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Simulation in open surgery

La simulación en cirugía abierta

Abilene Cirenia Escamilla-Ortiz,* Josefina Serrano-Pérez‡

The increase in minimally invasive procedures has greatly diminished surgical specialty residents' training to perform open surgery. This deficit impacts patient care, especially surgical services, care, and training.[1]

Traditional general surgery training has changed in the last decade. These changes include fewer hours per week in surgical training, the opening of more subspecialty slots, few exchange or fellowship programs, increased organizational efficiency in the operating room, and increased complexity of cases needing interdisciplinary treatments.[1]

In 2013, an increase of 20 to 1,000% in endovascular or percutaneous procedures was reported, while open gastrointestinal or vascular procedures decreased by 30 to 70%. This increase is also in trauma centers where many cases are managed non-surgically.[1]

The increasing complexity of the cases seen in surgical centers does not allow the teaching of the primary surgical skills necessary for the surgeon of any specialty. Cadaveric and animal models have been used to train these skills. With the inclusion of technology in the training of residents, virtual and augmented reality software and haptic movements are used. Training personnel should evaluate and supervise simulation teaching strategies for surgical skills training. In addition, acquiring appropriate simulators for complex case scenarios for training open surgical procedures should be evaluated.[1]

The skills necessary for open surgical procedures are essential in a resident in training and should be developed before starting technical procedures in laparoscopic surgery. More quality research should be done on the benefits of simulation in open surgery, and this should stimulate the development of simulators with more accurate and objective evaluation tools.[2]

Simulators are implemented for patient safety, allowing practice in a safe environment and objective evaluation of the development of these skills.

The selection of models for simulation in open surgery is limited, but some simulators are used for open surgery; examples are the open lobectomy bench model and silicone tubing for anastomosis (BOPT). Another model is the Virtual Reality Educational Surgical Tool (VREST)-Virtula Lichtenstein Trainer, used for inguinal hernia repair.[2]

The development of new simulators is critical. Imperial College London is developing a simulator for inguinal hernia repair using the Lichtenstein technique.[2] Limb and Things UK/USA and Pharmacobiotics Ltd are the manufacturers of surgical training simulators such as suture pads, venipuncture simulators, injections, central venous catheter placement, benign lesion simulators, and others, but research is still needed to validate the models and investigate their benefit.[2]

Simulation in open surgery has promising results, although there are few studies in the literature with its limitations. There is much to be done, especially research on the benefits of simulation in open surgery and the acquisition of skills and then see the effect on procedures performed in the operating room by residents;

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this should make us achieve standardization in simulation.[2]

It is important to reiterate that skills in open surgery should be a prerequisite for acquiring skills in laparoscopic surgery and that simulation centers can include open surgery simulators, taking into account costs, monitoring, check listing, feedback, etcetera. Doing so will increase resident competencies, patient safety, and fewer hours in the operating room.[2]

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Factors associated with true vesicular polyps in patients with polypoid lesions

Factores asociados a la presencia de pólipos vesiculares verdaderos en pacientes con lesiones polipoides

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Keywords:
gallbladder polyps, gallbladder, risk factors, polypoid lesion, adenocarcinoma.

Palabras clave:
pólipos vesiculares, vesícula biliar, factores de riesgo, lesión polipoide, adenocarcinoma.

ABSTRACT

Introduction: gallbladder pseudo polyps are considered benign lesions, while true polyps are related to the gallbladder's adenoma-adenocarcinoma sequence. **Objective:** to determine if there are sociodemographic or clinical risk factors related to the presence of true gallbladder polyps in patients with polypoid lesions submitted to cholecystectomy in a Third Level Hospital in Mexico City. **Material and methods:** a descriptive observational study was performed, with 48 patients with vesicular polypoid lesions detected in the histopathological reports of patients undergoing cholecystectomy between January 2015 and December 2019. **Results:** 13 patients were diagnosed with true polyps (27.1%) and 35 (72.9%) with pseudo polyps. The presence of type 2 diabetes mellitus (DM2) conferred an association with an OR = 2.349 (95% CI 1.042-5.294, p = 0.038), as well as overweight, with an OR = 5.727 (95% CI 1.457-22.512, p = 0.019) for the presence of a true polyp. **Conclusions:** type 2 diabetes and being overweight confer a higher risk of a polypoid lesion being a true polyp; these factors should be considered for management decisions since true polyps confer malignant potential.

RESUMEN

Introducción: *los pseudopólipos de vesícula biliar se consideran lesiones benignas, mientras que los pólipos verdaderos se relacionan con la secuencia adenoma-adenocarcinoma de vesícula biliar.* ***Objetivo:*** *determinar si existen factores de riesgo sociodemográficos o clínicos relacionados con la presencia de pólipos vesiculares verdaderos en pacientes con lesiones polipoides sometidos a colecistectomía en un Hospital del Tercer Nivel de la Ciudad de México.* ***Material y métodos:*** *se realizó un estudio observacional descriptivo, con un total de 48 pacientes con lesiones polipoides vesiculares detectadas en los reportes histopatológicos de pacientes sometidos a colecistectomía en el periodo comprendido entre enero de 2015 y diciembre de 2019.* ***Resultados:*** *13 pacientes contaron con diagnóstico de pólipo verdadero (27.1%) y 35 (72.9%) de pseudopólipo. La presencia de diabetes mellitus tipo 2 (DM2) confirió una asociación con OR = 2.349 (IC 95% 1.042-5.294, p = 0.038), así como sobrepeso, con un OR = 5.727 (IC 95% 1.457-22.512, p = 0.019) para la presencia de pólipo verdadero.* ***Conclusiones:*** *la presencia de diabetes tipo 2 y sobrepeso confiere un riesgo mayor de que la lesión polipoide sea un pólipo verdadero; se deben tener en cuenta estos factores para la toma de decisiones en su manejo, ya que los pólipos verdaderos confieren potencial maligno.*

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INTRODUCTION

Vesicular polyps are elevations in the gallbladder mucosa that project into the lumen.[1] These polypoid lesions are found in 4-6% of healthy adults.[2] In some series, a prevalence of up to 9.5% has been found.[3] They are usually asymptomatic, and most are detected incidentally by an abdominal ultrasound performed for another cause or when performing the histopathological study after cholecystectomy.[2,4] Their incidence is increasing due to the increased use of abdominal imaging techniques,[4] reaching a prevalence of 7% of all abdominal ultrasounds.[5]

Vesicular polyps are classified into pseudo polyps and true polyps. Pseudo polyps can be adenomyomas, inflammatory or hyperplastic polyps, and benign lesions.[4] True polyps are further classified as benign (adenomas), premalignant (dysplastic polyps), and malignant (adenocarcinoma).[5] On ultrasound, a polyp is seen as an elevation of the gallbladder wall protruding into the lumen.[1] In terms of prevalence, pseudo polyps are more common than true polyps.[6,7]

Benign gallbladder disease usually presents with localized intraluminal lesions, which include lithos, cholesterol polyps, and adenomas. Polyp size, wall thickness, and contrast uptake can differentiate cholesterol polyps from gallbladder cancer.[8] Evidence suggests that some malignant gallbladder neoplasms originate from preexisting adenomas.[9] Gallbladder adenocarcinoma is rare, and its incidence varies among ethnic groups: in Caucasians, it is 1.5/100,000, while in high-risk groups such as the Indian or Indian population, it rises to 27/100,000.[10] When the adenocarcinoma is in stage III, the five-year survival is 25%, while for stage I the five-year survival is 100%.[11] Early-stage gallbladder adenocarcinoma could be detected as a polyp by imaging studies. Some series have shown that the prevalence of malignancy in gallbladder polyps is up to 27%.[12] Since gallbladder polyps are common, but gallbladder cancer is rare, it is a diagnostic challenge to determine which polyps are likely to undergo malignant transformation and require cholecystectomy.[6]

Physicians' leading problem is more homogeneity in decision-making about which approach to take when identifying a gallbladder polyp.[13] In 2016, a consensus was reached among various international medical societies, where it was concluded that in the case of finding multiple polyps, a giant polyp would be used to decide on management. An algorithm was created that indicated performing cholecystectomy for polyps 10 mm or larger.[6] A study by Bhatt et al. identified that the probability of malignancy is about the size of the polyp. Polyps with diameters smaller than 4.15 mm have a 0% risk of malignancy, so that they may be followed up ultrasonographically.[14] They also observed other risk factors for malignancy that include: the presence of a single polyp (malignancy risk of 4.3%), presence of a sessile polyp (13.9% malignancy risk), patient age > 50 years (20.7% malignancy risk) and a single sessile polyp (24.8% malignancy risk)[14] According to Wiles and his team, risk factors for malignancy are: age > 50 years, primary sclerosing cholangitis (PSC), Indian ethnicity or the presence of sessile polyps.[6] Cha and colleagues observed that age > 65 years, diabetes, and a polyp larger than 15 mm are predictive variables for malignancy with odds ratios of 2.27, 2.64, and 4.94, respectively.[15]

The American Association for the Study of Liver Diseases recommends cholecystectomy for patients with PSC presenting a polypoid lesion.[16,17] Another risk factor is the thickening of the gallbladder wall; Zhu and collaborators observed that a wall larger than 4 mm is an independent variable for cancer.[18] In patients with gallbladder polyps between 6 and 9 mm in size without risk factors for gallbladder cancer, ultrasonographic follow-up is recommended at six months, one year, and five years. Patients who do not present risk factors and have polypoid lesions smaller than 5 mm can be managed with a more spaced follow-up, and a polypoid lesion larger than 2 mm is an indication for surgery.[6,19] Kwon and his team conducted a study with 291 cases of vesicular polyps. They found that the group with cancerous lesions had single lesions (65.7 versus 44.1%), advanced age, and sessile polyps and were accompanied by symptoms (69.2 versus 28.9%).[20]

The main objective of this study was to determine if there are sociodemographic or clinical risk factors related to the presence of true vesicular polyps in patients with polypoid lesions who underwent cholecystectomy in a tertiary-level hospital in Mexico City. The secondary objectives were to evaluate the prevalence of adenomatous (true) polyps among patients with polypoid lesions and compare preoperative ultrasonographic findings with anatomopathological findings in patients with polypoid lesions undergoing cholecystectomy.

MATERIAL AND METHODS

A descriptive observational study identified 53 patients with vesicular polypoid lesions detected in the histopathological reports of patients undergoing cholecystectomy between January 2015 and December 2019 at Hospital Médica Sur. A review of clinical records was performed, looking for sociodemographic, clinical, laboratory, and pre-surgical ultrasound characteristics. Five patients were eliminated by applying exclusion criteria, one for being younger than 18 years old and the rest for having incomplete records, obtaining 48 patients for analysis. The patients were categorized into two groups according to the presence of a true polyp or pseudo polyp. True polyps included pyloric and tubular adenomas, while pseudo polyps included cholesterol polyps and adenomyomas. The histological type of the polyp (true or pseudo polyp) was the dependent variable. SPSS (Statistical Package for the Social Sciences) v. 25.0 software was used for statistical analysis. Student's t was used for numerical variables, and only one variable was the nonparametric Mann-Whitney U test (direct bilirubin). Pearson's χ^2 was calculated with a Yates continuity correction as it was a 2×2 table; Fisher's exact test was used for having a frequency less than 5 in the cross-tables. A concordance analysis was performed using a kappa index to compare variables. All data were represented as proportions in percentages and measures of dispersion with SD (standard deviation). All values with a $p < 0.05$ were considered significant. This protocol was approved by the Hospital Médica Sur Ethics Committee and carried out per the General Health Law on Health Research provisions.

RESULTS

Population: demographic and clinical characteristics are listed in *Tables 1 and 2*. The mean age was 47.78 years (± 16.53). Thirty-five patients (72.9%) were female, and 13 (27.1%) were male. The mean height was 1.63 m (± 0.87), and the mean weight was 69.44 (± 12.52). A mean body mass index (BMI) of 25.66 (± 5.34) was identified. Nineteen patients were identified as overweight (39.6%) and seven as obese (14.6%). Regarding comorbidities, 18 patients (37.5%) had a history of smoking, eight (16.7%) with systemic arterial hypertension, six (12.5%) with diabetes mellitus (DM), and 22 patients (45.8%) showed a risk factor related to gallbladder cancer. Of the patients, 14.6% showed preoperative symptomatology, such as right hypochondrium pain. Preoperative liver function tests were analyzed, finding a mean total bilirubin of 1.28 (± 2.4), mean direct bilirubin of 0.59 (± 2.09), and indirect bilirubin of 0.69 (± 0.5). By ultrasound findings, seven patients (14.6%) had thickening of the gallbladder wall, and 25 (52.1%) had gallbladder lithiasis. In 25 patients (52.1%), there was the detection of polypoid lesions, of which 12 (25%) had a polyp of 6-9 mm and 13 (27.1%) had a polyp smaller than 6 mm. In 11 patients (22.9%), multiple polyps were detected.

Histopathological analysis: thickening of the gallbladder wall was detected in eight patients (16.7%), gallbladder lithiasis in 17 (35.4%), and the presence of cholesterosis in 21 (43.8%). There were 25 patients (52.1%) with multiple polyps and 23 with single polyps (47.9%). In the total sample (48 patients), the diagnosis of polypoid lesion was confirmed by histopathological analysis; of these, 13 corresponded to a true polyp (27.1%) and 35 (72.9%) to a pseudo polyp.

Comparison of true polyps versus pseudo polyps: gender, BMI, age, obesity, hypertension, smoking, and symptoms showed no difference between the two groups *(Table 3)*. The presence of DM2 conferred an association with an OR = 2.349 (95% CI 1.042-5.294, p = 0.038) and

Table 1: Numerical variables represented by mean and standard deviation as measures of dispersion. N = 48.

Numerical variables	
Age	47.7885 ± 16.53794
Height	1.6322 ± 0.08764
Weight	69.44 ± 12.52
Body mass index	25.6605 ± 5.34660
Total bilirubin	1.2808 ± 2.48852
Direct bilirubin	0.5906 ± 2.09544
Indirect bilirubin	0.6946 ± 0.50272
Aspartate aminotransferase	41.1000 ± 70.27232
Alanine aminotransferase	57.9700 ± 181.29430
AP	80.7542 ± 73.30147
Gamma-glutamyl transferase	55.44 ± 144.58
Lactate dehydrogenase	154.76 ± 48.734

AP = alkaline phosphatase.

Table 2: Qualitative variables. Frequencies and proportions. N = 48.

Qualitative variables	n (%)
Female gender	35 (72.9)
Overweight	19 (39.6)
Obesity	7 (14.6)
Type 2 diabetes	6 (12.5)
Hypertension	8 (16.7)
Smoking	18 (37.5)
Presence of symptoms	7 (14.6)
Presence of cancer risk factors	22 (45.8)
Ultrasound parameters	
Wall thickening	7 (14.6)
Vesicular lithiasis	25 (52.1)
Presence of polypoid lesion	25 (52.1)
Polyps 6-9 mm	12 (25.0)
Polyps < 6 mm	13 (27.1)
Multiple polyps	11 (22.9)
Pathology parameters	
Wall thickening	8 (16.7)
Vesicular lithiasis	17 (35.4)
Multiple polyps	25 (52.1)
Single polyp	23 (47.9)
True polyp	13 (27.1)
Pseudo polyp	35 (72.9)
Cholesterolosis	21 (43.8)

overweight with an OR = 5.727 (95% CI 1.457-22.512, p= 0.019) for the presence of a true polyp. No significant difference was observed between the two groups in any parameter of the liver function tests or ultrasound *(Tables 4 and 5)*. When comparing the pre-surgical ultrasound variables with the pathology report, concordance was only observed with the presence of gallstones, with a Kappa index of 0.43 (p = 0.0015) *(Table 6)*.

DISCUSSION

Gallbladder polyps are common lesions; an incidence of these lesions has been reported from 0.3 to 12% of the population. They should not be overlooked because of their association with the development of gallbladder cancer.[15] A higher frequency of gallbladder polyps has been observed in women than men. In agreement with this, of the polyps detected in our study, it was observed that most cases corresponded to women (72.9%).[21] The presence of polyps increases with age and tends to be detected more frequently in patients between 40 and 50. In our sample, the mean age was within this range.[3] Several studies have shown the association between different risk factors and the presence of vesicular polyps. Among the known risk factors, the following stand out: female gender, overweight, obesity, and metabolic syndrome. Our study observed a prevalence of 39.6% for overweight, 14.6% for obesity, and 12.5% for type 2 diabetes (T2D).[22] The study of choice for diagnosing vesicular polypoid lesions is ultrasound. A meta-analysis performed by Cochrane, which included 16 clinical studies, identified that the sensitivity and specificity of transabdominal ultrasound for the detection of polyps is 0.84 (95% CI 0.59-0.95) and 0.96 (95% CI 0.92-0.98), respectively. In our study, preoperative ultrasound only detected vesicular polypoid lesions in 52.08% of cases (25/48).[23,24]

Vesicular polyps are classified into pseudo polyps and true polyps. The former corresponds to cholesterol polyps, adenomatous polyps, or adenomyomas, considered benign lesions. True polyps correspond to adenomas associated with the risk of malignant progression. In a study by Sarkut et al., 99 cases of vesicular polyps were detected by histopathological study, of which

77 (77.7%) corresponded to pseudopolyps and 22 to true polyps. In our study group, of the 48 cases of polypoid lesions, 35 (72.9%) corresponded to pseudopolyps.[4] True polyps are known to be related to the adenoma-adenocarcinoma sequence for gallbladder cancer.[8] Although there is still controversy in the management of polypoid lesions, guidelines have been created to standardize their management, which is based on the size of the polyp and the presence of risk factors for cancer.[6] The guidelines recommend cholecystectomy for 10 mm or more significant polyps and ultrasonographic follow-up for those smaller than 6 mm. For polyps between 10 and 6 mm in size, surgery is recommended when the following risk factors for gallbladder cancer are present: age over 50 years, history of primary sclerosing cholangitis, Indian or Chilean population, and the presence of sessile polyps. In our study, 22 patients (45.8%) had only one risk factor, corresponding to age over 50; we did not detect patients with the other risk factors mentioned.[6] When dividing the study population into those with true gallbladder polyps and those with pseudo polyps, we found no statistical difference in the following variables: gender, BMI, age, obesity, smoking, clinical, nor in the variables of liver function tests or preoperative ultrasound. Only overweight (BMI 25-29.9 kg/m^2) and T2D were related to the presence of true polyps with a significant difference.

