

Comparison of epidemiological, clinical and surgical characteristics of patients with and without recurrence of inguinal hernia after surgery of the Naval Medical Center

Comparación de las características epidemiológicas, clínicas y quirúrgicas de pacientes con y sin recidiva de hernias inguinales operados en el Centro Médico Naval

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Abstract

Background: Recurrent inguinal hernia is currently considered a complex hernia of the abdominal wall after it has been managed with a primary procedure, which represents a more technically challenging hernia. **Objective:** To determine the difference in epidemiological, clinical and surgical characteristics of patients with recurrent inguinal hernia and patients without recurrence. **Method:** Analytical cross-sectional study, in people over 18 years of age after surgery for inguinal hernia at the Naval Medical Center during the period from July 1, 2016 to June 30, 2019, integrating two study groups. **Results:** 106 patients were included, 29 surgeries for recurrence, predominance of men and older than 60 years. Differences were found between the group of surgery for recurrence and the group of primary surgery in surgical time in minutes, with medians of 115 (p25 75 and p75 154) and 72 (p25 58 and p75 110), respectively ($p = 0.001$); type of open approach, 62.1% and 88.3% ($p = 0.005$), and type of regional anesthesia, 48.3% and 75.3% ($p = 0.008$). Correlation between body mass index and size of the hernial defect was explored, obtaining r of -0.099 and $p = 0.652$, with a null correlation between them. **Conclusions:** With the findings obtained in this study, it is possible to hypothesize the behavior of the naval population which may differ from the general population and thus establish follow-up protocols to give magnitude to already known factors.

Keywords: Inguinal hernia. Recurrence. Clinical characteristics. Technical characteristics.

Resumen

Antecedentes: La hernia inguinal recidivante es considerada actualmente como una hernia compleja de la pared abdominal después de que se haya manejado con un procedimiento primario, lo que representa una hernia con un mayor desafío técnico. **Objetivo:** Determinar las diferencias en las características epidemiológicas, clínicas y quirúrgicas de pacientes con hernia inguinal recidivante y sin recidiva. **Método:** Estudio transversal analítico en mayores de 18 años operados por hernia inguinal en el Centro Médico Naval durante el periodo del 1 de julio de 2016 al 30 de junio de 2019, integrando dos grupos de estudio. **Resultados:** Se incluyeron 106 pacientes, 29 cirugías por recidiva, predominio de hombres y mayores de 60 años. Se encontraron diferencias entre el grupo de cirugía por recidiva y el grupo de cirugía primaria en tiempo quirúrgico, con medianas de 115 (p25 75 y p75 154) y 72 (p25 58 y p75 110) minutos, respectivamente ($p = 0.001$); tipo de abordaje, abierto 62.1% y 88.3% ($p = 0.005$); y tipo de anestesia, regional 48.3% y 75.3% ($p = 0.008$). Se exploró la correlación entre el índice de masa corporal y el tamaño del defecto herniario, obteniendo r de -0.099 y $p = 0.652$, con una correlación nula entre ambas.

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Conclusiones: Con los hallazgos obtenidos en este estudio es posible plantear hipótesis del comportamiento de la población naval que pueda diferir de la población general, y con esto establecer protocolos de seguimiento para dar magnitud a factores ya conocidos.

Palabras clave: Hernia inguinal. Recidiva. Características clínicas. Características técnicas.

Introduction

Every structure protruding through the myopectineal orifice or Fruchaud's and projects itself through the groin triangle (medial, lateral or femoral) is considered a inguinal hernia. An hernia is recurrent when a new protrusion appears where an hernia was previously operated¹⁻³.

The recurrence of inguinal hernias in the total of patients with this type of pathology at international level ranges from 11% up to 13%. From the total of plasties carried out in Mexico, it is reported that up to 25% are secondary surgeries for a recurrence in the inguinal hernias^{1,3,4}. The plasties opened with pressure (using tissue from the patient themselves) can be recurrent in up to 52%, but with the use of the prosthetic material the recurrence can be reduced in up to 11%⁵⁻⁷. In patients with recurrence after surgeries with pressure, 80% will appear in the first 5 years and the rest 15 years after primary surgery. With non-pressure techniques, the recurrences appear in 64% during the first year, 29% during the second, and 7% after 5 years³.

