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# Laparoscopic hernioplasty in Mexico: results of a national survey

## Abstract

**Background:** Inguinal hernia repair is one of the most commonly performed procedures worldwide but in most countries, including Mexico, the laparoscopic approach has developed at a slower pace than other surgical techniques. In the absence of a national hernia registry and with the purpose of understanding how laparoscopic inguinal hernia repair stands in our country, we performed a large survey among Mexican surgeons and evaluated different aspects about this minimally invasive procedure.

**Methods:** A structured survey with 40 single and multiple answer questions, using the Survey MonkeyVR (www. surveymonkey.com) platform was conducted from April 2014 to March 2015. The questionnaire was uploaded online in the websites of the two main mexican surgical societies: Asociación Mexicana de Cirugía Endocópica (AMCE), and Asociación Mexicana de Cirugía General (AMCG) during one year, and members were asked to participate voluntarily. A sample size of 968 responses was statistically calculated. Questions analyzed about laparoscopic inguinal hernia repair were focused on training, experience, practice, and availability of the procedure.

**Results:** A total of 1,151 questionnaires were collected. Of those who answered the question about having had training in laparoscopic inguinal hernia repair (LIHR) (74.29%), approximately 53% answered affirmatively. Only 47% of these considered their training adequate. More than half of the respondents had no training during their residency program and only 17% reported as performing more than 10 cases as a surgeon and 31% as an assistant. More than 70% required further training after their residency. Routine practice of LIHR is performed by 26% of respondents while never performed by 32.5%. Approximately 40% wishes to obtain training and more than 70% accept to be limited by lack of training.

**Conclusions:** Our survey shows that laparoscopic inguinal hernia repair has had a very slow development in Mexico, as it has in other countries. The large diversity of surgical care conditions and training opportunities seems to be the most relevant factor. Larger national registry data are required for a better understanding and for better planning of training and availability for this minimally invasive procedure.

**Keywords:** laparoscopy, hernia repair, national survey, Mexico

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## Introduction

Inguinal hernia repair (IHR) is one of the procedures that has taken longer to be a regular practice due to multiple factors. This phenomenon has been recurrent in the last three decades throughout the world. Mexico is not an exception, and its advancement has been steady but slow. The data about its practice in other nations are infrequent and dissimilar, but although speculative, important because they give an image of the situation. In this paper we present the results of a national survey with data about laparoscopic inguinal hernia repair (LIHR) in Mexico.

### Study design

To understand facts of laparoscopic surgery in Mexico, a prospective, study was conducted from April 2014 to March 2015, by means of a structured survey with 40 single and multiple answer questions, using the Survey MonkeyVR platform. It was directed toward general surgeons from all over the country, and surgical residents that wished to participate. The link for the questionnaire was uploaded online in the websites of the two main mexican surgical societies: Asociación Mexicana de Cirugía Endocópica (AMCE), and Asociación Mexicana de Cirugía General (AMCG) during one year, to allow a high number of surgeons to partake, specifying the motives, importance and usefulness of the survey. A pilot of the survey was conducted previously during a National Surgery Congress to evaluate its accuracy and was improved accordingly. It was approved by the ethical board of both organizations. To determine an adequate sample size, a non-randomized probabilistic sample calculation was made using the formula derived from Anderson and Burstein (1), with the addition of 10% per non-response rate, 95% CI, 3% sample error, and $p = 0.5$, $q = 0.5$. For calculations, we used double of the number of active registered surgeons in AMCG, the largest national surgical association in Mexico, which at the time of the survey was 2400 members. The final result of the sample calculation was 968.

Data were recorded on participants' demographics such as age, gender, place of surgical training and State of current practice, type of institutional practice (public, private or both), type of center (clinic, hospital, regional hospital or medical center), years since completion of surgical residency, formal laparoscopy training during residency or after, type and frequency of actual laparoscopic procedures practiced as surgeons, and during surgical residency (from a given list of 17 laparoscopic procedures), laparoscopic procedures they wish to learn, reasons for not practicing them (from a given list of options). Anonymized data was collected and managed using the SPSS v21 (SPSS Inc., Chicago, IL, USA). Surveys were discarded if less than 80% of the data was available. Missing responses were not imputed. Variables are presented as frequency and percentage. From the data of the survey, we report mainly the information regarding the practice of LIHR.