In a retrospective observational study conducted by Lee et al., it was observed that T2D is an independent risk factor related to the development of true vesicular polyps with a statistically significant measure of association (OR 2.942, 95% CI 1.061 to 8.158, p = 0.038), which supports our results.[25] Our study proves the association of being overweight with the development of true vesicular polyps, a precursor lesion of malignant neoplasia.[9] Adipose tissue is a highly dynamic endocrine organ that constitutes a central piece in the adiponectin network, which causes pleiotropic effects in the organism, including inflammation. In addition, neoplasms of the gastrointestinal tract grow anatomically close to adipose tissue.[26] These findings support the importance of detecting risk factors associated with developing true gallbladder polyps, representing the pathological basis for developing gallbladder cancer. Being overweight and having T2D

Table 3: Statistical analysis of categorical and numerical variables and their association with the development of true polyps.

Polyp vs. pseudo polyp	p	OR (95% CI)
Gender	0.300	0.364 (0.70-1.888)
Type 2 diabetes	0.038	2.349 (1.042-5.294)
Body mass index	0.140	Not applicable
Age	0.286	Not applicable
Obesity	0.662	0.381 (0.42-3.431)
Overweight	0.019	5.727 (1.457-22.512)
Hypertension	0.674	1.650 (0.348-7.821)
Smoking	0.618	1.714 (0.478-6.151)
Compatible clinical manifestations	0.420	0.435 (0.100-1.888)

OR = *odds ratio*. 95% CI = 95% confidence interval.

Table 4: Analysis of laboratory values between polyps and pseudopolyps.

	Levene's test for variance equality				
Variable	**F**	**Sig.**	**t**	**GL**	**p**
Total bilirubin	8.757	0.005	1.489	50	0.143
			0.882	12.276	0.395
Indirect bilirubin	1.288	0.262	1.219	50	0.229
	–	–	0.920	14.494	0.373
Aspartate aminotransferase	0.051	0.823	0.070	50	0.944
	–	–	0.095	41.227	0.925
Alanine aminotransferase	0.506	0.480	-0.327	50	0.745
	–	–	-0.530	47.867	0.599
Alkaline phosphatase	0.131	0.719	-0.121	50	0.904
	–	–	-0.114	18.779	0.911
Gamma glutamyl-transpeptidase	2.963	0.091	0.979	50	0.332
	–	–	0.710	14.012	0.489
Lactate dehydrogenase	0.049	0.826	-0.762	37	0.451
	–	–	-0.921	14.746	0.372
	U-value				
Direct bilirubin	-0.625*				0.532

* U value = to nonparametric Mann-Whitney U test.

Table 5: Association of ultrasound features with the finding of true polyps.

True polyp vs. pseudo polyp	Value	Degrees of freedom	p	OR
Thickened wall	–	1	0.203	3.022 (0.670-13.628)
Multiple polyps	–	1	0.703	1.833 (0.340-9.886)
Polypoid lesion	0.103	1	0.749	0.814 (0.231-2.866)
Lithiasis	–	1	0.523	1.867 (0.518-6.731)

OR = *odds ratio.*

as risk factors associated with developing true gallbladder polyps is a finding consistent with previous retrospective observational studies. According to Ali and colleagues, the prevalence of gallbladder polyps is significantly higher in patients with overweight, T2D, and hypertension.[27] Although hypertension was not statistically significant in our sample, there is biological plausibility to suggest that the metabolic syndrome represents a risk for the development of true gallbladder polyps. Regarding ultrasound as a diagnostic method, we found that there is a significant concordance of ultrasound for the detection of gallbladder stones, with a K-index = 0.43, with a significant p value, but not for the detection of polypoid lesions, wall thickening, or multiple polyps.

Table 6: Analysis of concordance by Kappa index for comparison of histopathology results and gallbladder and biliary tract ultrasound.

Pathology vs. ultrasound concordance analysis	Kappa	p
Presence of polypoid lesions	-0.061	0.612
Wall thickening	-0.026	0.512
Presence of multiple polyps	0.097	0.394
Presence of vesicular lithiasis	0.432	0.0015

CONCLUSIONS

This study demonstrates that the presence of T2D and overweight confer a higher risk of the polypoid lesion being a true polyp, with an odds ratio of 2.34 and 5.72, respectively. These factors should be considered when making management decisions because as they are more associated with true polyps, there is a greater risk of malignant potential. One of the study's secondary objectives was to identify true vesicular polyps (adenomas) prevalence. Our study found a prevalence of 27.08% of these lesions within the total of vesicular polypoid lesions. There are few studies on vesicular polyps in the Mexican population, and of these, most of them analyze their frequency and associations based on polyps detected by ultrasonography.

Our study performed a retrospective analysis based on cases detected by pathology (gold standard) and observed that ultrasound is unreliable for detecting these polyps. Among the limitations of our research, we found that it is a retrospective study, so it does not allow us to determine the incidence of the disease. Another limitation is that it involves a moderate number of patients and is limited to a single center, so similar investigations with larger and multicenter samples will be required to confirm the associations we detected.

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Drainage of pancreatic pseudocysts: endoscopic vs. surgical, a meta-analysis. Is it time for hybridization?

Drenaje de los pseudoquistes pancreáticos: endoscópico vs quirúrgico metaanálisis. ¿Es momento de la hibridación?

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Keywords: pancreatic pseudocysts, cystogastrostomy, laparoscopic drainage.

Palabras clave: *pseudoquistes pancreáticos, cistogastrostomía, drenaje laparoscópico.*

ABSTRACT

Introduction: pancreatic pseudocysts are peripancreatic collections of non-epithelial capsules that, in case of not presenting a spontaneous resolution, need intervention and drainage; different surgical and endoscopic techniques have shown similar efficacy. However, there is no definitive management algorithm since the available evidence is heterogeneous. **Objective:** to compare endoscopic with surgical drainage for treating pancreatic pseudocysts by evaluating the prognostic variables in the existing evidence that directly compares both techniques. **Material and methods:** a systematized search was performed in MedLine databases via PubMed, SCOPUS, LILACS, TRIP DATABASE and by using metadata search and cross-referencing in REFSEEK and CROSSREF of controlled clinical trials and cohort studies over ten years comparing surgical versus endoscopic techniques. Two independent investigators analyzed and compared the information, which a moderator separately audited. A systematic review and meta-analysis were performed. **Results:** six studies were taken to the qualitative and quantitative analysis, with a total of 347 patients, 187 with endoscopic management and 160 with surgical management; therapeutic success was obtained in 95.1% (from 91.1 to 97.7%) of the patients treated with surgery and 87.8% (from 82.2 to 92.1%) of the patients with endoscopy with an OR of 2.41 (95% CI 1.08 to 5.38) in favor of surgical management with statistical significance (p = 0.03) (heterogeneity I^2 0.0%. p = 0.86); 18.3% (from 13.1 to 24.5%) in the surgical group had adverse events, while in only 15.1% (from 10.3 to 21.1) of those treated with endoscopy, there were adverse events, with an OR of 0.90 (95% CI 0.51 to 1.58) (heterogeneity test I^2 12% p = 0.34) no statistically significant difference was found (p = 0.70); 6.07% of those treated with

RESUMEN

Introducción: *los pseudoquistes pancreáticos son colecciones peripancreáticas de cápsula no epitelial que en caso de no presentar resolución espontánea, necesitan intervención y drenaje, diferentes técnicas quirúrgicas y endoscópicas han mostrado eficacia similar; sin embargo, no existe un algoritmo de manejo definitivo, ya que la evidencia disponible es heterogénea.* ***Objetivo:*** *comparar el drenaje endoscópico con el quirúrgico para el tratamiento de los pseudoquistes pancreáticos mediante la evaluación de las variables pronósticas contenidas en la evidencia existente que compara directamente ambas técnicas.* ***Material y métodos:*** *se realizó una búsqueda sistematizada en las bases de datos de MedLine Vía PubMed, SCOPUS, LILACS, TRIP DATABASE y mediante el empleo de búsqueda de metadatos y referencias cruzadas en REFSEEK y CROSSREF, de ensayos clínicos controlados y estudios de cohorte en un periodo de 10 años que comparan técnicas quirúrgicas versus endoscópicas, dos investigadores independientes analizaron y compararon la información, la cual fue auditada por separado por un moderador. Se realizó revisión sistemática y metaanálisis.* ***Resultados:*** *seis estudios fueron llevados al análisis cualitativo y cuantitativo, con un total de 347 pacientes, 187 con manejo endoscópico y 160 con manejo quirúrgico, se obtuvo éxito terapéutico en 95.1% (de 91.1 a 97.7) de los pacientes tratados con cirugía y 87.8% (de 82.2 a 92.1) de los pacientes con endoscopia con un OR de 2.41 (IC 95% 1.08 a 5.38) en favor del manejo quirúrgico con significancia estadística (p = 0.03) (heterogeneidad I^2 0.0% p = 0.86); 18.3% (de 13.1 a 24.5) en el grupo quirúrgico presentaron eventos adversos, mientras que en sólo 15.1% (de 10.3 a 21.1) de los tratados con endoscopia sí los hubo, con un OR de 0.90 (IC 95% de 0.51 a 1.58) (test de heterogeneidad I^2*

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endoscopy had adverse events, with an OR of 0.90 (95% CI 0.51 to 1.58).70); 6.07% of the cases in the surgery group showed recurrence, 8.12% showed this characteristic in the endoscopy group with an OR of 1.54 (95% CI from 0.48 to 4.98) and a heterogeneity I^2 29% p = 0.24, without statistical significance (p = 0.47). **Conclusion:** surgical techniques are slightly superior to endoscopic techniques in terms of therapeutic success. No statistically significant difference was found in recurrence and adverse events. The arrival of emerging techniques such as Hybrid NOTES and luminal apposition stents present characteristics that promise to solve the problems currently faced by both techniques. However, it is still necessary to carry out studies focusing on risk stratification based on anatomical variables, probability of recurrence, and complications to determine which patient is a candidate for each procedure.

12% p = 0.34) no se encontró diferencia estadísticamente significativa (p = 0.70); 6.07% de los casos en el grupo de cirugía mostraron recurrencia, 8.12% evidenciaron esta característica en el grupo con endoscopia con un OR de 1.54 (IC 95% de 0.48 a 4.98) y una heterogeneidad I^2 29% p = 0.24, sin significancia estadística (p = 0.47). ***Conclusión:*** *las técnicas quirúrgicas son ligeramente superiores a las endoscópicas en términos de éxito terapéutico, no se encontró diferencia estadísticamente significativa en la recurrencia y eventos adversos. La llegada de técnicas emergentes como Hybrid NOTES y los stent de aposición luminal presentan características que prometen resolver los problemas que enfrentan actualmente ambas técnicas. Sin embargo, sigue siendo necesario realizar estudios con enfoque en la estratificación de riesgo basado en variables anatómicas, probabilidad de recurrencia y complicaciones que permitan determinar qué paciente es candidato a cada procedimiento.*

INTRODUCTION

The 2013 Atlanta review defines pancreatic pseudocysts (PP) as encapsulated fluid collections with a well-demarcated non-epithelial fibrous tissue wall outside the pancreas with minimal necrosis, which occurs more than four weeks after the onset of edematous pancreatitis. It manifests during the late phase of the acute episode of moderate to severe pancreatitis.[1] It is the most common cystic lesion of the pancreas, seen in 75-85%.[2] Its pathogenesis is still controversial; however, it is accepted that disruption of the pancreatic duct (PD) allows extra ductal collection of chyme, which is subsequently blocked by detritus, protein plugs, calculi, and inflammatory tissue. Its occurrence has been reported to be related to acute (AP) and chronic pancreatitis, abdominal trauma, or during surgical procedures, being more common in alcoholic pancreatitis.[2] It occurs with an incidence of 1.6-4.5% per year per 100,000 adults, with a prevalence of 10 to 26% of AP, 20 to 40% of chronic pancreatitis (CP), 6 to 15% in idiopathic pancreatitis and 6 to 8% in biliary pancreatitis.[3] It is estimated that 37% of AP cases will develop some acute peripancreatic collection; however, only 7 to 12% will develop PP.[4] There are two traditional management concepts: time to maturity (four to six weeks) refers to the time needed for the fibrous tissue encapsulating the collection to be stable enough to receive treatment without risk of rupture, and time to resolution (four to eight weeks) of treatment needed for spontaneous resolution.[5] They are considered unlikely a spontaneous resolution when they have: 1) > six weeks, 2) chronic pancreatitis (CP), 3) communication with the CP and abnormalities in the pancreaticobiliary junction, 4) cysts surrounded by a thick wall.[6] They are considered susceptible to transpapillary drainage (TD) with the placement of a 5 to 7 Fr stent (ST) directed to the interior of the cyst; when these are smaller than 4 to 6 cm, communicate with the PC and are close to the papilla, this therapeutic approach being beneficial when there is proximal obstruction of the PC due to stenosis or biliary lithiasis. The transluminal approach (cystogastrostomy or cystoduodenostomy) is preferred in patients with larger lesions with symptomatic PP directly adjacent to the gastroduodenal wall (usually less than 1 cm apart).[7] The prevalence of success of the procedure is 97%, with definitive resolution in 80% of the cases. In the long term, it is 65 to 81%, with a recurrence of up to 23% in some series.[8] There are technical aspects that have been evaluated and that have importance in the prognosis. In a randomized clinical trial, mechanical dilatation was compared with

electrocautery (Needle Knife [NK], cystotome, and sphincterotome), finding greater adverse events with the latter technique, the main one is bleeding.[9] Some recent studies have evaluated the use of transluminal fully covered self-expandable metallic ST (FCSEMS); however, no studies evaluate the cost-effectiveness of plastic versus metallic ST in PP. A complete resolution has been reported in 70% of patients with FCSEMS, with 15% adverse events and 15% device migration.[10] The new luminal apposition plastic STs (Axios Xlumina Inc. Mountain View, CA) have been used for cystogastrostomy in a multicenter cohort with 93% complete resolution, 9% adverse events and complications, and 10.5% device migration.[11] A retrospective study in peripancreatic collections evaluated Another self-expandable apposition ST with an electrocautery delivery system (Hot Axios) for drainage. In 52 cases, direct endoscopic necrosectomy (DEN) was performed almost without fluoroscopy assistance, obtaining complete resolution in 92.5% of cases, with no recurrence during follow-up. Treatment failed in six patients due to the persistence of infection, who required surgery.[11] DT and the application of an SP is necessary, especially in patients with CP, lithiasis in the CP, stenosis requiring dilatation + ST, and in the scenario without obstruction but with demonstrable leakage into the cyst from the PD.[12] In case of partial disruption of the PC, an ST is placed to recanalize the area without leakage.[13] It is considered controversial whether the tip of the ST should be placed in the PC or inside the cyst since if it is placed from the PC towards one of the small branches from which the cyst originates, it may prevent it from closing the connection between these two structures, favoring recurrence. The TS is usually removed one to two weeks after its placement via endoscopic retrograde cholangiopancreatography (ERCP). Surgical management is performed for cysts complicated by infection or necrosis, PP associated with pancreatic stenosis, dilated PC, cystic neoplasia, and biliary stenosis refractory to endoscopic treatment. Complications such as stomach compression, duodenum, perforation, and hemorrhage from erosion of arteries and pseudoaneurysms have been reported.[14] The ideal time to perform the procedure is also four to six weeks in search of cystic wall maturation; patients with CP can be treated without delay because wall maturation is already present.[6] Intraluminal drainage is the method of choice for uncomplicated pseudocysts, although it depends on the anatomical topography; in cysts adjacent to the posterior wall of the stomach, cystogastrostomy is performed; in small cysts of less than 4 cm in the head of the pancreas and cysts in the uncinate process, cystoduodenostomy is preferred, while cystojejunostomy is performed in cysts larger than 15 cm. There is considerable controversy about whether cystogastrostomy is superior due to its simplicity, ease, and speed in its performance and a lower tendency to infections; however, it has been related to upper gastrointestinal bleeding.[15,16] Follow-up with magnetic resonance cholangiopancreatography (MRCP) after the cyst's resolution and the transluminal drainage removal is recommended. Evaluating the integrity of the PC is of utmost importance before removing the transluminal ST; the periampullary edema expected due to venous congestion caused by acute pancreatitis can make papillary cannulation difficult.[10] It is recommended that one to two months after the successful procedure perform, an imaging study is suggested to evaluate possible residual collections; if these are not present, it is recommended to remove the ST. In patients with persistence of the pseudocyst, expectant management is adopted for four to six weeks, and in case of persistence, the PC status will be evaluated with MRCP or ERCP. If obstruction, disruption, or residual communication of the cyst is confirmed, an ERCP with transpapillary pancreatic ST placement is recommended. If it persists, empirical ST replacement, dilatation of the transluminal cystostomy, DEN, and endoscopic ultrasound (EUS) guided drainage of the septa are recommended. In case of recurrence, a

surgical approach is considered. According to the literature, complications occur at a frequency of 11 to 37%, including secondary infection, bleeding, perforation, and ST migration.[17,18] The most common complication is an infection, and it is related to the presence of necrosis, so patient individualization and intentional search for necrosis in the pseudocyst is recommended.[18] Bleeding during the procedure is another frequent complication; in one study, balloon dilatation over the guidewire was proposed to omit electrocautery.[19] Perforation has been reported in 3% of cases, occurring mainly when the pseudocyst wall is poorly defined in imaging studies or if it has a distance greater than 1 cm from the intestinal lumen.[20] Although there is no evidence-based recommendation, it is well accepted that those with poor prognostic factors in the cyst anatomy (giant cyst, calcified walls, distance between the cyst and the drainage site) endoscopic management decreases their performance, so they are probably better treated laparoscopically.[21] The surgical approach can be open or laparoscopic; however, it is associated with a morbimortality of 25% in the open procedure versus 5% laparoscopic. In the setting of multiple cysts, gastrointestinal bleeding with distal splenic pseudoaneurysm, duodenal or common bile duct obstruction, painful CP, and cyst in the uncinate process, cyst resection is preferred over internal drainage.[14] Newell et al. found no difference in cyst recurrence concerning morbidity or mortality between cystogastrostomy versus cystojejunostomy.[22]

Rationale

PPs need more standardization in their management, and there is no universally used treatment algorithm to choose the most appropriate technique given their anatomical characteristics for drainage based on their risk of recurrence and complications. Among the numerous techniques available, endoscopic, and laparoscopic management stand out due to their efficacy, safety profile, and low prevalence of complications; however, current evidence does not allow us to establish a definitive treatment guideline.

