise. In this survey, 68% of the surgeons performed less than 10 colonic anastomoses per year, which may be explained by at least two situations: 1) because of low volume, laparoscopic colon surgery is not feasible for most surgeons and 2) morbidity may be increased as compared to 20% of surgeons who perform more than 10 colonic anastomoses, which would have to be corroborated by a new study.

Mechanical preparation in anastomosis

It is noteworthy that, although 89.5% agreed to mechanically prepare the colon, only 50.5% reported using the combination of laxatives and enemas and 3.5% did not clarify the method they use. For many years it was believed that this practice prevented the dehiscence of anastomosis or complications; however, new literature reveals controversial results. While some authors find a positive correlation with the use of colonic preparation,[7,8] recent meta-analyses report that the use of mechanical bowel preparation (MBP) does not produce a significant change in the prevention of complications such as anastomotic dehiscence.[9-12] However, a new trend has shown a decrease in the number of complications with the use of MBP + oral antibiotics (OA), as demonstrated in the meta-analysis conducted by Rollins et al.[13] where there is a statistically significant reduction in surgical site infection, anastomotic leakage, 30-day mortality, overall morbidity, and ileus development compared to MBP alone; However, it is mentioned that there is no evidence comparing MBP + OA against OA alone, so no definitive recommendations can be given.

Antibiotic prophylaxis

Antibiotic prophylaxis, according to different studies, should be applied 30 to 60 minutes before the skin incision. There is a risk of infection of up to 30% at the surgical site, so it is important to apply antibiotics to patients

Table 1: AMCG survey highlights compared to evidence-based literature.

	Mexican survey (%)	Evidence-based literature	Comments
Mechanical preparation	89.5 perform mechanical preparation	Controversial results No statistical significance has been observed between the use or non-use of mechanical bowel preparation	A combination of oral antibiotics and mechanical bowel preparation should be considered. Further clinical trials are required
Oral antibiotic prophylaxis	69.2 indicate prophylaxis with oral antibiotics	100% Its use decreased surgical site infection, dehiscence rate, ileus and major complications	Combined use of mechanical preparation plus oral antibiotics decreased mortality
Smoking	79 four-week suspension	Ideally an eight week suspension	Add Vit. C
Nutritional status	73.5 perform nutritional assessment	Ideally 100%	Malnutrition is a risk factor for major complications
Anastomosis	28.7 use suture	Variable	Meta-analysis in favour of mechanical anastomosis in the right colon
Manual (suture) Mechanical (stapling)	71.2 use a stapler	Variable	
Hermeticidad	59.6 perform watertightness tests	Ideally 100%	Direct colonoscopical vision is best, but only 5.8% use it
Drainages	72.4 indicate drainage	No benefit in mortality, reoperations, anastomotic leakage, surgical site infection or respiratory complications	Increase post-operative bowel obstruction
Nasogastric tube	76.8 do not use tube 20.8 use tube	Not indispensable	

to prevent bacterial growth and spread. Antibiotics should be administered rationally for maximum effectiveness and to decrease adverse effects.[14] The survey revealed that metronidazole is the most commonly used prophylaxis, as mentioned in the Mayo Clinic report on adult antimicrobial prophylaxis. In colorectal surgery, metronidazole (500 mg) IV should be administered, or ampicillin-sulbactam 3 grams IV.[15]

Smoking and preoperative nutritional status

Seventy-nine percent of the surgeons agreed to instruct their patients to stop smoking for at least four weeks before the surgical procedure. To achieve a beneficial effect in connection with surgery, it is advised to stop smoking at least eight weeks before surgery.

Smoking is associated with decreased tissue restoration, increased risk of surgical wound infection, ulcers, as well as being a deleterious factor in the repair of surgical flaps and grafts. Smokers of a pack of cigarettes per day have a three-fold increased risk of tissue necrosis, while two packs per day have a six-fold increased risk compared to non-smokers.

Nicotine stimulates central and peripheral epinephrine release that increases smooth muscle vasoconstriction through the production of thromboxane A2. The cutaneous blood flow decreases by up to 40% to produce ischemia and decrease healing. The smoking of one single cigarette creates a vasoconstrictive effect for up to 90 minutes, while smoking a pack results in hypoxic tissue that lasts a full day.

Tobacco consumption has a reducing effect on vitamin C stores. Smokers require a minimum of 140 mg of vitamin C daily to maintain a total pool similar to non-smokers who consume 100 mg per day. In terms of nutritional status, malnutrition has been identified as an independent risk factor for developing post-operative complications.[16,17] In our population there is a greater tendency to perform a preoperative nutritional assessment, since as expected, the latter is considered an important step for patients who will undergo colorectal surgery. Knowing the preoperative nutritional status is of a great relevance, as demonstrated in the study by Sagawa and his group,[18] in which they evaluated the nutritional status of 351 patients who underwent bowel resection for colon cancer, and found that of malnutrition contributed to the development of surgical site infections in 10% of their patients.