## Results

A total of 1,151 questionnaires were collected. Twenty-three were discarded, because they were inappropriate for analysis. Of the participants, 1018 (90.25%) were male, and 110 (9.75%) female. Their age ranged from 20 to more than 70 years-old. Only 3.7% were younger than 30 years. The fourth decade of life, was the largest group of participants (29.3%). 25.3% of the contributors finished their surgical training before 1990, and 21.1% within the five years previous to the survey. Surgeons from all States in the country responded the survey. 305 (36%) worked in the metropolitan area of Mexico city. The surgeons from the rest of the country were distributed accordingly to the size, population density, and economic development of each State.

Regarding the geographic origin where they performed the surgical residency, 70% of the responders did it in the four top economically developed Mexican States: Nuevo León, Jalisco, State of Mexico and Guanajuato. Two States, had no responders. The rest, had each between 1 and 3% of the participants, 1.9% of them underwent their residency program abroad. Only 838 (74.29%) surgeons answered the question of whether they had formal training in laparoscopy during their residency; 444 (52.98%) answered affirmatively, and 394 (47.02%) denied formal training. From the responders who received formal laparoscopic training, 304 (47.47%) perceived the instruction as adequate. 426 (50.8%) of the participants confirmed additional instruction in laparoscopy courses (theoretical, practical or both), fellowships (at least one month in duration), tutorial, or high specialty courses, mainly after the surgical training 801 (73.35%) (Table 1). During surgical residency, 464 (55.4%) indicated they never performed laparoscopic inguinal repair. Of the residents who performed LIHR as surgeon, 27.6% completed less than ten procedures; and only 17% reported more than 10 procedures performed. When asked about their experience as surgical assistants in LIHR, the percentages were as follow: 41.2% never, 27.2% less than ten and 31.6% more than ten respectively (Table 2).

**Table 1** Results to the question: Was formal training in laparoscopy received during residency?

| Formal training in laparoscopic surgery during residency | N (%) |
|---|---|
| Answered survey 74.29% | |
| Received formal training? | 444 (52.98%) |
| Training was considered adequate? | 304 (47.02%) |
| Received additional training? | 426 (50.8%) |
| Additional training obtained after surgical residency? | 801 (73.35%) |

**Table 2** Results to the question: Was training received in LIHR?

| Training in LIHR | N (%) |
|---|---|
| Answered survey 73% | |
| Did NOT receive training | 464 (55.4%) |
| Participated as surgeon in > 10 cases | 17% |
| Participated a surgeon in < 10 cases | 27.60% |
| Participated as assistant (never) | 41.20% |
| Participated as assistant in > 10 cases | 31.60% |
| Participated as assistant in < 10 cases | 27.20% |

Of the participants, 224 (20.18%), 258 (23.24%) and 628 (56.58%) had public, private and mixed type of institutional practice, respectively. Concerning the type of center 638 (59.85%) labored in a general hospital, 320 (30.02%) in a regional hospital, 126 (11.82%) in medical center, and 98 (9.19%) in small surgical clinics. Of 1095 participants, 1012 (92.42%) answered current practice of laparoscopic surgery. From the list of 17 laparoscopic procedures, of 1080 attending surgeon responders, 227 (26.03%) answered routinely perform LIHR, 121 (13.88%) often, 240 (27.52%) seldom, and 284 (32.57%) never. When asked about their wish to perform minimally invasive inguinal repair, 362 (37.24%) answered affirmatively, and the reason among different options listed 705 (72.16%) was lack of training (Table 3).

**Table 3** Answer to the questions Perform LIHR in routine practice? Does not perform due to lack of training? Wish to perform?

| Frequency of LIHR perform, lack of training, wish to perform | N (%) |
|---|---|
| Routinely performs | 227 (26.03%) |
| Often performs | 121 (13.88%) |
| Seldom performs | 240 (27.52%) |
| Never performs | 284 (32.57%) |
| Does not perform due to lack of training | 705 (72.16%) |
| Wish to perform | 362 (37.24) |

## Discussion

IHR is the most common surgical procedure in general surgery. The laparoscopic approach published by Ger in 1992 arouse concerns, because it did not comply with reasonable surgical principles.[2,3] This was one of the factors, among many others, that explains why this procedure has taken longer to develop.[4,5]

Global national registries on LIHR are typically not available. In most of the countries, the true frequency and data about LIHR are unknown. To understand better certain facts regarding the practice of laparoscopic surgery in Mexico we conducted this study. This is the report of the largest survey ever conducted in Mexico, to describe the tendencies of different issues regarding the Mexican practice of laparoscopic surgery and particularly about LIHR.