Objective: to determine which procedure offers better efficacy and results in the drainage of PP with surgical versus endoscopic techniques by evaluating the prognostic variables contained in the existing evidence that directly compares both techniques.

MATERIAL AND METHODS

A search of MedLine databases via PubMed, SCOPUS, LILACS, and TRIP DATABASE was performed, limited to clinical trials and cohort studies published from January 2008 to July 2019 with the terms MeSh (pancreatic pseudocyst, peripancreatic collection) (cystogastrostomy, cystoduodenostomy, Roux-en-Y) (drainage, endoscopy, surgical drainage). A search was done using metadata and cross-referencing using the search engines REFSEEK and CROSSREF; articles were reviewed and analyzed with a focus on patient outcomes and prognosis. Data analysis was performed with Cochrane REVMAN 5.3 software using odds ratios with fixed effects and the Cochran-Mantel-Haenszel test. I^2 assessed study heterogeneity and reported the results in an effect diagram.

Selection of studies

Two independent investigators searched studies comparing management with endoscopic and surgical techniques published within the period between January 2008 and July 2019 in material and methods regardless of whether they were prospective or retrospective with several participants greater than 40, with populations older than 18 years and younger than 85. Literature reviews, letters to the editor, case reports, systematic reviews and existing meta-analyses were excluded, by using the Cochrane semaforization tool (Revman 5.3). Studies considered at high risk of bias, studies not published in English or Spanish, and studies with conflicts of interest were eliminated. Ultimately, studies not considered by both investigators were analyzed with a moderator for review.

Data analysis and extraction: 265 publications were obtained by searching

keywords and MeSh terms, 102 by searching metadata and cross-references, obtaining 367 articles for the application of selection criteria and the inclusion and exclusion criteria; 271 articles were eliminated, 96 were included for qualitative analysis of the abstract, excluding 21 duplicate publications, 12 letters to the editor and explanatory notes, 27 case reports, 18 literature reviews and book chapters, three meta-analyses, and four systematic reviews; 10 publications were taken to exhaustive analysis, where three articles were eliminated due to lack of full text, one publication was eliminated due to incomplete data, and six studies were selected for quantitative analysis and synthesis for meta-analysis *(Figure 1)*.

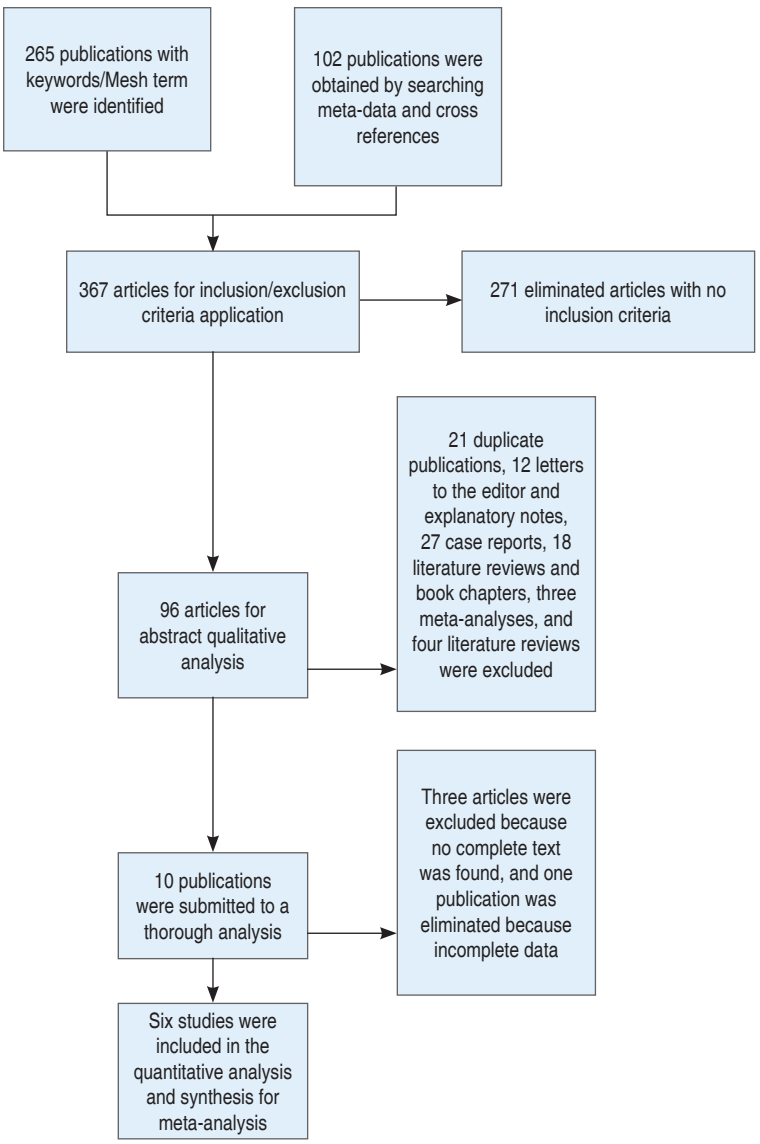


Figure 1: *PRISMA flow chart.*

RESULTS

No studies directly assessed the laparoscopic versus endoscopic approach with the minimum desired population. Likewise, in different studies, no discrimination was detected between the type of peripancreatic collections, with some frequency of peripancreatic collections with necrosis, among others, observed within the analysis groups. There is wide heterogeneity in the techniques used for both groups and little evaluation of variables identified as important for prognosis, which is not individually analyzed in any articles reviewed about recurrence, therapeutic success, and complications. Likewise, none of the publications considered location, wall, or PD status in the statistical analysis. The risk of bias was evaluated with the Cochrane risk of bias tool, concluding that there was "good" quality evidence in the six included studies. An analysis of the data contained in these studies was performed. A total of 367 patients were evaluated in six publications; only two studies described the follow-up time, and all reported the mean size of the pseudocysts. No uniformity was found in the criteria for surgical drainage used (methodological heterogeneity). Only two studies described the use of pancreatic transpapillary ST in their groups managed with endoscopy. The mean in-hospital stay is reported in only three/six studies; only two studies recorded the mean in-hospital cost. Only in the publication of Saul et al. was performed with a balloon, none of the studies used luminal apposition ST, and all authors used Pigtail. In 2017 Redwan and team published a prospective study conducted from March 2014 to September 2016 with results in a total of 71 patients, with endoscopic management in 35, laparoscopic in 4, and open in 32; 82.9% had immediate success (p = 0.01).

Therapeutic success was obtained in 91.4% of those managed endoscopically, 100% in the laparoscopic group, and 100% in those treated with open techniques. The prevalence of complications after the primary procedure was not significantly different (p = 0.08) between endoscopic 8.6%, laparoscopic 25%, and open 18.8%. No mortality was documented among the three groups; recurrence, reoperation, transoperative time, need for opioids, and in-hospital stay was significantly lower in the endoscopic group. Bleeding was also evaluated, being around 15 ml in the endoscopic procedures and 85 to 100 ml in the surgical drains; no patient required blood transfusions in the three groups. The study is unclear in its choice criteria for one procedure and another. There is an important variability in the number of patients in the different interventions; only four patients were taken to a laparoscopic approach and 35 to endoscopic management.[23] Saluja et al. in 2016 compared a prospective study of cystogastrostomy in 57 patients with PP, they obtained therapeutic success in the endoscopic group in 31 of 35 (89%) patients and 20/20 (100%) in the surgical group; it was associated with the presence of necrosis as the cause of drainage failure. The mean in-hospital stay was 6.4 days in the endoscopic group and 5.9 days in the surgical group. Seventeen percent of the procedures were converted, and complications were reported in 10/35 in the endoscopic group versus 2/20 in the surgical group. The mean size in the endoscopic group was 11 cm, and in the surgical group was 14.2 cm. The study revealed the presence of necrosis in 14/20 in the surgical group and 11/35 in the endoscopic group; it does not specify the techniques used to perform the endoscopic procedures, nor does it specify other variables or poor prognostic factors. It was unclear which techniques were used to select the patients, who would undergo one or the other treatment modality, and did not report the recurrence or the cost of intra-hospital stay.[24] In Mexico, Saul and collaborators carried out a retrospective study in the National Institute of Nutrition, where 64 procedures were evaluated in 61 patients, 21 endoscopic, and 43 with surgical management, and in 16 of the 21 performed endoscopically (76%) drainage was transgastric and in five (24%) it was transduodenal. Therapeutic success was achieved in 90.5% of the patients in the endoscopic group and 90.7% of the surgical patients (p = 0.7) with a prevalence of complications of 23.8 and 25.6% respectively (p = 0.8) and a mortality of zero to 2.3 for each group (p = 0.4). The in-hospital stay was shorter in the endoscopic group, from zero to ten days, compared to the surgical group, from two to 42 days. The cost of the endoscopic group was significantly lower, and recurrence was similar in both groups, 9.5 and 4.5 (p = 0.59). The group of patients treated with endoscopy was associated with ST migration.[25] In a prospective randomized controlled clinical trial in a single institution, 40 patients were evaluated, comparing endoscopic management in 20 patients and surgical management in 20 patients. Therapeutic success was reported in 100% of the patients with surgical management and 95% of the patients with endoscopic management; one of the patients developed pseudocyst recurrence, but this was associated with alcohol abuse; no differences were found in complications and reinterventions. The in-hospital stay was longer in patients with endoscopic management, with a mean of two versus six days in the surgical group (p < 0.001). The mean cost (in American dollars) was lower in patients treated endoscopically at $7,011 versus $15,052 (p = 0.003). The usefulness of this study has been considered limited because the sample was small, and the inclusion data were generated by only one surgeon and two endoscopists at a single institution.[26] Johnson et al. in 2009 published a retrospective study conducted at the *Cleveland Clinic* from December 1998 to October 2005; 49% were treated surgically, 24.39% endoscopically, and 7.11% percutaneously; there was no significant difference in the complication rate, being 20% surgical versus 21% endoscopic.

Pseudocyst resolution was 93.3% in the surgical group and 87.5% in the endoscopic group (p = 0.39). They concluded that both procedures were equivalent in safety and efficacy.[27] In 2009, Melman et al. published a retrospective study from March 1999 to August 2007 at Barnes Jewish Hospital, Washington University Medical Center. Of 83 patients, an endoscopic technique was performed in 45, a laparoscopic in 16, and an open technique in 22. In the endoscopic group, the postoperative in-hospital stay time was 3.9 days, the therapeutic success was 81.2%; 64.4% of the patients with initial endoscopic management did not require further procedures; 13 failed endoscopies were reported, which required an open salvage procedure, and three required percutaneous drainage; major complications within the first 30 days occurred in seven patients (15.6%); of these, three patients, 6.7%, required surgical management. Laparoscopic management was applied in 16 patients; none required conversion to open management. Six of these patients underwent concomitant cholecystectomy; the average in-hospital stay was 6.9 days, the primary success rate was 86.5%, and therapeutic success was obtained in 93.8%; one patient during follow-up developed recurrence. He was treated with endoscopic transgastric drainage; four patients (25%) experienced complications within the first 30 days of the procedure. Open management was performed in 22 patients, six simultaneously with cholecystectomy. The average in-hospital stay was 10.8 days, and therapeutic success was achieved in 90.9%; 22.7% (five patients) developed complications within the first 30 days, which were managed with percutaneous drainage, one patient developed multiple organ failure and required mechanical ventilation and an in-hospital stay of 82 days, 4.5% (one patient) had surgical site infection, 9.1% (two patients) had post incisional hernias. The comparison between the three methods considerably favored the laparoscopic procedure (p < 0.01), the therapeutic success was not significantly different (p > 0.05), and the incidence of late complications at 30 days was not statistically significant (p > 0.05). However, the study analysis did not discriminate between the technique performed, cystogastrostomy versus cystojejunostomy, which entail different complications, recovery time, and success rates, and did not consider the anatomical characteristics of the PP, which implies a higher probability of failure in endoscopic management. The data were collected retrospectively and may be incomplete, particularly concerning follow-up. The evaluation of late complications during follow-up was performed exclusively in a clinical manner, using imaging studies only in those patients with suspicion. The study population was heterogeneous and did not discriminate between etiologies of pancreatitis or comorbidities. The study did not describe the size of the cystostoma (usually < 2 cm), inadequate drainage of the cyst, the type of TS used, and other features, which are characteristics that radically influence the therapeutic success *(Table 1)*.[28]

Therapeutic success

The definition of therapeutic success was included in four of the six studies; for the purposes of this research, it is defined as the clinical resolution of symptoms during the first four weeks of patient follow-up with a complete resolution or decrease in the size of the collection to 2 cm or less on the computerized tomography scan. We found a therapeutic success ratio in the surgically managed group of 95.1% (91.1 to 97.7%) and 87.8% (82.2 to 92.1%) in the endoscopically managed group with an OR of 2.41 (95% CI 1.08 to 5.38) in favor of surgical management with statistical significance (p = 0.03). Heterogeneity tests found and I^2 0.0% (p = 0.86 heterogeneity) *(Figure 2)*.

Adverse events

Four of the six studies contain definitions of adverse events. A prevalence of adverse events was observed in the group managed with surgery of 18.3% (13.1 to 24.5%), and in the group managed with endoscopy of

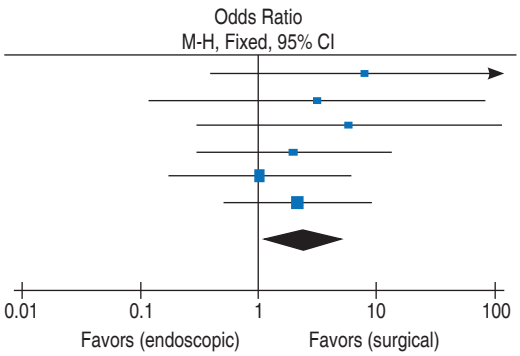
Table 1: Summary of characteristics in the studies analyzed.

Features	Study					
	Redwan, 2017 N = 71	**Saluja, 2016 N = 55**	**Saul, 2015 N = 61**	**Varadarajulu, 2013 N = 40**	**Johnson, 2009 N = 54**	**Melman, 2009 N = 83**
Design	Retrospective	Randomized clinical trial	Retrospective	Randomized clinical trial	Retrospective	Retrospective
Follow-up [months]	Not reported	Not reported	Not reported	24		Not reported
Endoscopy					0 a 43	
Surgery					1 a 74	
Size of pseudocysts assessed [cm]						
Endoscopy, mean	10.3	11.0	6.7	10.5	9.5	9.1
Surgery, mean	10.0	14.2	10.0	11.0	9.1	9.5
Presence of disconnected PD syndrome						
Endoscopy	Not reported	Not reported	13	15	Not reported	Not reported
Surgery			7	Not reported		
Transpapillary pancreatic stent	2 de 35	Not reported	Not reported	10 de 50	Not reported	Not reported
Therapeutic success						
Endoscopy, n (%)	32 (91.4)	31 (85.0)	19 (90.5)	19 (95.0)	21 (87.5)	38 (84.4)
Surgery, n (%)	36 (100.0)	20 (100.0)	39 (90.7)	20 (100.0)	28 (93.3)	35 (92.1)
p	0.01	0.14	0.74	0.50	0.39	≤ 0.01
OR	0.12	0.17	0.97	0.32	0.5	0.23
Adverse events						
Endoscopy, n (%)	3 (8.6)	10 (28.5)	5 (23.8)	0 (0)	3 (12.5)	7 (15.6)
Surgery, n (%)	7 (19.4)	2 (10.0)	11 (25.5)	2 (10.0)	6 (20.0)	5 (22.7)
p	0.08	0.17	0.87	0.24	1.0	≥ 0.05
OR	0.38	0.27	0.91	0.47	0.57	0.63
Recurrence						
Endoscopy, n (%)	4 (11.4)	Not reported	2 (9.5)	0 (0)	Not reported	Not reported
Surgery, n (%)	1 (2.78)		2 (4.5)	1 (15.0)		
OR	0.3048	N/A	2.16	1	N/A	N/A
In-hospital stay [days]						
Endoscopy, mean	3.9	6.4	0	2	Not reported	Not reported
Surgery, mean	7.1	5.9	7	6		
In-hospital cost [USD]						
Endoscopy, mean ± SD	Not reported	Not reported	3,092 ± 1,705	7,011 ± 4,171	Not reported	Not reported
Surgery, mean ± SD			7,734 ± 623	15,052 ± 10,670		
p	N/A	N/A	< 0.0001	0.001	N/A	N/A

PD = pancreatic duct. N/A = not applicable.