The recurrent hernia is currently considered as a complex hernia from the abdominal wall after being managed with a primary procedure placing a mesh patch, which represents a hernia with a greater technical challenge. Likewise, it is important to highlight that patients with scores from the American Society of Anesthesiologists (ASA) III/IV have a significant higher risk for developing recurrent hernias at the time of the surgery⁸.

There is literature³ that attributes the source of the recurrence of inguinal hernias to diverse factors:

- Defects in collagen metabolism in different levels and alterations in the quality of the tissues.
- Excessive pressure in the suture line.
- Repeated or continuous rises of the intra-abdominal pressure.
- Related diseases of the patient that can alter the healing process of tissues.
- Local factors of the surgical site, such as infections or excessive dissections.
- The surgeon's experience and the flaws in the surgical technique.

In a meta-analysis carried out in 2015, it was discovered that females (relative risk [RR]: 1.38; confidence interval of 95% [CI95%]: 1.28-1.48; $p < 0.001$), body mass index (BMI) of 25-30 kg/m² (RR: 1.19; CI95%: 1.0-1.4), the primary surgery of direct inguinal hernia (RR: 1.91; CI95%: 1.62-2.21), surgery of recurrent inguinal hernias (RR: 2.2; CI95%: 2.0-2.4; $p < 0.001$) and smoking (*odds ratio* [OR]: 2.53; CI95%: 1.43-4.47; $p = 0.001$) are risk factors for the recurrence of an inguinal hernia⁹.

In systematic revisions and cohort studies it is also established that a direct inguinal hernia in primary surgery is an essential risk factor for the recurrence (*hazard ratio*: 1.90; CI95%: 1.77-2.04; $p < 0.001$); similarly, the reoperation relative risk for recurrent of patients operated in less than 36 minutes was a 26% higher than patients with a surgery time over 66 minutes (RR: 1.26; CI95%: 1.11-1.43), and the complications of the laparoscopic repair of hernia significantly increased the risk of recurrence (OR: 7.86; CI95%: 3.46-17.85; $p < 0.05$)¹⁰⁻¹².

There are publications that establish an increased risk of recurrence in patients older than 50 years (OR: 9.92; CI95%: 1.29-76.35; $p = 0.008$), it is the same with patients with obesity, and with a difference in the prevalence of men, from 11.5% versus 6.7% in women. As for recurrent inguinal hernias (univariate OR: 3.38, $p = 0.011$; multivariate OR: 3.94, $p = 0.039$) and patients who smoke (univariate OR: 3.95, $p = 0.013$; multivariate: OR: 4.66, $p = 0.027$), higher recurrence rates were also obtained¹³.

The pertinence of this study lies in that it approaches one of the most common late complications in the treatment of inguinal hernias: its late recurrence to the surgical resolution. Although there are certain risk factors in other populations that can explain the presence of this condition, it is important to mention that its appearance in a more controlled and captive population, as the naval one, may be different, since there is less frequency for diverse characteristics that condition the recurrence.

It is intended to explore the main characteristics that may be related to the recurrence by comparing two study groups: one comprised of patients with recurrence and another without recurrence in the population

of the Naval Medical Center, to then give way to studies of a more causal and explicative power, as there is a sufficient level of evidence to analyze and quantify the predictive variables that identify differences regarding what was reported in other populations. The main objective of our study was to determine the difference of the epidemiological, clinical and surgical characteristics of the patients with recurrent inguinal hernia in comparison with the patients without recurrence presence in the general service of surgery of the Naval Medical Center, in 3 years.

Method

A search was conducted for surgical procedures carried out with the diagnosis of inguinal hernia in the record of the operating room of the Naval Medical Center during the period between the 1st of July of 2016 and the 30th of June of 2019, and the study included patients over the age of 18 operated by the general service of surgery with complete clinical record. The study was reviewed and approved by the Research Committee and the Research Ethics Committee of the Naval Medical Center. All the population was added dividing it in two groups (with and without recurrence), taking the totality of the identified sample for the group with recurrence and making the calculation of the sample size considering the estimated risk for patients older or younger than 50 years for the development of recurrence of the inguinal hernia according to the reference of Jungle et al.¹³, that establishes as OR of 9.92 and a CI95% of 1.29-76.35 (different calculations of the sample size were carried out considering different factors related to recurrence: BMI > 30 kg/m², smoking, direct inguinal hernia, size of the hernial defect > 3 cm, and the difference in proportions between the two groups reported in the literature, choosing the sample according to the feasibility of the sample found in the Naval Medical Center⁹⁻¹³), and forming the group without recurrence by means of simple randomization of those individuals through a table of random numbers. Afterwards, the collection of the study variables was performed in relation to the demographic, clinical, and technical characteristics of the studied population, adding the data base to conduct the statistical analysis and obtain the results.