To give an appropriate interpretation of our results, it is essential to understand some facts about the country. It covers almost 2 million square kilometers, with almost 130 million people. It is organized as a federation; comprising 31 states and Mexico City, its largest metropolis. It is a developing country, however, with great economic and social diversities between cities, towns and small municipalities spread throughout Mexico, and this is also applicable to health care.[6] The health care system consists of three main components: employment based social insurance schemes, public assistance services for the uninsured supported by a governmental financial protection scheme. Both give service for the majority of Mexican population; and a private sector composed of service providers for a privileged minority, in general, better equipped to provide specialized procedures, and overall higher quality care.[7,8] Both sectors differ in technical resources available among the different types of facilities; from the largest medical centers, to small clinics. We have national guidelines for clinical practice on numerous topics. The Mexican Federal Government published in 2008 guidelines for the management of inguinal and femoral hernias. They indicate that open repair of the inguinal hernia with prosthetic material is the treatment of choice, individualizing the surgical technique, since systematic reviews do not support the use of laparoscopy.[9] In contrast, the guidelines published by the European Hernia Society (EHS) gave the following recommendations: endoscopic inguinal hernia techniques result in a lower incidence of wound infection and hematoma formation, and an earlier return to normal activities or work than the Lichtenstein technique (level 1A).[10] The guide presented later in 2015, by the Mexican Hernia Association states that open and laparoscopic

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approaches offer similar advantages, although the latter has less hospital length of stay, pain, and faster recovery time.[11]

The analysis of the present study, shows that more than 90% of the calculated sample for the survey was obtained; and the contribution of surgeons from all over Mexico, gave us confidence that the results are representative and provide a good overview of the facts. We did not aim to record the national data regarding number of LIHRs, but to try to understand the reality of operating surgeons regarding this procedure. We realized that approximately half of our surgeons have mixed practice in both, public and private health systems; and the rest, work equally distributed in one or another sector. Only 11.82% of the responders work in large medical centers, almost 90% operate in general or regional hospitals (institutions with more complex technical resources), and 9.19% perform surgery in small clinics. The apparent inconsistency in the percentages, lies in the fact that surgeons may work in more than one type of institution.

The vast majority of responders were males, and 90% were in active surgical practice. Only 3.7% of responders were younger than 30 years-old, most of them were surgical residents. Almost half of the participants underwent their surgical residency in Mexico City, and another 22.8% were distributed in the four other better developed Mexican States. Only half of the responders admitted formal training in laparoscopy during their surgical residency, although many confirmed additional training; but this education varied greatly from short basic theoretical courses, to high specialty laparoscopic courses of more than one year duration.

Regarding LIHR during surgical training, 55.4% of the responders never performed the procedure as surgeon, 41.2% never played the role of assistant in this kind of surgery. For those who answered affirmatively, the number of procedures performed or assisted was low, in accordance with the status in other countries. Nazari et al., reported from a survey in which surgery residents from 19 European countries participated, that 59.2% of them had no experience on LIHR.[12] Our study showed that one fourth of the participants finished the residency before 1990, and therefore, they were not trained when modern laparoscopic surgery began. One fifth of them, finished the residency within the five years previous of the survey, so they were trained fully in laparoscopic era. These numbers must be compared with the number of open hernia repairs that trainees perform in other countries, a range of 600–2785 procedures per trainee in the United States as reported by Bell, or Thomas et al. who documented a range of 783–3764 procedures per trainee in the UK.[13,14] An outlying US study reported a mean of 113 hernia repairs per trainee.[15] Few young surgeons are currently learning LIHR, the procedures that they perform or assist are insufficient as in other countries.[16,17] In Mexico, this is probably a consequence that most of them performed their surgical residency in the public sector, where the volume of laparoscopic procedures is very low. From the data published by the National Information System of Health in Mexico, from almost 5 thousand inguinal hernias operated in the Public System in a year, only 0.5% were performed with laparoscopic approach.[18] From this information it is evident that most of the procedures are done in the private sector.