Study or subgroup	Endoscopic Events	Endoscopic Total	Surgical Events	Surgical Total	Weight (%)	Odds Ratio M-H, Fixed, 95% CI
Redwan, 2017	36	36	32	35	5.5	7.86 [0.39, 158.01]
Varadarajulu, 2013	20	20	19	20	5.7	3.15 [0.12, 82.16]
Saluja, 2016	20	20	31	35	6.8	5.86 [0.30, 114.65]
Johnson, 2009	28	30	21	24	19.1	2.00 [0.31, 13.06]
Saul, 2015	39	43	19	21	29.2	1.03 [0.17, 6.11]
Melman, 2009	35	38	38	45	33.7	2.15 [0.52, 8.97]
Total (95% CI)		187		180	100.0	2.41 [1.08, 5.38]
Total events	178		160			

Heterogeneity: $\chi^2 = 1.91$, df = 5 (p = 0.86); $I^2 = 0\%$
Test for overall effect: Z = 2.15 (p = 0.03)



Fixed effects diagram comparing the results of the therapeutic success regarding endoscopic vs. surgical approaches.

Figure 2: *Therapeutic success.*

Study or subgroup	Endoscopic Events	Endoscopic Total	Surgical Events	Surgical Total	Weight (%)	Odds Ratio M-H, Random, 95% CI
Johnson, 2009	3	24	6	30	16.6	0.57 [0.13, 2.57]
Melman, 2009	7	45	5	38	23.1	1.22 [0.35, 4.20]
Redwan, 2017	3	35	7	36	17.8	0.39 [0.09, 1.64]
Saluja, 2016	10	35	2	20	14.3	3.60 [0.70, 18.46]
Saul, 2015	5	21	11	43	23.9	0.91 [0.27, 3.07]
Varadarajulu, 2013	0	20	2	20	4.3	0.18 [0.01, 4.01]
Total (95% CI)		180		187	100.0	0.88 [0.46, 1.69]
Total events	28		33			

Heterogeneity: Tau^2 0.08; $\chi^2 = 5.67$, df = 5 (p = 0.34); $I^2 = 12\%$
Test for overall effect: Z = 0.39 (p = 0.70)

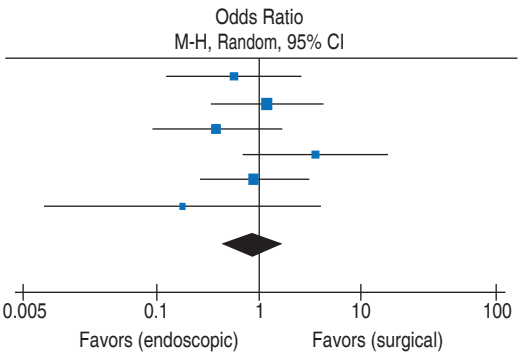


Diagram of random effects showing adverse events found with both interventions.

Figure 3: *Adverse events.*

15.1% (from 10.3 to 21.1%), adverse events occurred with an OR of 0.90 (95% CI 0.51 to 1.58) (heterogeneity test I^2 12% p = 0.34) no statistically significant differences were found in both groups (p = 0.70) *(Figure 3)*.

Recurrence

Only three of the publications analyzed reported recurrence, with a total of 11 of 175 cases corresponding to 6.28% in both groups; 6.07% of the cases in the surgery group showed recurrence, 8.12% evidenced this characteristic in the group managed with endoscopy; with an OR of 1.54 (95% CI 0.48 to 4.98) with a heterogeneity I^2 29% p = 0.24, without statistical significance (p = 0.47) *(Figure 4)*.

Endoscopy

In the individual review of the available evidence for the group managed with endoscopy, six publications with the inclusion criteria were found, with a total population of 617 participants, of which 526 had resolution of the picture, which represents 86.25% (75.20-97.30%); 122/617 had complications, which represent 19.94% (5.20-26.30%). Recurrence was not reported in one publication, observed in 52/518 cases, representing 9.18% (5.0-15.50%), and 95/617 required salvage surgical management representing 15.39% (2.0-27.50%). The results are detailed in *Table 2*.

Weckman and collaborators reported one of the most extensive series with 179 patients evaluated retrospectively, in whom

endoscopic management was performed during a period from 1998 to 2003 by means of transpapillary drainage, with pancreatic STs of 7 to 10 Fr. Transmural methods were performed in the PP in immediate contact with the duodenal and/or gastric wall by means of a papillotome and NK with subsequent use of an 8 mm balloon dilator. Therapeutic success was achieved in 86.1% of the patients, 13.9% required rescue surgical management, and no mortality was reported during the procedures; however, four patients were excluded from the study due to mortality, and although it is stated that they died of causes unrelated to the management, the circumstances and time of death were not specified. Patients with infected PP were observed within the evaluation, with no difference in effectiveness concerning patients with non-infected PP 86.1%. In half of the patients, necrotic material was reported inside the cyst. Recurrence was reported in 4.8% of patients in a mean of 17.5 months. A 10% complication rate was reported, and seven patients (4%) required salvage surgery. In patients in whom only papillotomy was performed as part of the treatment, successful treatment was reported in 85.3% of these patients, while 14.7% failed and required additional procedures.[29]

Park et al. performed a randomized clinical trial with 60 patients in 2009, comparing ultrasound-guided versus conventional endoscopic management. Treatment was successful in 94% of ultrasound-guided patients and 72% of patients with conventional endoscopic drainage. Complications were reported in 7% of patients in the ultrasound-guided group and 10% in the conventional group. The resolution was achieved in 97 versus 91%. Long-term results found no difference in long-term clinical prognosis, 89 versus 86%.[30]

Kahalek and his team conducted a randomized clinical trial with 53 patients to evaluate the effectiveness of ultrasound-guided versus conventional management over 13 years, in 46 patients; they found no significant differences in therapeutic success between the two groups, 93 versus 94%; However, at six-month follow-up, they reported 84 versus 91%, respectively, complications that occurred in 19% versus 18% and consisted of bleeding with infection n = 3, infection of collections n = 8, ST migration n = 3, and pneumoperitoneum n = 5; only one complication required surgical management.[17]

Seewald et al. evaluated 80 patients with pancreatic collections, a total of 24 pseudocysts, 20/80 abscesses, and 36/80 infected necroses from October 1997 to March 2008. Retrospectively, initial therapeutic success was obtained in 97.5% with clinical resolution of collections in 83.8%, 13/80 required surgical management due to complications or technical difficulties, 5/80 required surgical management after six months due to recurrent collections, and long-term success was reported in 72.5% of patients.[31]

Will and colleagues in a prospective study conducted between 2002-2008 with 147 patients, n = 32 with pseudocysts, n = 81 with abscesses, n = 34 with necrosis, therapeutic success was achieved in 100% of patients guided by external ultrasound and 97% with

	Endoscopic		Surgical			Odds Ratio
Study or subgroup	Events	Total	Events	Total	Weight (%)	M-H, Fixed, 95% CI
Redwan, 2017	4	35	1	36	19.4	4.52 [0.48, 42.59]
Saul, 2015	2	21	2	43	26.4	2.16 [0.28, 16.50]
Varadarajulu, 2013	0	20	2	20	54.2	0.18 [0.01, 4.01]
Total (95% CI)		76		99	100.0	1.54 [0.48, 4.98]
Total events	6		5			

Heterogeneity: $\chi^2 = 2.82$, df = 2 (p = 0.24); $I^2 = 29\%$
Test for overall effect: Z = 0.73 (p = 0.47)

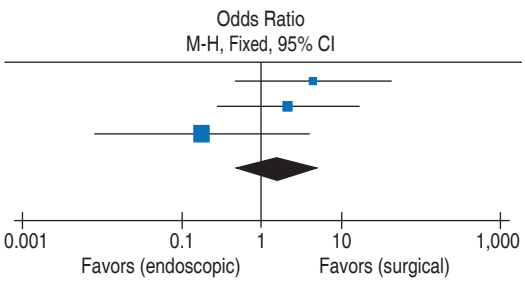


Diagram of random effects showing adverse events found with both interventions.

Figure 4: *Recurrence.*

Table 2: Evidence on endoscopic treatment.

Study	Number	Therapeutic success, n (%)	Complications, n (%)	Recurrence, n (%)	Surgery required, n (%)	Follow-up [months], mean
Baron, et al 2002	95	82 (86.316)	17 (17.895)	9 (9.474)	7 (7.368)	25.0
Kahaleh, et al 2006	99	93 (93.939)	19 (19.192)	Not reported	2 (2.020)	13.9
Weckman, et al 2006	170	124 (72.941)	38 (22.353)	8 (4.706)	23 (13.529)	4.1
Park, et al 2009	60	50 (83.333)	8 (13.333)	9 (15.000)	28 (46.667)	12.0
Will, et al 2011	113	110 (97.345)	19 (16.814)	17 (15.044)	13 (11.504)	21.0
Seewald, et al 2012	80	67 (83.750)	21 (26.250)	9 (11.250)	22 (27.500)	31.0
Total	617	526 (86.253)	122 (19.940)	52 (9.977)	95 (13.990)	–

transmural drainage; the transpapillary drainage reported success in 92. The complications of external drainage were 3.7% transmural and 9.6% transpapillary complications, bleeding n = 3, perforation = a migration of the stent with perforation of the terminal ileum n = 1. After a follow-up of 20.7 months the therapeutic success was 96.2% on average, 96.9% of the PP, abscesses 70.5% and necrosis 94.1% respectively. There was recurrence in 15.4% and a mortality of 0.7% unrelated to the intervention.[32]

In 2002 Baron reported complete resolution in 113/138 patients (82%) with peripancreatic collections managed endoscopically, of which 64 were PP; the success rate in patients with an acute PP was 74%, 23/31 patients. For chronic PP it was 92% 59/64 (p = 0.02). For patients with walled necrosis, only 72% efficacy was reported (p = 0.006). In multivariate analysis, chronic pseudocyst predicted successful drainage (OR 2.1: 95% CI 0-4.5), while necrosis was a predictor of lousy drainage (OR 0.64 95% CI 0-3.1). When the approach was compared, transpapillary (OR 3.1: 95% CI 0.3-67.9) and transduodenal (OR 1.7: 95% CI 0.4-7.0) were suggestive of better therapeutic success, although neither reached adequate statistical significance.[33]

DISCUSSION

Over the years, different techniques have been described for the drainage of pancreatic pseudocysts. Different research studies have widely evaluated their effectiveness; although percutaneous drainage has been generally discarded as a primary therapeutic measure, the current controversy concerns surgical and endoscopic techniques. Due to the low incidence of the disease, there are not enough studies for its analysis, and unfortunately, those found in the literature are inconsistent in the appropriate application of terminology, and some of them have heterogeneous populations where drainage was evaluated for PP, walled necrosis, infected necrosis as equivalents, resulting in clinical heterogeneity. The presence of necrosis within the PP, distance to the enteric wall where the fistulous tract will be performed, size of its wall, direct communication with the PD, the size of the cystostoma (< 2 cm) and the presence of disconnected PD syndrome as well as PD obstruction could help to establish predictors of endoscopic drainage failure in search of generating markers for risk stratification. This theory was contrasted by Nealon and collaborators, who found no significant

statistical difference between ductal anatomy, the relationship of the PP with the PD, and its relationship with the severity of the disease; 83.5% of the patients managed endoscopically and percutaneously who presented failure required rescue surgery. Although these results are referenced in some publications as support for not stratifying their patients, they should be interpreted cautiously since only patients with unsatisfactory management and who developed complications were included in this study. Two-thirds had pancreatic ductal disruption and did not have a pancreatic ductal TS prior to the procedure. There were other variables (such a cystotoma < 2 cm, presence of necrosis, among others) that are considered to have a greater probability of manifesting in patients with failure of primary therapy, which were not evaluated, in addition to the fact that patients with percutaneous drainage were used, which is not currently accepted as a definitive treatment modality.[34]

During the last few years, some studies suggest a discreet improvement in the therapeutic effectiveness offered by endoscopy, related to the arrival of endoscopic ultrasound and FCSEM and SEM, which generate more stable fistulous tracts with less risk of collapse. In a retrospective cohort, Sharaiha and collaborators found superiority in the resolution of PP with the use of FCSEMS about plastic ST.[35] The advent of luminal apposition STs is theoretically supposed to improve the effectiveness of endoscopic procedures, which should be evaluated against laparoscopy, which offers, according to the data presented, a more traditional approach with better therapeutic success, theoretically with a lower prevalence of complications, less days of in-hospital stay and a lower cost of medical care concerning the open approach. Siddiqi and his team reported a series of 313 patients with walled necrosis in whom the use of drainage by double Pigtail, FCSEMS, and luminal apposition ST (LAMS) was evaluated. Complete resolution was 81% in CPs, 95% in FCSEMS, and 90% in LAMS; however, no significant differences were found in the latter two during follow-up, while fewer complications were observed in patients managed with LAMS.[36] The advantages of LAMS compared to other DES included single-step placement and the possibility of direct endoscopic debridement with minimal migration; although its superiority to PD is clear, further studies are needed to evaluate its superiority to FCSEMS.[37]

In relation to the meta-analysis, there is no uniformity of the characteristics observed in the different studies. Essential differences in the methodology, the definitions used, and the reports of the data presented were evaluated and weighted. It was considered that despite the apparent methodological and clinical heterogeneity, there was sufficient evidence and the differences shown do not substantially influence the research questions posed. A meta-analysis was performed, in which the superiority of surgery in obtaining therapeutic success was evidenced without finding a statistically significant difference between both techniques in terms of complications and recurrence. However, the findings in this meta-analysis are limited by the scope of the methodology, the risk of bias, and methodological heterogeneity. Likewise, we performed a purposive search for studies that evaluated the therapeutic performance of the laparoscopic intervention. Unfortunately, we did not find research studies with a sufficient population to perform an analysis, and we needed to find methodological characteristics that met our inclusion criteria. In the case of endoscopy, six studies with these characteristics were found, which were analyzed, showing that the effectiveness of endoscopic drainage has improved, probably thanks to the ST used and the advent of endoscopic ultrasound. The main arguments supporting endoscopic techniques are similar effectiveness, fewer complications, lower cost, and shorter hospital stay. We consider that the possibility of placing a stent in the PC, performing papillotomy, and better categorization by endoscopic ultrasound are characteristics that, over time, incline the tendency to prefer this approach since it provides additional therapeutic and diagnostic elements, which is not reflected in the present meta-analysis. Resolving the controversy may be less critical than evaluating new techniques that help to resolve this pathology

more effectively. Patil et al. reported in a systematic review that included 298 patients in 11 studies a 96% therapeutic success using luminal apposition TS.[37] There are case reports of therapeutic success in patients with NOTES management (endoscopic surgery through natural orifices).[38] Despite the logical assumption of their effectiveness, the advent of these techniques still needs to be improved by the high specialization of their performers and the need for complex equipment and high cost. Due to these causes, the possibility of performing a hybrid NOTES procedure, as described in some recent case reports, is being considered.[38,39] This approach offers the logical assumption of ERCP's possibilities in transpapillary management plus the arsenal of tools offered by laparoscopy. This technique is described using the placement of a transgastric laparoscopic trocar, which allows the use of laparoscopic instruments for debridement, necrosis control, cleaning, and widening of the anastomoses, complemented or not with the placement of transgastric and transabdominal drainage to the outside. Although these techniques have not yet been evaluated, some characteristics imply better results than those evaluated in the present work. However, there is a clear need for risk stratification measures that, by means of a predictive model, would allow improving the therapeutic indication of one procedure over another based on the characteristics of the patients. This model would imply that endoscopic procedures would be indicated in patients without poor prognostic factors. Patients in the group with these factors could be managed with a therapeutic spectrum ranging from luminal apposition ST to Hybrid NOTES management. From this perspective, future medical training could contemplate the possibility of hybridization that would allow comprehensive management of peripancreatic collections with these emerging techniques to compare the results of this management in relation to current results.

CONCLUSION

Surgical techniques are slightly superior to endoscopic techniques in terms of therapeutic success and lower recurrence; however, they are associated with more significant complications, higher costs, and extended hospital stays. Endoscopy supported by ultrasound provides therapeutic (papillotomy and transpapillary TS) and diagnostic elements that translate into therapeutic success, which has yet to be evaluated individually. More studies are needed to consider these characteristics and evaluate the impact of anatomical factors on poor prognosis to know their translation into complications and efficacy of the procedures, which could lead to a system for risk stratification that would allow a standard working algorithm. The emerging techniques, NOTES/Hybrid notes, and the use of luminal apposition TS contain the theoretical elements that may allow us to solve the problems encountered with current endoscopic techniques.