Intestinal anastomosis technique, suture versus stapling

In general terms, there are two types of suture for a colorectal anastomosis, manual suture and mechanical suture (staplers). The choice of one or the other type is related to the surgeon's preferences, the accessibility to the tissues (very low anastomosis), and cost, among others. In our sample, we found that 866 (71.2%) surgeons prefer the use of staplers versus 350 surgeons (28.7%) who prefer manual suture.

In a multi-center study, de Frasson and his team[16] analyzed risk factors for anastomotic leakage in 1,102 patients, and found that stapler closure was a risk factor independent of the stapler. However, a recent Cochrane meta-analysis[19] concluded that functional ileocolic mechanical anastomosis is associated with less anastomotic leakage than manual anastomosis and should be considered the standard against which all other techniques should be compared. Also, a systematic review[20] reports that most anastomoses are performed with a stapler, as manual ones require a longer learning curve and are more difficult to standardize, particularly in laparoscopic surgery.

Leakage test

Airtightness tests are used to verify absence of leaks after an anastomosis. There are several techniques.[21,22] In our population, most surgeons (59.6%) use air insufflation through a rectal probe, most likely because of accessibility to this type of test in our environment. Some publications suggest that it is preferable to perform the air insufflation test with the help of a colonoscopy to have a direct view of the anastomosis, its characteristics, and even the possibility of detecting the site of leakage if it is the case. However, it is very likely that due to the availability and cost in our environment, only 5.8% of total respondents use it.[6] Despite what appears to be a certain advantage, there are no studies that accurately compare air testing and direct vision to identify anastomotic leakage.[23]

Use of drainages in surgery intestinal anastomosis

In our sample, after an anastomosis of the colon, 928 surgeons (76.3%) routinely leave a

drain in the peritoneal cavity and 258 surgeons (21.1%) do not. The great inclination to use drains after surgery is to be noticed, but it should be mentioned that current evidence from different meta-analyses shows that their use does not decrease mortality, reoperation rate, nor postoperative complications such as anastomotic leakage, wound infection, or respiratory complications.[24,25] It has even been observed that their use increases the risk of postoperative small bowel obstruction,[26] so their systematic use should be reconsidered.

Postoperatory analgesia

There is evidence that the combination of different analgesics in postoperative pain provides better results than the use of a single analgesic. As can be seen from the results of the survey 53.9% of surgeons use NSAIDs alone, while 41.1% use NSAIDs in combination with opiates. When comparing this information with the literature obtained from the Mayo Clinic, for severe pain it is recommended to provide analgesia with opioids such as morphine, fentanyl or tramadol, and NSAIDs such as ibuprofen, naproxen, ketorolac or celecoxib.[27] In turn, there is talk of applying local anesthetic such as bupivacaine 0.125% plus fentanyl 5 μg/ml in moderate to severe pain, together with NSAIDs and paracetamol. This may favor a decrease in the incidence of postoperative ileus by increasing the irrigation in the intestinal mucosa to produce splacnic vasodilation and cause the pH to be in ranges close to normal, which initiates intestinal parasympathetic activity by the vagus and sacral nerves and may block surgical stress caused by sympathetic reflex arches. Providing analgesics by epidural route in combination with local analgesics is said to reduce the time of intestinal paralysis, increase the force of contraction of the colon without affecting the healing of the anastomosis.[28,29]

Use of nasogastric tube

Nasogastric tubes (NGTs) can be used in some operations of the digestive system such as colorectal surgery. Some surgeons believe that they are effective in preventing problems such as postoperative paralytic ileus, nausea, and/or vomiting related to anastomotic dehiscence.[30] It was found that most surgeons (76.8%) do not routinely use the NGTs, which corresponds to a literature review that found no difference between using NGTs and not using them, and that their systematic use is not indispensable.[31]

Dehiscence of anastomosis

Virtually 50% of surgeons surveyed admitted to have had at least one anastomosis dehiscence for every 10 procedures. The description of the prevalence or incidence of this event is usually greater when exploring it through surveys than what is published about it. As Shogan and colleagues[32] refer when surveying prominent professors and directors of specialty courses in the United States and Europe, who mostly answered that their incidence is greater than the 10% published in the international literature, the results of our survey suggest that preparation and postoperative care measures need to be improved to prevent dehiscence, the most feared complication of colorectal surgery, although it should be mentioned that the incidence of anastomotic leakage is directly related to the number of procedures performed per year by each surgeon.

CONCLUSIONS

Knowledge of the trends in colonic anastomosis of the members of the Mexican Association of General Surgery reveals the need to improve the selection of patients and their adequate preoperative preparation. It is necessary to take key points into consideration, such as intestinal preparation, preoperative nutritional status, antibiotic prophylaxis, and patient risk factors such as smoking, due to the high morbidity rate for anastomotic leaks. In the surgical event, it is recommended to verify the stability of the anastomosis with hermeticity tests, assess the use of peritoneal cavity drains, as well as the correct use of postoperative analgesia.

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