The statistical analysis included an initial exploratory analysis of the demographic and clinical variables as frequency studies, measures of central tendency and dispersion. Arithmetic means and standard deviation

were used in the numerical variables, and percentages in the categorical variables. The distribution of the quantitative variables per study group was analyzed with the proposed sample size using the Shapiro-Wilk test. To determine the differences between both groups the test of χ^2 or Fisher's exact test were conducted, as appropriate. The difference between the numeric variables considered as risk factors (bleeding, surgical time, biochemicals, among others) was established with parametric distribution using the Student's t-test and the Mann-Whitney U test for non-parametrical variables. For the exploration of bivariate correlations, continuous quantitative variables were taken into account comparing them with ordinal variables, for which the calculation of Spearman's rank correlation coefficient was used. In all cases, a value of $p < 0.05$ was considered as a significant statistical finding. The statistical analysis was conducted with SPSS® (Statistical Package for the Social Sciences) for Mac, version 23.

Results

Out of the 292 patients operated for an inguinal hernia in the Naval Medical Center from 2016 to 2019, 106 that met the inclusion criteria were included in the study protocol, from which 29 comprised the group with recurrence and 77 the group without recurrence. Out of the total of the included samples, the group with recurrence presented a frequency of men of 82.8% ($n = 24$) and the group without recurrence of the 84.4% ($n = 65$) ($p = 0.836$).

In the group with recurrence, a median age of 63 years (p_{25} : 46.5; p_{75} : 69.5) was identified, and in the group without recurrence it was of 61 years (p_{25} : 46.5; p_{75} : 72) ($p = 0.843$). Grouping the population older and younger than 50 years, it was discovered that the primary surgery patients > 50 had a frequency of 67.5% ($n = 52$), while the patients with surgery for recurrence were of 75.9% ($n = 22$) ($p = 0.405$).

According to the technique with or without pressure used in the repairs of complicated inguinal hernias, they were primary or with recurrence, only one patient where a technique with pressure for sepsis is described; the rest is described as a technique without pressure despite having a complicated hernia.

For the frequency of recurrence in the patients with surgery for recurrence of inguinal hernia were obtained two patients with three previous cases of recurrence were obtained, one with two previous cases, three with two recurrences, and the rest being the first manifested recurrence.

Table 1. Frequency of patients recovering during the period of time between primary surgery and recurrence surgery

Years	Percentage (n)	Accumulated percentage (n)
1	6.9 (2)	6.9 (2)
5	24.1 (7)	31 (9)
10	31 (9)	62 (18)
15	13.8 (4)	75.8 (22)
20	20.7 (6)	96.5 (28)
25	3.5 (1)	100 (29)

Table 2. Clinical characteristics of patients with inguinal hernia (n = 106)

	Relapse group (n = 29)	Group without recurrence (n = 77)	p
BMI (kg/m ²)	26.7 (24.4-30.4)	25.9 (23.9-28.9)	0.274
Diabetes mellitus, n (%)	2 (6.9)	13 (16.9)	0.229
EPOC, n (%)	1 (3.4)	2 (2.6)	1
Smoking, n (%)	15 (51.7)	34 (44.2)	0.486
Prostatism, n (%)	7 (24.1)	19 (24.7)	0.954
Albumin, g/dl*	4 (3.9-4.2)	3.9 (3.65-4.1)	0.306
Hemoglobin, g/dl	15.7 (13.9-16.1)	15.8 (14.7-16.4)	0.372

COLD: chronic obstructive lung disease; BMI: body mass index.

*Group with recurrence n = 11, group without recurrence n = 37.

The data is presented in frequencies for the qualitative variables and as medians and inter-cut range (p25-p75) for the non-parametric distribution estimates. The tests χ^2 or Fisher's exact and Mann-Whitney's U for the qualitative and quantitative variables, respectively, were carried out.

From the time period between the primary surgery and the recurrence surgery of the patients with recurrence of inguinal hernia the results in the table 1 were found.

In table 2, the clinical characteristics of the patients with inguinal hernia are detailed, according to the presence or absence of recurrence.

According to the examination conducted with the technical characteristics of the studied patients with or without recurrent inguinal hernia, the results shown in table 3 were obtained.