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Breast cancer close to the radial scar

Cáncer de mama cercano a cicatriz radial

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Keywords:
breast, breast diseases, breast neoplasms.

Palabras clave:
mama, enfermedades de la mama, neoplasias de la mama.

ABSTRACT

Introduction: breast cancer is the leading cause of death worldwide. The radial scar is a high-risk lesion for cancer development; currently, there is controversy regarding treating these lesions. **Objective:** to review publications that evaluate and measure the presence of breast cancer near the percutaneous radial scar biopsy site. **Material and methods:** a systematic review in the PubMed database, with the terms *breast radial scar and neoplasms*. The search focused on articles with a single diagnosis of a radial scar by percutaneous biopsy and subsequent open biopsy with the finding of malignant breast neoplasm, separated from the site of the first biopsy and confirmed by measurement of the distance between the two lesions. **Results:** 242 publications were found. Of these, 108 were excluded from the screening by title and abstract, and 28 because they were review articles. Two articles in German, five case presentations, one letter, and one commentary were excluded. The others were excluded because they did not correspond to the research objective. From the remaining review, two articles were selected for qualitative analysis. **Conclusions:** this study reviews the occurrence of breast cancer outside the pure radial scar biopsy site. Despite the low frequency of this location, excisional biopsy is considered the appropriate approach after percutaneous biopsy because it allows the diagnosis of cancer close to this site.

RESUMEN

Introducción: *el cáncer de mama es la principal causa de muerte a nivel mundial, la cicatriz radial es una lesión de alto riesgo para el desarrollo de cáncer, actualmente existe controversia respecto al tratamiento de estas lesiones.* ***Objetivo:*** *revisar publicaciones que evalúen y midan la presencia de cáncer de mama en proximidad del sitio de biopsia percutánea de cicatriz radial.* ***Material y métodos:*** *revisión sistemática en la base de datos de PubMed, con los términos* breast radial scar and neoplasms, *al buscar artículos con diagnóstico único de cicatriz radial por biopsia percutánea y posterior biopsia abierta con hallazgo de neoplasia maligna de mama, separada del sitio de la primera biopsia y confirmada por medición de la distancia entre las dos lesiones.* ***Resultados:*** *se encontraron 242 publicaciones, de éstas, se excluyeron 108 en el cribado por título y resumen, 28 de ellas por tratarse de artículos de revisión. Se excluyeron dos artículos en alemán, cinco presentaciones de casos, una carta y un comentario. Las demás se excluyeron por no corresponder al objetivo de la investigación. De la revisión restante, fueron seleccionados dos artículos para análisis cualitativo.* ***Conclusiones:*** *este estudio revisa la presencia de cáncer de mama por fuera del sitio de biopsia de cicatriz radial pura. A pesar de la baja frecuencia de esta localización, se considera que la biopsia por escisión es el enfoque adecuado después de la biopsia percutánea porque permite el diagnóstico de cáncer cercano a este sitio.*

INTRODUCTION

Breast cancer is the most common cancer diagnosis in women (2.1 million new cases in 2018) and the leading cause of cancer death worldwide (627,000 women in the same year).[1] In the breast, high-risk lesions are associated with increased concurrence or future development of cancer, including radial scar. This lesion is considered benign but may be accompanied by carcinoma, which may be indistinguishable on imaging.[2] Diagnostic biopsy is usually performed percutaneously (most frequently with a 14G trucut needle). Then, a surgical excisional biopsy is performed[3,4] to establish or confirm the existence of epithelial atypia and hyperplastic proliferative lesions (often associated[5]) or to diagnose malignant neoplasia. Given the low association with carcinoma when the radial scar is "pure" (without

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another proliferative lesion),[6] some services recommend, with caution, the performance of vacuum-assisted excision.[7] One of the risks of omitting surgical excision is that a malignant neoplasm outside the radial scar biopsy site will not be resected with this technology, leaving the cancer present undiagnosed.

MATERIAL AND METHODS

A systematic review of articles registered in the PubMed database, with the terms *breast radial scar and neoplasms*, without the use of filters, was performed on 28/03/2020, searching for articles with a single diagnosis of a radial scar by percutaneous core needle biopsy and subsequent open biopsy with a finding of malignant breast neoplasm, separated from the site of the first biopsy and confirmed by measurement of the distance between the two lesions. The author provided the search terms, and with another reviewer, articles relevant to the research objective were selected according to the title or by additional information in the abstract. Discrepancies were resolved by reviewing the whole article and mutual agreement. In the articles that continued in evaluation, the author reviewed the complete article to ensure the relevance of the articles with the research objective. Review articles, reports of less than five cases, letters, and comments were excluded. *Figure 1* shows the flow of information through the different phases of the systematic review.

RESULTS

With the search terms, 242 publications were found. Of these, 108 were excluded from the screening by title and abstract, and 28 because they were review articles. Although there was no initial restriction by language, two articles in German, five case presentations, one letter to the editor, and one commentary were excluded. The rest were excluded because they did not correspond to the research objective. Two articles were selected from the review for qualitative analysis.

In the article by Leong et al.[6] of 161 pure radial scar biopsies taken by stereotactic biopsy (9 g-gauge needle vacuum-assisted biopsy with 12 samples taken) and surgical excision, only one ductal carcinoma *in situ* (0.6%) of 2 mm located 5 mm from the percutaneous biopsy cavity marked on the titanium clip biopsy sites was detected. It should be noted that in this case, residual microcalcifications were seen on post-biopsy mammography.

In the article by Li Z et al.,[8] of 220 14 g needle biopsies, two cases were found with carcinoma (0.9%). The first case was a 10mm invasive ductal carcinoma with

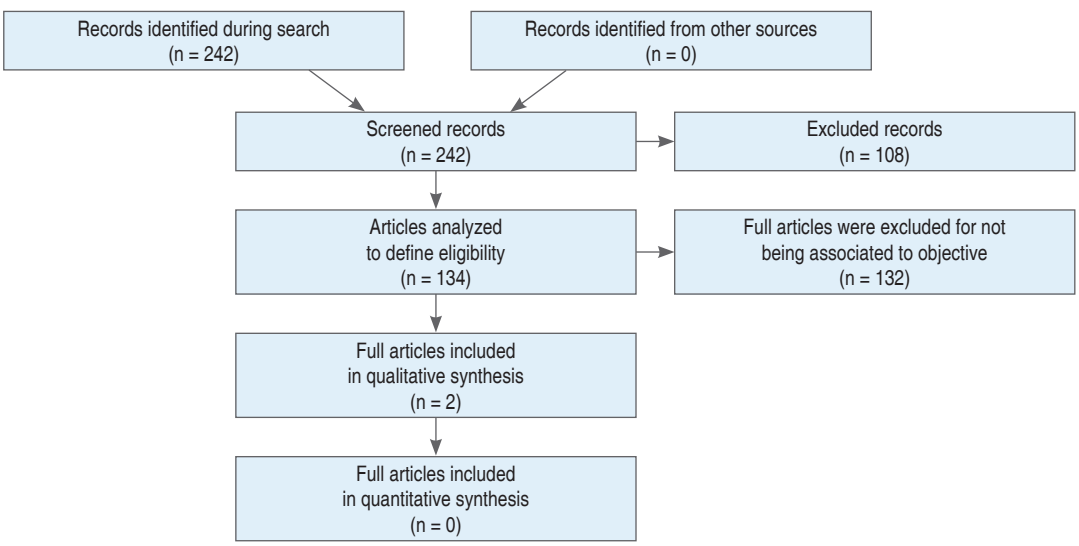

Figure 1: *Flow of information through the different phases of the systematic review.*

Table 1: Cases with carcinoma outside the radial scar biopsy site.

Author	No. of biopsies	Cancer	Type of cancer	Tumor size (mm)	Distance from radial scar (cm)
Leong, et al.[6]	161	1	Ductal *in situ*	2	5
Li Z, et al.[8]	220	2	Ductal invasive Ductal *in situ*	10 5	8 7

Nottingham grade 1 (5/9), nuclear grade 2, no lymphovascular invasion, and 8 mm distance from the biopsy site. The second case was a 5 mm focal ductal carcinoma *in situ* with a cribriform growth pattern, nuclear grade 2, and 7mm distance from the biopsy site *(Table 1)*.

DISCUSSION

The denomination of radial scar is usually used in lesions up to 1 cm (a larger one corresponds to a complex sclerosing lesion).[9,10] Its diagnosis was incidental in the microscopic evaluation. However, recently its suspicion has increased due to greater access to mammography[11,12] in which it appears as an area of architectural distortion,[5] accompanied by other criteria: 1) presence of a central radiolucency, 2) thin, long radiating spicules, 3) different appearance according to the projections, 4) radiolucent linear structures parallel to the spicules, and 5) absence of palpable lesions or changes in the skin.[13] On ultrasound, they are visible as irregular hypoechoic masses with posterior shadowing virtually identical to the appearance of breast cancer.[14]

They are most frequently detected in women between 40 and 60 years of age, being rare before the age of 30.[15] In population screening programs, their incidence is estimated between 0.03 and 0.09%.[5,12,15-18] In autopsy specimens, it is reported between 1.7 and 28%.[15,19]

The association of radial scar with malignancy is probably not an etiologic relationship.[8] The most frequently associated malignant tumors are low or intermediate-grade ductal carcinomas *in situ* and grade 1 or 2 invasive carcinomas[18,20] with favorable biological profiles (estrogen and progesterone receptor positive and low proliferative index.[21,22] The foci of malignancy are usually small; in some cases, they correspond to only 5% of the lesion.[23] Farshid and Rush, in their study, reported that the malignancy was within the radiological area in seven of nine cases but extended beyond it in two cases.[23] Doyle et al.[24] describe 25 malignant lesions; four were in the radial scar,[17] at the border, and four were separated. Diagnostic omission of cancer on percutaneous core needle biopsy may occur due to inadvertent failure of the biopsy procedure[18] (sampling only from the radial scar in a lesion that also contains carcinoma), possibly related to needle size or a low sample count (14 g gauge needle or smaller or with sample count ≤ 12) and at higher risk of occurring in cases where mammography and histology are discordant.[2,19,25]It may also be due to a diagnostic error in the pathology study due to difficulty in differentiating radial scar from carcinoma, particularly of the tubular type.[26]

There is significant variation in the finding of malignancy in surgical excision after a core needle biopsy with reports of radial scar (0 and 40%).[20,26] This situation is more frequent when the radial scar is accompanied by atypical ductal hyperplasia, lobular neoplasia, or papilloma (on average 26%), compared to 7.5% when there is no associated proliferative lesion.[27]

Some departments replace trucut needle biopsies with vacuum-assisted biopsies favoring their larger size and proceeding as a next step after diagnosing radial scar to excision, also by vacuum, intending to remove the entire lesion as an alternative to the traditional open biopsy.[7] This additional procedure, in its great majority, did not find malignancy[7] (currently considered less than 5% when there are no atypia[5,28]).

In a meta-analysis, radial scar without atypia assessed by vacuum-assisted biopsies changed to carcinoma *in situ* in 1% (95% CI 0 ± 4) of excisional biopsies.[28] The low proportion of residual lesions on excision after an initial percutaneous radial scar biopsy obtained by conventional or vacuum-assisted core needle was supported by the UK National Health Service Breast Screening Multidisciplinary Working Group to develop guidelines for vacuum-assisted excision in this pathology (without epithelial atypia) on a case-by-case basis using a multidisciplinary approach.[7] However, the transition to this procedure has not been widely used[7] and with limited evidence in the medical literature[28] (studies are few, with a low number of patients and observational type), may leave without a diagnosis some lesions as previously described Fashid and Rush of two (22.2%) lesions,[23] that extended beyond the radiological area of the radial scar, and the four lesions described in the publication of Doyle and collaborators[24] (16%) and the three (0.7%) of this review.

The expectation that imaging would decrease the risks of missing cancer with percutaneous biopsies has not been confirmed. Despite its high negative predictive value, MRI missed the cancer diagnosis in 24% (95% CI 11, 39%),[28] and the malignancy rate at surgical excision was similar with and without digital breast tomosynthesis.[29]

Low sample sizes, differences in inclusion criteria, and possible selection biases of lesions for surgical excision have explained the variability in reports of concurrent carcinoma between 0 and 40%.[20] In addition, in some publications, the authors did not fully provide methodological, radiological, or clinical details[18] (which may explain the low number of cases in this review requiring measurement of the distance outside the biopsy site). These factors increase the uncertainty about the risk of leaving undiagnosed carcinoma at or near the biopsy site. In this case, both areas are amenable to resection with surgical excision.

CONCLUSIONS

Radial scarring is associated with an increased risk of breast cancer concurrence. Surgical excisional biopsies after diagnosis are the following standard procedure. This second biopsy allows the diagnosis of proliferative lesions or cancer. It facilitates the location of the lesion in the specimen, which has allowed the development of studies that evaluate separate lesions, but close to the radial scar. In the systematic review of this study, three lesions were found among 381 biopsies neighboring the biopsy site that measured the distance from the biopsy site. Implementation of aspiration excision is not expected to reach these types of lesions. Given the limited evidence for aspiration excision as an alternative to surgical biopsy, the latter offers greater certainty in diagnosing concurrent cancer.

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Hepatocellular carcinoma in a young patient with a non-cirrhotic liver

Carcinoma hepatocelular en una paciente joven sobre hígado no cirrótico

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Keywords: hepatocellular carcinoma, non-cirrhotic liver, alpha-fetoprotein, liver resection, survival.

Palabras clave: *carcinoma hepatocelular, hígado no cirrótico, alfa-feto proteína, resección hepática, supervivencia.*

ABSTRACT

Introduction: hepatocellular carcinoma without cirrhosis has an incidence of 15%, with a different presentation from cirrhotic patients. We present a patient with hepatocellular carcinoma without cirrhosis. **Case report:** 29-year-old female patient, 9 cm lesion in the right hepatic lobe, without cirrhosis (albumin 4.6 g/dl, total bilirubin 0.5 mg/dl, prothrombin time 13.7 seconds, international normalized ratio (INR) 0.98, alpha-fetoprotein 1.38 ng/ml), treated with resection, discharge, and readmission for a liver abscess with discharge. Twenty-one months of disease-free survival. **Conclusion:** hepatocellular carcinoma without cirrhosis is not frequent. It should be considered in young patients with abdominal pain and liver injury. Resection is the treatment.

RESUMEN

Introducción: *el carcinoma hepatocelular sin cirrosis tiene una incidencia de 15%, con presentación diferente a los cirróticos. Se presenta una paciente con carcinoma hepatocelular sin cirrosis.* ***Caso clínico:*** *paciente femenino de 29 años de edad, lesión de 9 cm en lóbulo hepático derecho, sin cirrosis (albumina 4.6 g/dl, bilirrubina total 0.5 mg/dl, tiempo protrombina 13.7 segundos, índice internacional normalizado (INR) 0.98, alfafetoproteína 1.38 ng/ml), tratada con resección, alta y readmisión por absceso hepático con egreso. Veintiún meses de supervivencia libre de enfermedad.* ***Conclusión:*** *el carcinoma hepatocelular sin cirrosis no es frecuente. Debe considerarse en jóvenes con dolor abdominal y lesión hepática. La resección es el tratamiento de elección.*

INTRODUCTION

Hepatocellular carcinoma (HCC) is the world's most common primary liver tumor and the fifth and ninth most common cancer in men and women, respectively.[1] Worldwide, the leading risk factor for HCC is the hepatitis B virus.[2] The incidence of HCC in non-cirrhotic liver is 15-20% of all HCC.[3] The characteristics of patients with HCC in the non-cirrhotic liver have been addressed in several studies, showing that these patients are young females, and the tumor is detected at a more advanced and symptomatic stage than in cirrhotic patients.[4] In the asymptomatic form, it is diagnosed incidentally by imaging studies or due to abnormal laboratory findings.[5]

Radical treatments of HCC include liver transplantation, surgical resection, and local ablation methods.[6] Liver resection (LR) is considered the treatment of choice in the healthy liver due to the low risk of liver failure after surgery, lower recurrence, and lower morbidity and mortality than in the cirrhotic liver.[7]

This paper aims to present the case of a young woman with liver resection secondary to HCC in non-cirrhotic liver.

CLINICAL CASE

A 29-year-old female patient with no previous history of importance, and a body mass index of 28.5 kg/m^2, starts suffering from sudden pain

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in the right hypochondrium, radiating to the scapular region, so she goes to a hospital of the Instituto Mexicano del Seguro Social (IMSS), at Unidad Médica de Alta Especialidad (UMAE) No. 14, where using computed tomography (CT) and magnetic resonance imaging (MRI) she was diagnosed with an occupying lesion in the right hepatic lobe of 9 cm in its largest diameter *(Figure 1)*, with no clinical or biochemical data of liver cirrhosis (total bilirubin (BT) 1.20 mg/dl, direct bilirubin (BD) 0.7 mg/dl, total protein 5.4 g/dl, albumin 3.4 g/dl prothrombin time 14.4 seconds, international normalized ratio (INR) 1.08, platelets 217 × 10^3 cell/mm^3) and serum alpha-fetoprotein 4 ng/ml.

Serology against hepatitis A, B, and C was negative. A blood cell count showed hemoglobin 11.4 g/dl, hematocrit 34%, and leukocytes 5.5 × 10^3 cells/mm^3. Blood chemistry showed glucose 92 mg/dl, urea nitrogen 9 mg/dL, and creatinine 0.7 mg/dl. The rest of her liver tests were as follows: aspartate transaminase (AST) 25 IU/l, alanine transferase (ALT) 95 IU/l, and alkaline phosphatase (ALP) 100 IU/l.