We started performing LIHR in Mexico in 1991, but we have not a widespread use of this approach compared to other countries. The particular cultural, socio-political and economic organizational model in each country affects the health system in different ways. In Africa, there are some nations where LIHR it is not practiced, as the greatest concern is that many deaths still occur frequently in remote rural communities due to the lack of adequate surgical care for inguinal hernia. From a survey about IHR among surgical trainees from all over Nigeria, that they did not perform LIHR, although 65% recommended the approach.[19,20] The cost, availability of meshes and laparoscopic equipment, as well as expertise, are the major factors limiting the utilization of this approach.

National registers provide an opportunity to gather better organized data to draw well-founded conclusions; like Sweden, where a voluntary hernia registrar has been in place since 1992. But it took them almost fifteen years to prospectively document 100% of all groin hernia operations in the Sweden Hernia Registry.[21] They informed in 2000, that about 70% of the surgical departments performed laparoscopic repair for inguinal hernia.[22,23] The Danish Hernia Database, claimed to be the only hernia database in the world to qualify as a genuine national registry. They report that LIHR has increased to include more than 50% of all groin hernias repairs.[24,25] In Germany, data of the National Office for Statistics Wiesbaden in 2019, indicated that nearly 67% of the in-hospital IHR's were performed laparo-endoscopically.[26] Or South Korean data, which registered between 2007 and 2015 a drastic percentage increase of LIHR, from 2.4% to 29.5%.[27]

Attempts to look at facts about LIHR based on a survey, have been undertaken in many countries as national registries are exceptional, but although valuable, they usually offer dissimilar and fragmented information on the topic. For example, a National survey in Australia, showed that surgeons who have less than 10 years post-fellowship, tend to do more open procedures compared older surgeons; and practitioners in public practice were more likely to do open repairs compared to surgeons in private practice. There are differences for diverse scenarios. Open and TEP procedures were equally common for primary unilateral hernia repairs 70%; while TEP were more common in primary bilateral repairs 85%, compared to open repairs 30%, which are the main approach for primary repair of large inguinal hernias 88%. Recurrent unilateral hernias that were originally repaired laparoscopically, are most commonly revised via an open procedure 95%, whereas recurrent unilateral hernias originally repaired via open procedures, were most commonly revised via TEP 84%.[28] In the United Kingdom, a survey directed to the members of the British Hernia Society in 2019, showed that 92% declared interest to do the majority of their elective hernia workload laparoscopically, but more than 50%, still perform open Lichtenstein procedures.[29] In Scotland, the survey aimed to all the patients who underwent IHR registered in the National Health System, found that only 4% of them were operated laparoscopically; and this group was significantly associated with more complications than open procedures. It is reasonable to assume that the marginal experience with the LIHR, was responsible for this result.[30] In Wales, only 15% of the surgeons who answered the mailed survey used a laparoscopic repair.[31] In 2015 Trevisonno et al., published the practice patterns of IHR from the administrative health care data of Quebec. From 49,657 inguinal hernias operated, laparoscopy was used in 8 % of the cases, but the patterns varied. They used LIHR in 28 % of bilateral hernias, 10% of recurrent hernias, 6% of unilateral hernias, and 4% of incarcerated hernias. 56 % of surgeons did not perform any laparoscopic repairs, and only 2% of surgeons performed more than 100 repairs.[32]

In the survey made by Moreno-Sanz in Spain in 2014, 64% of the surgeons have never used LIHR, 30% do it occasionally, and only 6% do it regularly.[33] Later, Martínez-Hoed et al. published in 2019 the results of their Spanish national survey. They found that use of laparoscopy in the respondent hospitals was scarce, and LIHR is still a matter of debate. Also, that the general surgeons' perception about it, is one of resistance. Most of the participants including surgical residents, did not believe that these repairs could become a standard

approach.[34]