With these results it was determined that there was only a significant statistical difference in the variables of surgical time measured in minutes, type of approach, and type of anesthesia.

Continuous quantitative variables like the BMI and the size of the hernial defect were investigated, to

determine if there is a bivariate correlation between both of them, obtaining an r of -0.099 with a $p = 0.652$, establishing a null correlation between both variables.

Discussion

The available literature up until now regarding the related factors to the development of recurrence in the operated patients of inguinal hernia manifest the risk measurement, obtained from studies of high methodological power, like the meta-analysis and the systematic revisions of prospective cohorts and case studies and controls. These factors are focused on variables like the demographic, clinical, and technical characteristics described in this study.

Although there is published evidence of the known risks that may be used in the routine clinical practice, with the obtained findings in this study it is possible to hypothesize of the behavior of the naval population, which may differ from the general population, and with this, we can establish follow-up protocols to give magnitude to the already known factors.

A different prevalence of surgery for recurrence was observed in this investigation (10.3%) in comparison with what was reported in Mexico by Mayagoitia³ (up to 25%), which can be due to the possibility of only having considered the diagnosed and operated patients and not the diagnosed but not treated patients.

Regarding the clinical characteristics explored, according Burcharth et al.^{9,10} and Junge et al.¹³, it is established that age over 50 or 60 years is a factor related with a higher recurrent frequency; however, in the results of this research the age at the moment of the primary surgery and the surgery for recurrence was not different between both groups ($p = 0.843$), with very similar averages (61 and 63 years, respectively).

According to the gender, there is discrepancy in the literature, as authors like Burcharth et al.^{9,10} note that being female is a risk factor, whereas others, like Sondena et al.¹¹ and Junge et al.¹³, state that the risk factor is the male gender. In our study, no significant statistical difference appeared, but the male gender had a major prevalence, probably due to the size of the sample and the higher proportion of male staff in the naval population.

In the analysis of the important clinical characteristics, such as smoking, which represents a noteworthy risk factor in the literature^{9,10,13}, in contrast with the findings of the study, in which no significant statistical

Table 3. Technical characteristics of patients with inguinal hernia (n = 106)

	Relapse group (n = 29)	Group without recurrence (n = 77)	p
Size of hernia defect, cm			
Right*	2.8 (1.3-5.2)	2.5 (1.3-3)	0.133
Left†	3.5 (2-6.2)	1.8 (1.25-3)	0.262
Size of the hernia defect, n (%) ^g			
> 3 cm	4 (36.4)	14 (34.1)	0.891
< 3 cm	7 (63.6)	27 (65.9)	
Laterality, n (%)			
Right	11 (37.9)	27 (35.1)	0.372
Left	7 (24.1)	29 (37.7)	
Bilateral	11 (37.9)	21 (27.3)	
ASA classification, n (%) [‡]			
I	5 (19.2)	28 (37.3)	0.135
II	20 (76.9)	41 (54.7)	
III	1 (3.8)	6 (8)	
Anesthesia, n (%)			
Regional	14 (48.3)	58 (75.3)	0.008
General	15 (51.7)	19 (24.7)	
Bled, ml	10 (2.5-35)	10 (5-20)	0.71
Relationship with other hernias, n (%) [§]			0.438
No relationship	10 (58.8)	17 (40.5)	
Relationship with a hernia	6 (35.3)	21 (50)	
Relationship with hernias	1 (5.9)	4 (9.5)	
Complicated hernia, n (%)			
Uncomplicated	26 (89.7)	75 (97.4)	0.225
Incarcerated	1 (3.4)	1 (1.3)	
Strangled	2 (6.9)	1 (1.3)	
Type of hernia, n (%)			
Direct	13 (44.8)	35 (45.5)	0.987
Indirect	11 (37.9)	28 (36.4)	
Mixed	5 (17.2)	14 (18.2)	
Workload, n (%)			
0-3 kg	11 (57.9)	18 (45)	0.647
3-25 kg	6 (31.6)	16 (40)	
> 25 kg	2 (10.5)	6 (15)	
Surgical time, min	115 (75-154)	72 (58-110)	0.001
Type of approach, n%			
Open	18 (62.1)	68 (88.3)	0.005
Laparoscopic	8 (27.6)	8 (10.4)	
Robotic	3 (10.3)	1 (1.3)	

*Group with recurrence n = 17, group without recurrence n = 37

†Group with recurrence n = 17, group without recurrence n = 30

^gGroup with recurrence n = 11, group without recurrence n = 41[‡]Group with recurrence n = 26, group without recurrence n = 75[§]Group with recurrence n = 17, group without recurrence n = 42^{||}Group with recurrence n = 19, group without recurrence n = 40

The data is presented in frequencies for the qualitative variables and as medians and inter-cutting range (p25-p75) for the quantitative variables of non-parametric distribution.