It was decided to perform surgery with resection of the lesion in segments V and VIII, using the Habib 4x device energy system (AngioDynamics®, N.Y., US), cholecystectomy, and a biopsy of healthy liver tissue with 0

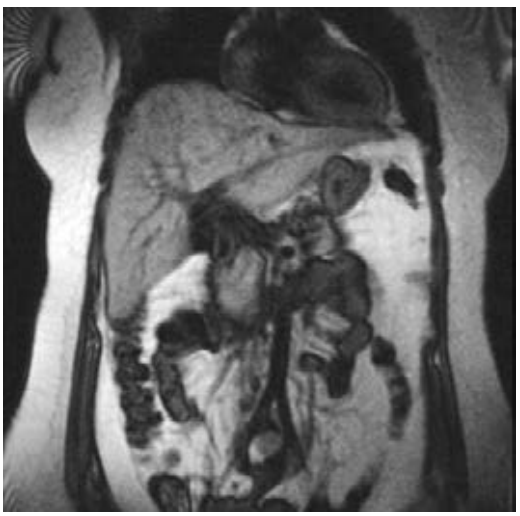

Figure 1: *Nuclear magnetic resonance imaging showing a hepatic lesion compatible with hepatocarcinoma of approximately 9 cm in segments VI and VII.*

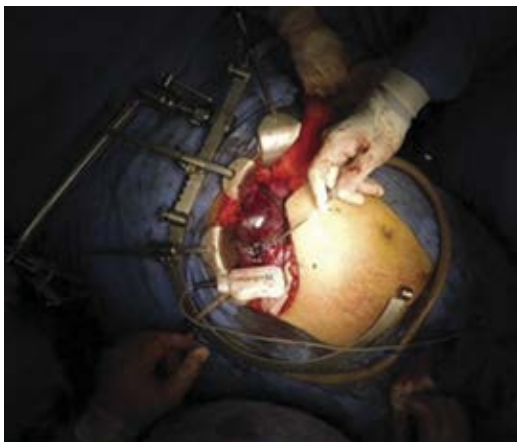

Figure 2: *The described liver tumor resected with Habib 4x support.*

chromic suture, with a surgical time of 160 minutes, through the bilateral subcostal incision without Pringle maneuver; the closure was performed with Vicryl 1 with continuous stitches in two times for the aponeurosis, and Dermalon 3-0 for the skin with simple stitches. A ¼" Penrose drainage was directed to the liver bed *(Figures 2 and 3)*.

Transoperative bleeding was 800 ml. Postoperative pain management was performed with ketorolac at 30 mg IV c/8 hours, cefotaxime 1 g IV c/8 hours was used during the hospital stay, and the patient was discharged on the sixth postoperative day. The histologic report of the lesion was a well-differentiated hepatocarcinoma, grade 2, in the modified Edmondson-Steiner classification. It was encapsulated, measuring 7 × 5 × 4 cm, with regenerating nodules *(Figure 4) and* with tumor-free margins of 1 cm. The histopathologic report of the non-tumorous liver was non-alcoholic fatty liver grade 1 activity (30% steatosis, lobular focus of inflammation) and grade 2 fibrosis (portal fibrosis and pericellular fibers without fibrous bridges).

The patient was readmitted 20 days after the postoperative period due to a residual hepatic abscess verified by a CT scan. She was managed with imipenem at a dose of 1 g IV c/8 hours, metronidazole at 500 mg IV c/8 hours for 14 days, and a percutaneous pigtail Expel placed by interventional radiology obtained 50 ml of purulent material. A complete blood

count was performed, observing a decrease in leukocytes to 7,300 mm^3 on day 14. The antibiotic regimen was suspended, and the patient was discharged on day 15 of the hospital stay.

The patient was asymptomatic 21 months after surgery with no data of tumor activity by CT scan, with a blood cell count showing a hemoglobin 13.3 g/dl, hematocrit 39.2%, leukocytes 4.6 × 10^3 cell/mm^3, platelets 244 × 10^3 cell/mm^3, prothrombin time 13.7 sec, and an INR 0.98. His blood chemistry results were glucose 82 mg/dl, urea nitrogen 9 mg/dL, creatinine 0.7 mg/dL, and liver function tests: BT 0.50 mg/dl, BD 0.20 mg/dl, BI 0.30 mg/dl, ALT 21 IU/l, AST 20 IU/l, ALP 118 IU/l.

DISCUSSION

Liver cirrhosis is the leading risk factor for HCC; however, a certain number of HCCs occur in the non-cirrhotic liver, with a proportion of cases lower than 20%, making it an uncommon pathology. HCC in non-cirrhotic liver has different epidemiological and clinical characteristics, therapeutic management, and prognosis than the tumor produced in cirrhotic liver. At the epidemiological level, there seems to be a greater preponderance in the female sex and a less advanced age,[4] although other studies have not confirmed these characteristics.

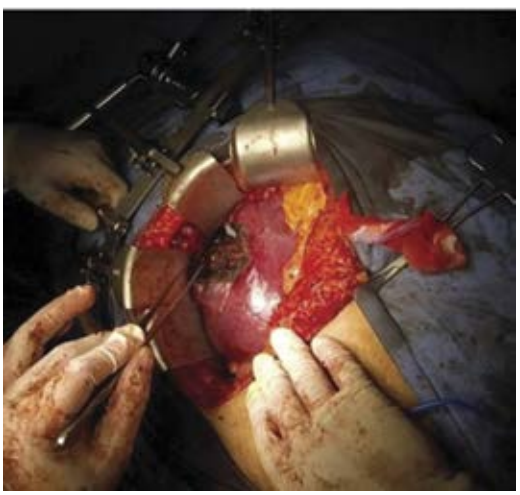

Figure 3: *Resection area of the liver tumor. Macroscopically a healthy liver is seen.*

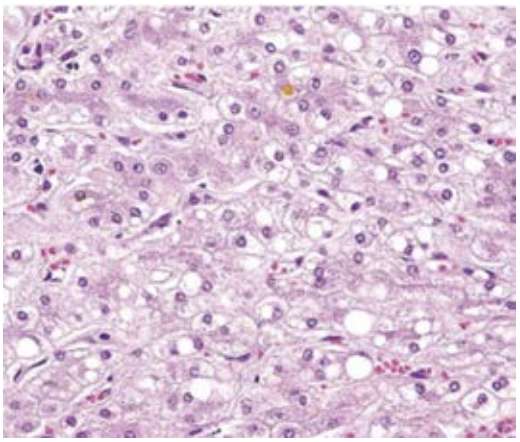

Figure 4: *Light microscopy of the lesion with a histopathological report of cellular hepatocarcinoma (hematoxylin and eosin).*

Núñez Martínez and collaborators[8] evaluated 29 patients with HCC in the non-cirrhotic liver, reporting a higher incidence in the male sex and a mean age of 61.

HCC in a healthy liver is generally diagnosed when the tumor has reached a larger size, producing the appearance of symptoms (abdominal pain or discomfort in the right upper quadrant, jaundice, nausea).[9] It is essential to know how to identify and differentiate HCC from the fibrolamellar type, which, although a rare variant, can be problematic at the time of diagnosis, as it also occurs in young patients (< 40 years) and livers with minimal damage, characterized histologically by well-differentiated malignant liver cells with eosinophilic and deep granular cytoplasm due to the presence of numerous mitochondria, and by the presence of fibrosis throughout the tumor.[10]

Hepatic resection is the best method for patients with HCC in non-cirrhotic liver. Although these patients present larger tumor lesions, the preserved function of the non-cirrhotic liver allows extensive resections to be performed relatively safely.[9] Faber et al.[11] studied 148 patients with HCC in non-cirrhotic liver undergoing liver resection. They found a median in-hospital stay of 15 days, with one to five-year survival of 75.4 and 38.9%, respectively. Rayya and his team[12] analyzed 55 patients with HCC in non-cirrhotic liver

undergoing RH, reporting an in-hospital stay of 18 days, with one to five-year survival of 69 and 48%, respectively, and Lubrano and co-workers[13] studied 20 patients with HCC in non-cirrhotic liver undergoing RH, with one and five-year survival of 85 and 64% respectively.

Our case represents a large (9 cm) HCC in non-cirrhotic treated by liver resection, with in-hospital stay like the studies already described with adequately resolved postoperative morbidity. Morbidity in RH in this type of patient can be up to 40%,[11] exemplified in our case. The fact that our case presented a liver with minimal liver damage contributed to a successful HR. The tumor-free margins (1 cm) contribute to the present-day survival without tumor activity.

CONCLUSION

The presence of hepatocellular carcinoma (HCC) in non-cirrhotic liver is a rare entity that should be considered in young patients with abdominal pain and liver tumor. Hepatic resection (LR) is the treatment of choice in these cases to provide good survival.

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Ethical responsibilities: protection of people and animals. It is declared that no experiments on humans or animals have been performed for this research.
Data confidentiality: the protocols of our work center on the publication of patient data were followed.
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Recurrent spontaneous pneumothorax secondary to pulmonary bullae

Neumotórax espontáneo recidivante secundario a bulla pulmonar

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Keywords: spontaneous pneumothorax, video thoracoscopy, pulmonary bulla.

Palabras clave: *neumotórax espontáneo, videotoracoscopia, bulla pulmonar.*

ABSTRACT

Introduction: pneumothorax is the presence of gas in the pleural space, with consequent pulmonary collapse and compromise of ventilatory mechanics. Spontaneous pneumothorax appears without a history of thoracic trauma; the diagnosis is made with a simple chest X-ray, and tomography is the study of choice to detect subpleural bullae. **Clinical case:** 18-year-old male with a history of right lobectomy at age 15 presented with dyspnea at rest and left pleuritic pain; on examination with hypoventilation of the left hemithorax, chest X-ray showed pneumothorax, received management with water seal with good response and was discharged due to improvement. One month later, he returned for a recurrence of symptoms, and computerized axial tomography of the thorax showed a left apical bulla. **Conclusions:** treatment consists of evacuating the air from the pleural space and must be individualized, considering the severity of the clinical situation and the risk of recurrence. Video thoracoscopy with bullectomy has improved dyspnea, gas exchange, and pulmonary function.

RESUMEN

Introducción: *el neumotórax es la presencia de gas en el espacio pleural, con el colapso pulmonar consiguiente y compromiso en la mecánica ventilatoria, el neumotórax espontáneo es aquél que aparece sin un antecedente de traumatismo torácico, el diagnóstico se realiza con una radiografía simple de tórax, la tomografía es el estudio de elección para detectar bullas subpleurales.* ***Caso clínico:*** *masculino de 18 años, con el antecedente de lobectomía derecha a los 15 años, acude por presentar disnea en reposo y dolor pleurítico izquierdo, en la exploración con hipoventilación de hemitórax izquierdo, radiografía de tórax se observa neumotórax, recibió manejo con sello de agua con buena respuesta y fue egresado por mejoría. Un mes después acude por recidiva de síntomas, se realizó tomografía axial computarizada de tórax donde se observó bulla apical izquierda.* ***Conclusiones:*** *el tratamiento consiste en la evacuación del aire del espacio pleural, se debe individualizar, teniendo en cuenta la gravedad de la situación clínica y el riesgo de recurrencias. La videotoracoscopia con bulectomía ha demostrado mejorar la disnea, el intercambio gaseoso y la función pulmonar.*

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INTRODUCTION

Pneumothorax is the presence of gas in the pleural space between the parietal and visceral pleura with consequent pulmonary collapse,[1] causing a compromise in ventilatory mechanics. Spontaneous pneumothorax appears without a history of chest trauma. It can be classified as primary and secondary, depending on whether it occurs in an individual with or without underlying lung disease.[2]

In the case of primary spontaneous pneumothorax, in the absence of a triggering disease, this entity is related to predisposing risk factors such as smoking, family history, Marfan syndrome, anorexia, and intrathoracic endometriosis.[3]

Primary spontaneous pneumothorax occurs mainly in young people around the second and

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third decades.[3] The rupture of a subpleural bulla or bleb usually causes it.[4] Blisters and bullae are found in up to 80% of cases of primary pneumothorax on chest CT scan and in up to 90% of cases on thoracoscopy or thoracotomy.[5]

Primary spontaneous pneumothorax is characterized by a recurrence risk of 30-50% during the patient's lifetime.[6,7]

Of spontaneous pneumothoraxes, 90% appear at rest, and only 10% coincide with physical exertion. Patients with spontaneous pneumothorax present sudden pleuritic pain, dyspnea, and non-productive cough.

Physical examination reveals reduced chest wall movements, hyper resonance to percussion, and absent or decreased breath sounds on the affected side.[8]

The definitive diagnosis of spontaneous pneumothorax is confirmed with a plain chest X-ray, where a line of visceral pleura well differentiated from the air interface of the pleural space running parallel to the chest wall is identified.[8,9]

The computed tomography (CT) scan can be considered the "gold standard" in detecting small pneumothoraxes and size estimation.[9]

Bullous lesions contacting the chest wall have a concave appearance, unlike the pleural line of spontaneous pneumothorax; a CT scan is the study of choice to detect subpleural bullae and emphysematous changes causing primary spontaneous pneumothorax.[10]

This paper will describe diagnosing and treating primary spontaneous pneumothorax secondary to pulmonary bulla by presenting a clinical case.

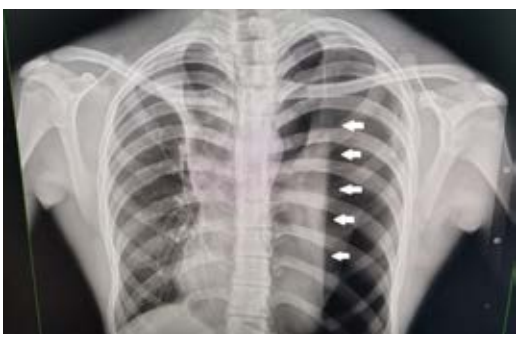

Figure 1: *Left pneumothorax.*

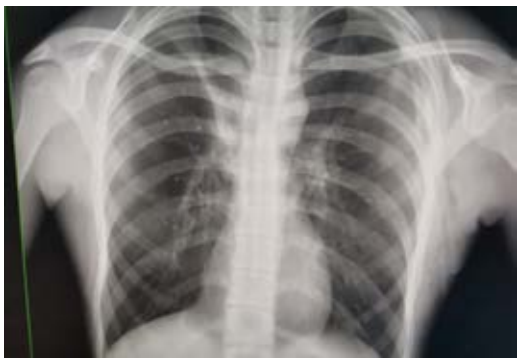

Figure 2: *Post-placement of an endo pleural probe.*

PRESENTATION OF THE CASE

An 18 years-old patient without any chronic degenerative history had a right apical lobectomy for refractory spontaneous pneumothorax secondary to a congenital cyst at age 15.

Physical examination revealed reduced thoracic movements, hyper resonance on percussion, and hypoventilation of the left hemithorax. Chest X-ray showed left pneumothorax, so it was decided to place an endo pleural tube; he was admitted for surveillance, showing clinical and radiographic improvement, and was discharged due to improvement.

Three weeks later, he came to the emergency department referring a two-day evolution of pain in the left hemithorax, of sudden onset, transfixing, as well as dyspnea at rest; the physical examination revealed hypoventilation of the left hemithorax and hyper resonance to percussion. The X-ray showed recurrent pneumothorax *(Figure 1)* and an endo pleural probe was placed. Adequate pulmonary expansion was seen on X-ray *(Figure 2)*. Seven days later the patient underwent a seal pleural probe test, presenting dyspnea and chest pain. A control X-ray showed recurrent left pneumothorax *(Figure 3)*, so a CT scan was requested, showing persistent pneumothorax, and left apical bulla, so a surgical protocol for thoracoscopy was initiated.

Laboratory results showed a leukocyte count of 14.9 $\times$ 10^9/l, with a neutrophil count of 82 $\times$ 10^3/ml, hemoglobin 14.1 g/dl, hematocrit

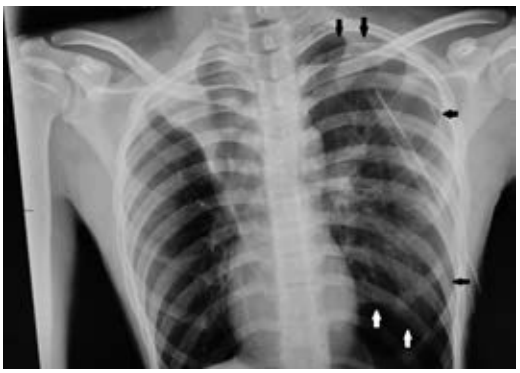

Figure 3: *Spontaneous pneumothorax. Arrows identify the lung silhouette on the chest radiograph without complete expansion despite chest tube placement.*

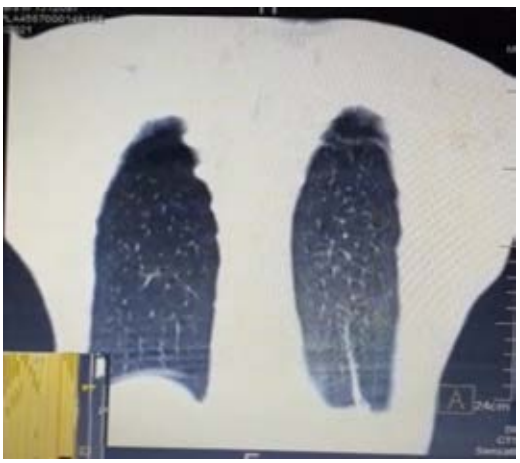

Figure 4: *A thorax computed tomography scan showing a left pulmonary bulla.*

42.8%, platelets 449 × 10^9/l, prothrombin time 14.8 seconds, thromboplastin time 34 seconds, INR 1.26, glucose 122 mg/dl, urea 49 mg/dl, creatinine 0.7 mg/dl, sodium 144 mEq/l, potassium 3.9 mEq/l, and chlorine 101 mEq/l.