Costa Rica which possesses a strong public health and social security system, and most of the IHRs are performed within this system, also undertook a national survey based of opinions directed to Costa Rican surgeons regarding IHR. The most common technique for IHR was Lichtenstein 64%, followed by TAPP or TEP 26%. Although 68% of responders do LIHR, their preferences vary significantly according to the case. 8% of the participating surgeons' hospitals, did not perform LIHR, and 62% of them performed very few cases. The remaining 18% indicated that less than half of their cases were done laparoscopically.[35] In 2018 the Hernia Surge Group published data about LIHR in some countries.[36] And recently, Bittner and Felix reported updated relative frequencies.[26]

If our survey, from 1080 responder surgeons, almost 40% perform routine or frequent laparoscopic inguinal repair, and more than 30% had never performed the procedure. This data contrast strongly with the answer of the same surgeons regarding laparoscopic cholecystectomy, 93.14% confirmed routine or frequent practice, and only 1.11% had never performed the procedure. But 40% of surgeons that never perform LIHR, wish to do so. The main reason for not performing it, is the lack of training.

As stated before, the volume of LIHR in public sector is extremely low, so it is very likely to assume that the surgeons who perform the procedures do it mainly in the private sector; but again, there are large disparities between centers. For example, from a study we conducted in our hospital, which is one of the most important private medical centers near Mexico City in 2016, to evaluate the frequency of LIHRs procedures, we found that 54.1% of the IHRs were open procedures; but currently, 95% are LIHRs. (Weber-Sánchez A. Hernioplastía laparoscópica en México. Lecture given at the XXV International Congress of Endoscopic Surgery. AMCE. Veracruz, México. May 04, 2016.) These findings could be potentially explained by the fact that patients around this sector, look for minimally invasive procedures because they are familiarized with their better results and advantages, so surgeons are forced by their preferences to perform them. Hence, there are significant differences among the diverse Mexican regions. Even in private practice, in many small clinics, hospitals in other cities or small towns, LIHR are much less frequently performed.

Hernia surgery is a difficult procedure to evaluate. There is not a perfect surgical approach for all the inguinal hernias, and the general management of IHR is not uniform among surgeons even in the same country. By the registries and national surveys available, it is clear that despite the increasing evidence in favor of LIHR, and taking into account that the number of procedures has increased worldwide during recent years, there has been a relatively slow adoption of laparoscopic techniques for hernia, compared with other minimally invasive surgeries.[37] In México, 92.42% of the surgeons responders were in current practice of laparoscopic surgery and more than 40% wish to learn the procedure. Therefore, there is a large demand to implement training for surgeons with special interest in LIHR, by means of clinical fellowships or hands-on courses to achieve adherence to guidelines and standardized technique with good results.[36,38] There is need to know accurate data on LIHR to design adequate policies. Standardized national surveys and registries are needed.[39,40]

Although, to our knowledge this is the largest survey conducted in Mexico that describes the tendencies of different issues regarding the Mexican practice of laparoscopic surgery, and one of the biggest in the world, there are limitations of this study that need to be considered. The survey was designed to understand the practice and different facts about laparoscopic surgery in Mexico, and not only of LIHR. Consequently, to keep the survey short and concise, many facts regarding LIHR are absent. That makes it difficult to draw robust conclusions, but gives a valuable overview of the Mexican surgeons' reality on the field. It is also worth mentioning that the participants in this survey could represent a possible bias, not being fully representative. Although surgeons nationwide responded the survey, probably the relative high percentage of LIHR is related to the fact that many of them work in big cities of developed states, visit the websites of surgical associations looking for periodical information, are the most well-trained surgeons in the country with interest in laparoscopic surgery, and therefore were willing to participate.

## Conclusions

This study provides a good overview about the reality of laparoscopic hernia repair in México as a result of the largest national survey about laparoscopic surgery in the country, although precise data about the practice of LIHR in Mexico are largely unknown. Our survey shows that laparoscopic inguinal hernia repair has had a very slow development in Mexico, as it has in other countries. The large diversity of surgical care conditions and training opportunities seems to be the most relevant factor. Larger national registry data are required for a better understanding and for better planning of training and availability for this minimally invasive procedure.

## Author contributions

AWS: Study conception and design, Data acquisition, analysis and interpretation of data and drafting of manuscript. DGM: Analysis, interpretation of data and critical revision. Authors read and approved the final manuscript.

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## Conflicts of interest

The authors declare no conflict of interest.

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## Informed consent

Informed consent was given by the participants when replying the questionnaire.

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