The tests χ^2 or Fisher's exact and Mann-Whitney's U for the qualitative and quantitative variables, respectively, were carried out.

difference in the proportion of patients with and without recurrence of inguinal hernia was found. Since there is knowledge of the magnitude of this factor, it is possible

that this discrepancy may be due to the inclusion of a limited sample size and to the recollection way of this variable due to the retrospective nature of the study.

The BMI > 30 kg/m² was explored in both groups, hoping that, according to what is reported in the literature¹³, was a characteristic to distinguish patients with recurrent surgery; nonetheless, what was found in the results reflects that there isn't a significant statistical difference, which may be explained due to the high prevalence of obesity already known in our country, as well as to the insufficient sample size to establish this difference.

Taking into account the type of hernia, considering the direct hernia as the most frequent in reoperations of recurrent hernia^{9,11,12}, a significant statistical difference it wasn't obtained, by comparing it with the frequency of patients with unilateral primary surgery, probably due to the limited sample size that the study considers; however, the prevalence of direct hernia in the groups of this study was higher for this type of hernias.

Considering the size of the hernial defect bigger or smaller than 3 cm, in this research, a significant statistical difference between the patients with and without recurrence was not observed in comparison to the reports found in the literature, in which an hernial defect bigger than 3 cm is considered as a risk factor for recurrence of the inguinal hernia, so it is assumed that at the moment of the surgical interventions in this population there is no difference regarding the size of the hernial defect.

When it comes to the surgical approach, it was found that there was a significant statistical difference between the frequency of the open approach and of the laparoscopic one between both study groups, being in accordance with the findings reported by Niebuhr y Kockerling¹², due to the fact that there is more experience in less time and with less procedures conducted with the open technique in comparison with the laparoscopic technique.

The surgical time obtained in this study was different (p = 0.001) between both groups, as it is reported in the literature¹², this in relation to the anatomical variables caused by the healing due to the primary surgery of the recurrent hernias.

A significant difference was found between the study groups and the type of anesthesia (p = 0.008). The group with recurrent inguinal hernia had a higher general anesthesia prevalence, while the group without recurrence had it with regional anesthesia, this is because to establish the type of anesthesia the approximate surgical time according its complexity is considered; the surgeries for recurrent hernias involve amore thorough dissection and, hence, a higher surgical time.

Conclusions

There are significant statistical differences in the variables type of anesthesia, surgical time, and type of approach between the patients with recurrence and the patients with primary surgery.

The group of patients with surgery for recurrence had a higher frequency of general anesthesia, while the patients with primary surgery had a higher prevalence with the regional anesthesia, because it is considered by the anesthesiologist that the approximate time of surgery is higher according to its complexity, as well as the higher possibility of transoperative complications for scarring fibrosis and the answer to a foreign object (mesh); the previous involves a more thorough dissection and thus, a higher surgical time.

The surgical time in surgeries for recurrence was higher than the surgical time in the patients with primary surgery, regarding the anatomical variables formed by the healing of the primary surgery of recurrent hernias due to fibrosis and the answer to a foreign object of prosthetic material.

In the type of approach, the higher prevalence was established by open approach in both groups of patients, because the surgeons of our hospital have more experience and, for the same reason, they mostly prefer the open approach, conducting with less frequency laparoscopic approaches.

The predominant gender in this study was the male one, attributed to the higher proportion of this gender in the naval population. Likewise, the prevalence of patients operated both with primary surgery and with surgery for recurrence was of the age group > 60 years.

In the exploration of the BMI and size of the hernial defect variables, a positive correlation between both was not established.

Within the explored characteristics in this study no differences were found in the naval population regarding the reports in the literature in the general population, which evidences that there is no sufficient distinction that requires a different diagnostic or therapeutic approach in the management of our patients.

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Ethical disclosures

Protection of people and animals. The authors declare that no experiments were carried out on humans or animals for this research.

Data confidentiality. The authors declare that they have followed their center's protocols on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the corresponding author.

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