A left pneumothorax was observed in the CT scan, with an endo pleural probe and left apical bulla *(Figure 4)*.

Thoracoscopy was performed on 11/03/21, finding lax adhesions in the pulmonary apex to the thoracic wall and two bullae in the left apical lobe of approximately 0.5-1 cm *(Figure 5)*. A bullectomy was performed without complications and an endo pleural suction tube was left in place *(Figure 6)*.

The patient had good clinical evolution, no respiratory distress data, and well-ventilated lung fields. His X-ray showed an adequate lung expansion; the endo pleural tube removal was decided on 3/14/21 without complications, and he was discharged home.

DISCUSSION

Treatment of spontaneous pneumothorax consists of evacuation of air from the pleural space and prevention of recurrences.[11]

Available therapeutic options include simple observation pending spontaneous resolution, aspiration with a catheter until the air has been evacuated from the pleural space, placement of a thoracostomy tube with or without subsequent pleurodesis, thoracoscopy, and thoracotomy.

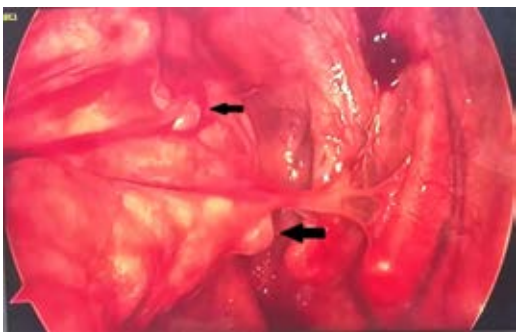

Figure 5: *Thoracoscopy image. Two 0.5 and 1 cm apical bullae are observed (black arrows).*

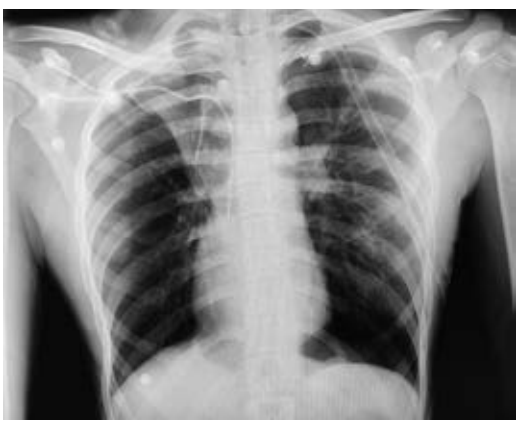

Figure 6: *Chest X-ray after bullectomy.*

Treatment selection should be based more on the patient's clinical status and the risk of recurrences than on the extent of spontaneous pneumothorax seen on plain radiography.

Treatment by surgery has been shown to improve dyspnea, gas exchange, lung function, and exercise capacity.

CONCLUSIONS

Spontaneous pneumothorax is a rare pathology that should be considered in emergency departments, as its diagnostic omission may lead to a tension pneumothorax.

The goal of treating a pneumothorax is to relieve the pressure in the lung, allowing it to expand again. Depending on the cause of the pneumothorax, a second goal may be to prevent recurrences.

Treatment of patients with spontaneous pneumothorax should be individualized, considering the severity of the clinical situation, the risk of recurrences, and the preferences of a well-informed patient.

Video thoracoscopy, which allows resection of bullae and subsequent pleurodesis, is the treatment of choice, offering significant advantages over open thoracotomy, including a shorter postoperative hospital stay, significantly less postoperative pain, improved pulmonary gas exchange, and decreased postoperative recovery time.[12]

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Ethical considerations and responsibility: the authors declare that they followed the protocols of their work center on the publication of patient data, safeguarding their right to privacy through the confidentiality of their data.

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Giant inguinal hernia repair with loss of dominance

Reparación de la hernia inguinal gigante con pérdida de dominio

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Ana Sofía Magallanes-del-Río,[§] Fernando Vázquez-Alaniz[¶]

Keywords:
giant inguinal hernia, loss of dominance, pneumoperitoneum.

Palabras clave:
hernia inguinal gigante, pérdida de dominio, neumoperitoneo.

ABSTRACT

Giant inguinal hernia with loss of dominance is rare. It is diagnosed when the hernia sac extends below the midpoint of the thigh with the patient standing. Repair of these defects is challenging due to the risk of developing abdominal compartment syndrome. We present the case of a 32-year-old man with a giant inguinal hernia with loss of dominance, who was treated with preoperative progressive pneumoperitoneum and hernioplasty with the Lichtenstein technique. No standard repair technique has been adopted for this condition. Whatever the approach, abdominal cavity preparation should be performed before surgical treatment to reduce the risk of abdominal compartment syndrome.

RESUMEN

La hernia inguinal gigante con pérdida de dominio es poco común. Se diagnostica cuando el saco herniario se extiende por debajo del punto medio del muslo con el paciente en bipedestación. La reparación de estos defectos es un desafío debido al riesgo de desarrollar un síndrome compartimental abdominal. Presentamos el caso de un hombre de 32 años, con una hernia inguinal gigante con pérdida de dominio, que fue tratado con neumoperitoneo progresivo preoperatorio y hernioplastía con técnica de Lichtenstein. No se ha adoptado una técnica de reparación estándar para este padecimiento. Cualquiera que sea el abordaje, se debe realizar una preparación de la cavidad abdominal previo al tratamiento quirúrgico para disminuir el riesgo de un síndrome compartimental abdominal.

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INTRODUCTION

Giant inguinal hernia (GIH) with loss of dominance is uncommon and results from neglect and fear of the surgical procedure. The social impact is significant; it can cause social isolation, fear of seeking medical attention, and subsequent worsening of the condition.[1] A GIH is established when the hernia sac extends below the midpoint of the inner thigh with the patient standing.[2] The designation of loss of dominance is subjective. Its management represents a challenge due to the risk of developing abdominal compartment syndrome (ACS), produced by suddenly reintroducing the herniated contents into an abdominal cavity with decreased capacity.[3] No treatment has been adopted as a standard procedure for this condition. The literature describes several surgical repair strategies. This paper aims to present the case of a patient with GIH with loss of dominance, successfully treated with prior progressive pneumoperitoneum (PPP) and tension-free plasty with the Lichtenstein technique.

PRESENTATION OF THE CASE

A 32-year-old male Mexican patient of mestizo ethnicity, a cab driver with a personal history of a sedentary lifestyle, and morbid obesity (body mass index [BMI] = 57), came for consultation for presenting a left inguinoscrotal hernia of 10 years of evolution. Physical examination confirmed that the patient had an inguinoscrotal hernia exceeding the upper border of the left patella and trophic changes of the

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scrotal skin *(Figure 1)*. Inguinal ultrasound showed a hernial sac with intestinal and omental contents. He was started on NPP during his hospital stay by inserting a Veress needle at Palmer's point. 200 cm^3 of room air was insufflated with a 100 cm syringe.[3] Subsequently, a double-lumen catheter (subclavian) was placed with the Seldinger technique. An 800 cm^3 of room air was insufflated, and a standing chest X-ray corroborated pneumoperitoneum. 1,000 cm^3 were administered every 24 hours for 21 days up to a total volume of 21,000 cm^3.

Under regional anesthesia, a left inguinal approach was performed through a standard transverse incision. A direct hernial sac was identified, dissected, and separated from the spermatic cord. After opening the hernia sac, small bowel loops, sigmoid colon, and omentum were identified *(Figures 2 to 4)*, which were manually introduced into the abdominal cavity without difficulty. The anatomical defect was repaired according to the Lichtenstein technique; there were no restrictive pulmonary changes during the transoperative and postoperative periods. The patient was discharged on the fourth day of hospital stay due to improvement. There was no hernia recurrence after clinical and ultrasound follow-ups for 1.5 years *(Figure 5)*. The patient reports that his quality of life has improved notably, increasing his personal and sexual relationships.

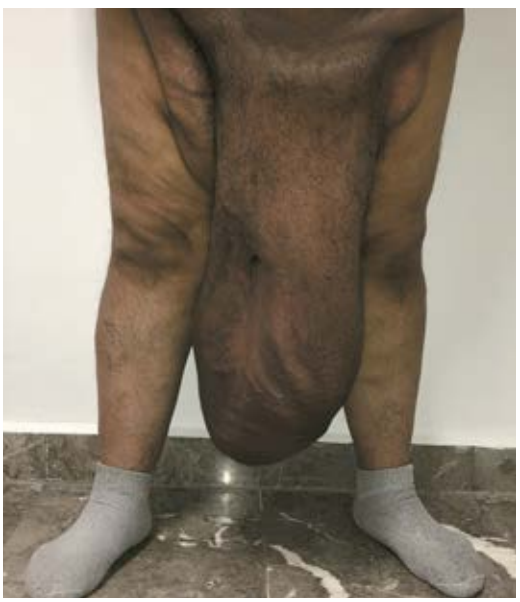

Figure 1: *A giant left inguinoscrotal hernia.*

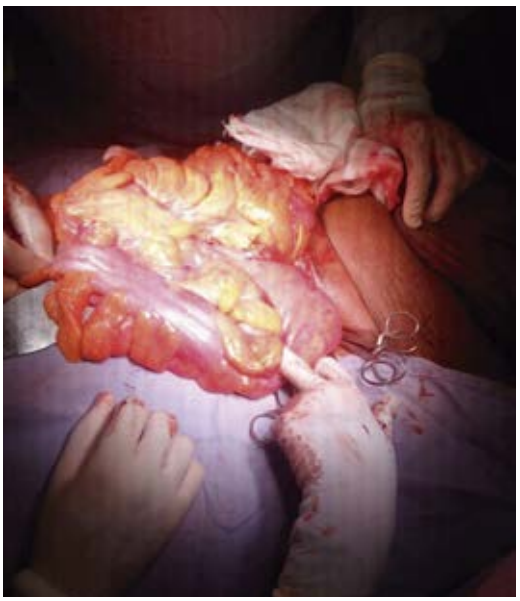

Figure 2: *The sigmoid colon.*

DISCUSSION

The surgical treatment of a GIH with loss of dominance differs significantly from the usual cases of inguinal hernia due to the technical difficulty of repair and the high risk of morbidity and mortality, which implies a challenge for the surgeon. Forced reduction of the viscera to the abdominal cavity can produce a sudden increase in intra-abdominal pressure (IAP) and trigger an acute coronary syndrome (ACS), defined as a sustained IAP > 20 mmHg associated with multiple organ failure.[4,5] Several techniques have been proposed to avoid these complications and obtain satisfactory results after surgical repair. Among the pre-surgical techniques are the creation of PPP and the application of botulinum toxin A (BTA), which aim to increase the abdominal cavity volume.[6] In 1940, Goñi Moreno[7] described the PPP, which consists of placing an intraperitoneal catheter, through which an average of 14,000-20,000 cm^3 of ambient

air is progressively insufflated to enlarge the abdominal cavity and thus achieve an adequate visceral reduction of the hernial sac. On the other hand, it stabilizes diaphragmatic shape and function and improves ventilatory function by allowing elongation of the abdominal wall muscles, adhesiolysis, and pneumatic dissection of the hernia sac.[8,9] There is no consensus in the literature on the optimal duration and volume of insufflation. Goñi-Moreno[7] described that the procedure ends when the abdominal flanks are found to be prominent and under tension by palpation. On the other hand, Mayagoitia-Gonzalez JC[10] recommends maintaining the pneumoperitoneum for nine to 15 days for a GIH. In this case, it was decided to perform PPP for 21 days as described by Goñi-Moreno, where 1,000 cm^3 of room air was administered every 24 hours for approximately 20,000 cm^3 of room air.

Today, PPP and BTA are mainly used for giant abdominal incisional hernias, and some isolated cases of these techniques for treating a GIH have been reported in the literature.[4,6,9,11]

BTA causes a reversible flaccid paralysis of the abdominal wall muscles by blocking the synaptic release of acetylcholine, achieving an increase in the transverse diameter of the abdomen, a decrease in the thickness, and an increase in the length of the abdominal muscles, which facilitates the reduction of the hernial contents into the abdominal cavity.[6,11,12] It has been observed that BTA complements the objective of PPP since it allows for handling larger insufflation volumes.[8]

Other techniques reduce the content of the hernial sac, also known as debulking, which consists of resection of the colon, small intestine, omentum, and spleen, among others;

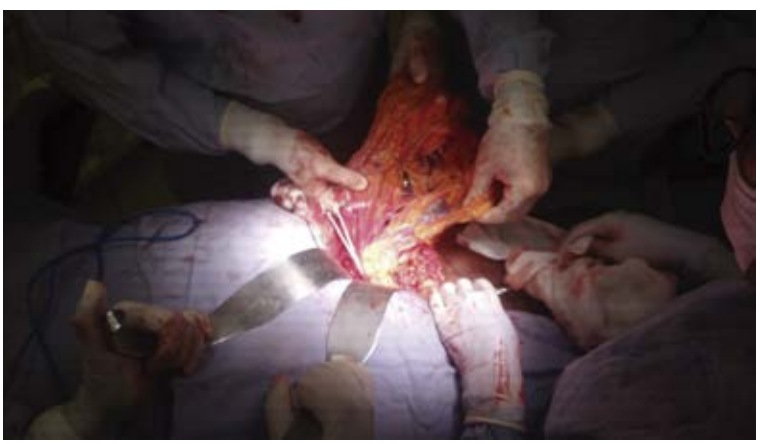

Figure 3: *The omentum.*

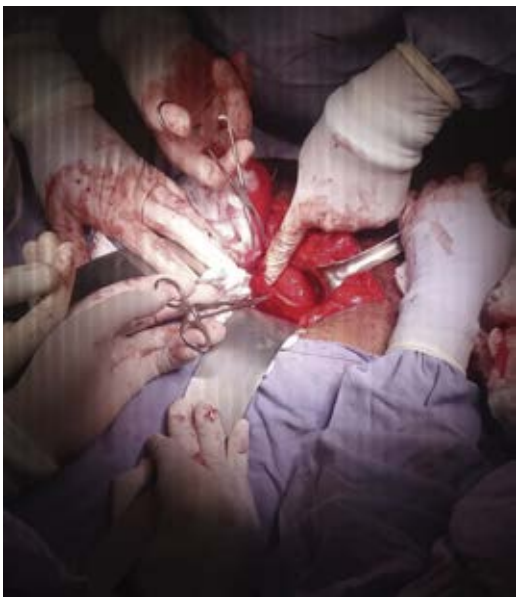

Figure 4: *Reduction of the hernia sac contents.*

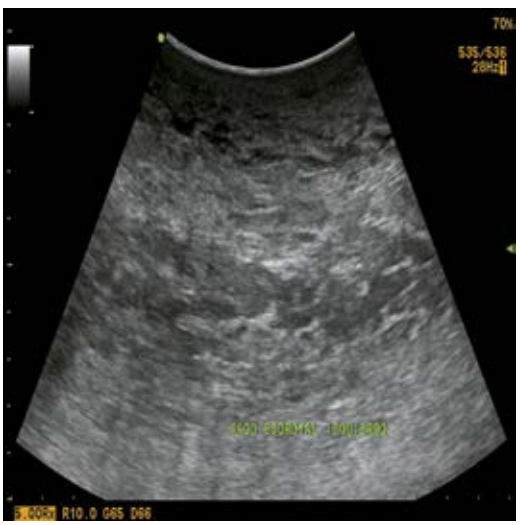

Figure 5: *Absence of hernial sac in the left inguinal canal and scrotal wall edema.*

however, they are associated with a high rate of complications such as dehiscence, abdominal sepsis, and intestinal fistulas.[8-12] In our case, there was no difficulty in reducing the hernial content. Therefore, a debulking procedure was not necessary.

Given the complex nature of GIHs, we chose to perform an open repair with the Lichtenstein technique, considered the technique of choice for most surgeons and is recommended by international guidelines for this type of hernia.[13]

Other surgical alternatives are the transabdominal preperitoneal approach (TAPP) and the totally-extraperitoneal approach (TEP), which are safe therapeutic options for scrotal hernia repair when performed by surgeons with a higher level of experience in either technique, obtaining favorable results and the benefits of minimally invasive surgery.[9,13,14]

CONCLUSION

There is no standard technique for the surgical repair of giant inguinal hernias with loss of dominance. The approach should be adapted to the surgeon's experience, the hernia's characteristics, and each hospital's resources. Whatever the approach, preparation of the abdominal cavity should be performed before surgical treatment to reduce the risk of abdominal compartment syndrome and the need for visceral resection or anatomic separation of components, either by PPP, BTA, or a combination of both.

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Cervical schwannoma

Cervical schwannoma

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Keywords:
schwannoma, cervical tumor, neurilemomas, vagus nerve, neurinomas.

Palabras clave:
schwannoma, tumoración cervical, neurilemomas, nervio vago, neurinomas.

ABSTRACT

Schwannoma or neurilemoma is known as a rare or frequent tumor arising from Schwann cells (glial cells found in the peripheral nervous system) and, in most situations, behaves benignly. Our case illustrates a rare pathology, a benign tumor that differentiates along Schwannian lines. Some of these tumors may have non-negligible mitotic activity, but their behavior is benign; however, these types usually occur in the deep soft tissues and rarely involve the subcutaneous tissue. During this report, we will deal with the case of a patient in her third decade of life who presents a cervical tumor with growth during three years until the medical-surgical approach, after the onset of symptoms, although without data of airway compromise, hemodynamic status or neurological alterations, but presenting significant pain and difficulty in cervical mobilization. It is complemented by imaging studies that suggest ruling out branchial cysts versus pleomorphic adenoma. The treatment of choice is excision since usually the schwannoma displaces and compresses the residual nerve in its periphery and can be removed without affecting the nerve, in this case, explicitly speaking of direct involvement of the left hemilateral vagus nerve (X pair), the tumor was dissected and enucleated seeking to preserve the functions of the nerve mentioned above. Subsequently, the patient presented data of Horner's syndrome during the immediate and immediate postoperative period with ptosis and enophthalmos, lasting for two months with alterations that remitted favorably, without data of paralysis, alterations in swallowing or dysphonia, only continued with pain in the temporal region when chewing.

RESUMEN

El Schwannoma o neurilemoma es conocido como una tumoración poco común o frecuente, proveniente de las células de Schwann (células gliales que se encuentran en el sistema nervioso periférico) y en la mayoría de las situaciones se comportan de manera benigna. El caso que presentamos es ilustrativo de una patología poco común, una tumoración benigna que se diferencia a lo largo de las líneas schwannianas, algunas de estas tumoraciones pueden tener actividad mitótica no insignificante, pero su comportamiento es benigno; sin embargo, este tipo de tumores suelen aparecer en los tejidos blandos profundos y sólo raras veces comprometen el tejido subcutáneo. Durante este reporte abordaremos el caso de una paciente de la tercera década de la vida, la cual presenta una tumoración cervical con crecimiento durante tres años hasta el abordaje médico-quirúrgico, posterior a inicio de sintomatología, aunque sin datos de compromiso de vía aérea, estado hemodinámico o alteraciones neurológicas, pero sí presentando importante dolor y dificultad a la movilización cervical. Se complementa con estudios de imagen que sugieren descartar quiste branquial contra adenoma pleomorfo. El tratamiento de elección es la escisión, ya que habitualmente el schwannoma desplaza y comprime el nervio residual en su periferia, pudiendo ser retirado sin afectar al nervio, en este caso específicamente hablando de afección directa al nervio vago (X par) hemilateral izquierdo, se diseca y enuclea la tumoración con lo que se busca preservar las funciones del nervio ya mencionado. Posteriormente la paciente presenta datos de síndrome de Horner durante el postquirúrgico inmediato y mediato con ptosis y enoftalmos, llegando a durar con alteraciones que luego de dos meses remiten favorablemente, sin datos de parálisis, alteraciones en la deglución o disfonía, sólo continua con dolor en región temporal a la masticación.

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INTRODUCTION

Schwannoma, neurinoma, neurolemoma, or neurilemoma is the formation of a benign neoplasm frequently seen in association with cranial nerve VIII (vestibulocochlear) and neurofibromatosis II.

These tumors were first described by Virchow and Verocay in 1910, but it was not until 1932 that Masson coined the term "schwannoma".

It is a rare, asymptomatic tumor originating from Schwann cells near a peripheral nerve. It usually appears in the fourth and fifth decades of life, with no apparent distinction between sexes, being its location predominantly in the head, neck, and extremities, and of single appearance; multiple forms are usually associated with Von Recklinghausen's neurofibromatosis. According to Daly and Roesler, lateral tumors evolve from cutaneous or muscular branches of the cervical plexus or the brachial plexus. In contrast, medial tumors arise from the last four cranial nerves and the cervical sympathetic chain.[1]

It is a pathology with generally slow clinical evolution, thus causing a late diagnosis in most patients suffering from this pathology.

At the time of diagnosis, it is essential to perform a correct and complete anamnesis and, above all, to have high-resolution imaging studies as diagnostic support (computed tomography scan, magnetic resonance imaging, and carotid arteriography).

According to pathological anatomy, they are subcutaneous, encapsulated lesions characterized by a double histological pattern, the Antoni A and B areas.

The areas of Antoni A are made up of the cellular component of the lesion, characterized mainly by dense clusters of Schwann cells, whose nuclei are arranged in some areas in a palisade, giving rise to two parallel rows separated by the prolongations of the Schwann cells, characteristics known as Verocay bodies.

Areas of Antoni B tend to present hypocellularity with irregular formation and predominate in a loose myxoid stroma with blood vessels and chronic inflammatory cells.

Most are sporadic and solitary but may be associated with neurofibromatosis, especially in neurofibromatosis type 2 NF2 and schwannomatosis (a distinct entity).[2]

Of the schwannomas, 10% are extracranial, and of this, 25-45% occur in the head and neck; 50% of the parapharyngeal schwannomas have origin in the vagus nerve, with the cervical sympathetic chain being the second most frequent site of schwannoma settlement. According to Laconi and Faggioni, those of the cervical sympathetic chain are extremely rare, with less than 60 cases reported in the English literature.[2]

Surgical excision continues to be the therapeutic management for schwannomas; with a low recurrence rate; complementary treatment is not recommended. Sending the anatomopathological specimen for study is necessary to confirm the diagnosis of schwannoma.

PRESENTATION OF THE CASE

The case is a 21 years-old female patient from Ciudad Juarez, Chihuahua, Mexico; she is a catholic housewife with a high-school education and a history of a normal pregnancy, with eutocic delivery at term and binomial discharge. She has no other relevant history, no chronic degenerative diseases, or previous surgeries. She denies smoking, alcoholism, and drug addiction.

Her current condition started four years ago (2018-2021), with localized pain in left hemi collar and a progressive increase in volume, without data of dysphagia or dyspnea, which begins with gradual growth until causing pain, 3/10 in intensity according to visual analog pain scale (VAS) and difficult cervical mobilization. She had no infectious process, fever, or constitutional symptoms history.

Physical examination revealed the presence of a cervical tumor measuring approximately 12 × 8 × 10 cm, indurated, and fixed to deep planes, covering regions II, III, and Va of the left hemi collar *(Figure 1)*; it was slightly painful on palpation with a 3/10 intensity on VAS, without difficulty in opening the mouth, no facial asymmetry nor airway involvement.

There was no systemic inflammatory response syndrome, hemodynamic instability, or cardiopulmonary compromise. As a

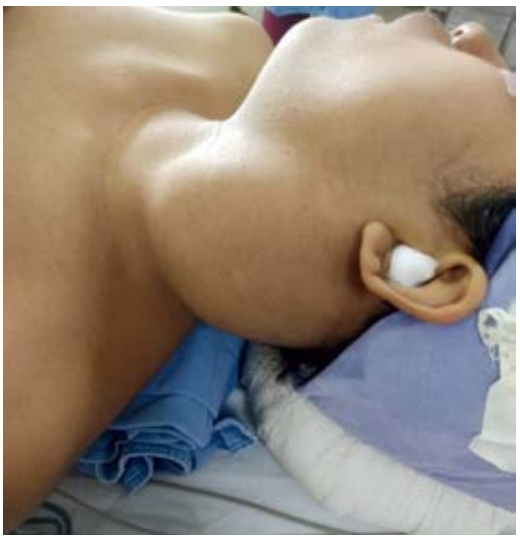

Figure 1: *Ovoid tumor in regions II, III, and Va of the left hemi collar.*

diagnostic complement, a CT scan is requested, which reports a large, rounded mass of solid appearance with regular edges, well delimited, heterogeneous, predominantly hypodense, with small areas of lower density inside, without identifying calcifications, with a density between 24 and 37 HU and that after the administration of intravenous contrast presents a density between 33 and 87 HU. It was in the left parapharyngeal level of 6.6 × 7.5 × 9.2 cm, as a left parapharyngeal space lesion with a suspected branchial cyst versus pleomorphic adenoma versus hemorrhagic branchial cyst *(Figures 2 to 4)*.

The study protocol was followed, and the surgical procedure was programmed. On the operating table with the patient in supine decubitus with Rossier position, a cervicotomy was performed through a Paul André cervical incision. After dissecting by planes (skin, subcutaneous cellular tissue, platysma), the sternocleidomastoid muscle was located, and a tumor located in the parapharyngeal space between the internal jugular vein and carotid artery *(Figure 5)* was found; it was dissected and enucleated, and a meticulous subcapsular dissection was performed trying to preserve the functions of the nerve of apparent origin, in this case, the X cranial nerve, to avoid its resection. The piece was sent to pathology; hemostasis was performed, and a negative pressure closed drainage of type Drenovac of 1/8 was placed. The surgical incision was closed by planes; in the fascia, Vicryl 2-0 was used, and the skin was approached with a nylon 3-0 intradermal stitch, and the surgical event ended.

During a four-day hospital stay, analgesic management and prophylactic antibiotic therapy were administered, and serous drainage decreased to report a minimum of 20 cm^3 in 24 hours; by then, it was removed. In the immediate postoperative course, ptosis and enophthalmos were seen, in addition to pain at the surgical site. They all improved and showed a clear progression. Therefore, the discharge was decided with outpatient follow-up at two weeks, one month, two months, and four months later, with remission of postoperative sequelae almost entirely, with no data of paralysis, swallowing disorders, or dysphonia. Currently, the patient only presents pain in the left lower jaw when chewing and pain in the ipsilateral temporal region.

Subsequently, a histopathological report was obtained with folio Q215-2022, where it was mentioned a neck tumor compatible with schwannoma, with an immunohistochemistry

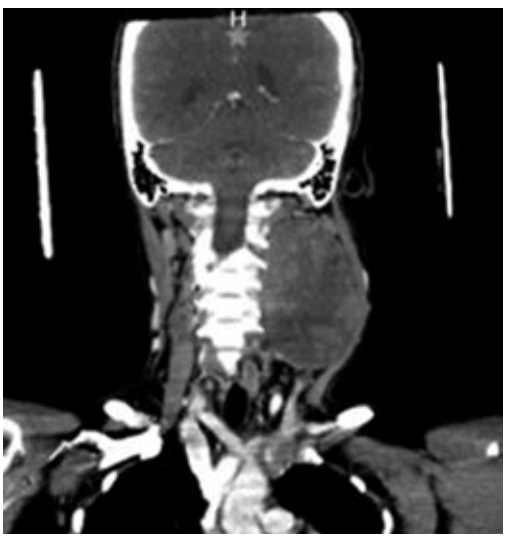

Figure 2: *Coronal section computed tomography scan showing a large mass with a solid appearance at the left parapharyngeal level.*

report with a result describing diffuse S100 (+++/+++) vimentin positive (+++/+++) *(Figures 6 and 7)*.

DISCUSSION

According to Araujo CE and Zhang H, this type of cervical tumor usually has a slow growth of approximately 2 to 3 mm per year;[3,4] according to the time of evolution of the reported case, if it complied with the above mentioned, it would measure no more than 1 cm; however, it measured ten times more. A factor is added because lesions of this type could have variable growth.

Luisa Gil and Marta Ortega Millán mention that one of the critical characteristics when interpreting imaging studies, given the fusiform morphology of the lesion with the major longitudinal axis, is that it follows the path of the nerve, which is characteristic in this type of lesion,[5] and shares the same characteristics in the report addressed.

It is of vital importance to know this pathology in the first instance to suspect it and to be able to make a diagnosis employing imaging studies. According to G. Cavallaro, fine needle puncture (FNA) has a low yield.[6]

The literature also mentions the high resistance of schwannomas to radiotherapy, thus leaving surgery as the treatment of choice. Precisely, the technique that consists of enucleation of these tumors, with preservation and protection of the nerve, total excision of the lesion of the neurovascular bundle is performed through a transcervical approach.[7]

According to Gibber, surgical resection can be achieved by enucleating the schwannoma of the vagus nerve and preserving it by microsurgical dissection and neuromonitoring,

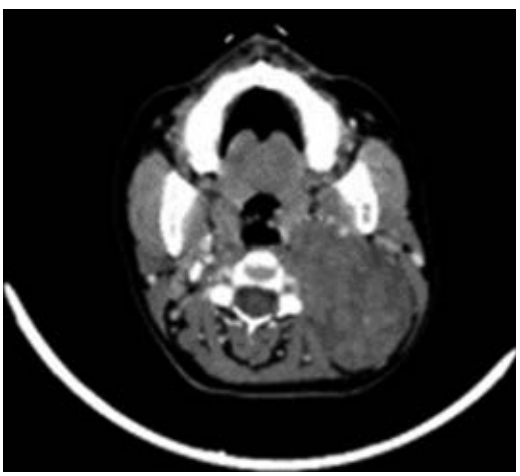

Figure 3: *Axial computed tomography scan with a solid appearing mass in left parapharyngeal space.*

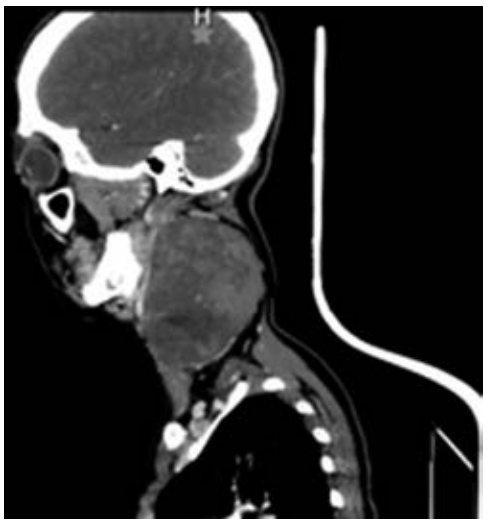

Figure 4: *Sagittal section of a computed tomography scan showing a solid lesion in the cervical region of approximately 10 × 9 cm.*

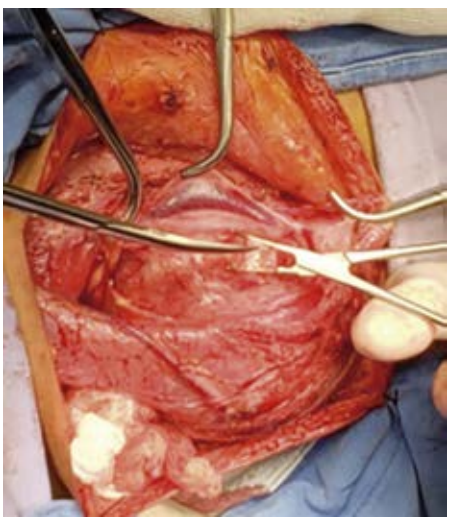

Figure 5: *Retraction of the internal jugular vein evidencing the origin of the schwannoma from the vagus nerve.*

thus reducing postoperative morbidity.[8] This is also mentioned by Kwok and Davis when referring to the use of intraoperative electrophysiological monitoring as a helpful tool during schwannoma resection.[9] In our particular case, the pathology approach was performed with high suspicion of a branchial cyst, so neuromonitoring was never considered as such, due to enucleation of the nerve from the schwannoma, preserving the nerve without monitoring.

As one of the complications during the follow-up at two and four months, the patient presented data of ptosis and enophthalmos, characteristic of Horner's syndrome, which, according to Massimo Politi and Faith Bingol, is one of the rare post-surgical manifestations with a duration of up to four months after the surgical event,[10,11] during which our patient had a good evolution and progression, reducing the clinical picture almost entirely. The patient presented with pain in the wound area and swallowing disorder with functional limits, with no data of paralysis or dysphonia.

CONCLUSIONS

Schwannoma is an infrequent pathology within neck tumors, but it is essential to consider it in soft tissue tumor pathology. Its approach is clinical, and with the support of imaging studies to reach the suspicion, better options for a trans-surgical approach, such as neuromonitoring, are considered, which offers a wide area of opportunity where professionals can obtain better results.

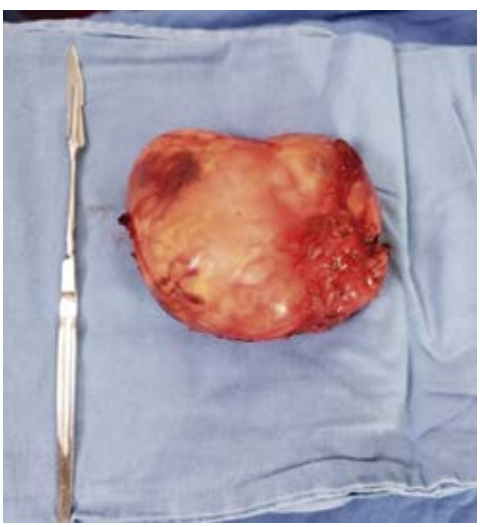

Figure 6: *Indurated tumor lesion with irregular borders.*

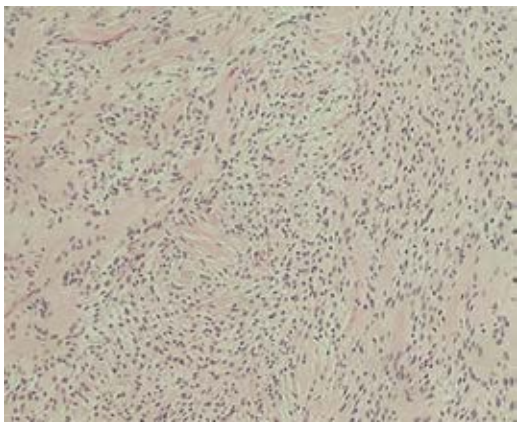

Figure 7: *Histopathologic section showing Antoni-A areas containing Verocay bodies, consisting of cells with oval-shaped nuclei and hypercellularity, and Antoni-B areas with diffuse laxity with hyaline degeneration and hypocellularity.*

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