



REVISTA DE
GASTROENTEROLOGÍA
DE MÉXICO

www.elsevier.es/rgmx



ORIGINAL ARTICLE

Laparoscopic management of pancreatic pseudocysts: experience at a general hospital in Mexico City[☆]



B.A. Crisanto-Campos^{a,*}, E. Arce-Liévano^b, L.E. Cárdenas-Lailson^c,
L.S. Romero-Loera^d, M.E. Rojano-Rodríguez^e, M.A. Gallardo-Ramírez^f,
J. Cabral-Oliver^g, M. Moreno-Portillo^e

^a Clínica de Cirugía Hepatobiliar y Pancreática del Departamento de Cirugía General, Cirugía Endoscópica y Endoscopia Gastrointestinal, Hospital General Dr. Manuel Gea González, Secretaría de Salud, Mexico City, Mexico

^b Departamento de Cirugía Endoscópica, Hospital General Dr. Manuel Gea González, Secretaría de Salud, Mexico City, Mexico

^c Clínica de Cirugía Hepatobiliar y Pancreática del Departamento de Cirugía General, Hospital General Dr. Manuel Gea González, Secretaría de Salud, Mexico City, Mexico

^d Departamento de Cirugía General, Hospital General Dr. Manuel Gea González, Secretaría de Salud, Mexico City, Mexico

^e Departamento de Cirugía Endoscópica y Endoscopia Gastrointestinal, Hospital General Dr. Manuel Gea González, Secretaría de Salud, Mexico City, Mexico

^f Departamento de Endoscopia Gastrointestinal, Hospital General Dr. Manuel Gea González, Secretaría de Salud, Mexico City, Mexico

^g Departamento de Cirugía Bariátrica, Hospital General Dr. Manuel Gea González, Secretaría de Salud, Mexico City, Mexico

Received 2 March 2015; accepted 28 May 2015

Available online 28 August 2015

KEYWORDS

Pancreatic pseudocyst;
Laparoscopic drainage;
Walled off pancreatic necrosis;
Acute peripancreatic fluid collections

Abstract

Background: Invasive management of pancreatic pseudocysts (PP) is currently indicated in those patients with symptoms or complications. Treatment options are classified as surgical (open and laparoscopic) and non-surgical (endoscopic and radiologic).

Aim: To describe the morbidity, mortality, and efficacy in terms of technical and clinical success of the laparoscopic surgical approach in the treatment of patients with PP in the last 3 years at our hospital center.

Methods: We included patients with PP treated with laparoscopic surgery within the time frame of January 2012 and December 2014. The morbidity and mortality associated with the procedure were determined, together with the postoperative results in terms of effectiveness and recurrence.

[☆] Please cite this article as: Crisanto-Campos BA, Arce-Liévano E, Cárdenas-Lailson LE, Romero-Loera LS, Rojano-Rodríguez ME, Gallardo-Ramírez MA, et al. Manejo laparoscópico de los pseudoquistes pancreáticos: experiencia de un hospital general en la Ciudad de México. Revista de Gastroenterología de México. 2015;80:198–204.

* Corresponding author. Hospital General Dr. Manuel Gea González, Departamento de Cirugía Endoscópica y Endoscopia Gastrointestinal, Calzada de Tlalpan nº 4800, México, D.F., C.P. 14080. Tel.: +01 55 4000 3000; ext.: 3329; Cel: 044 55 3225 7837.

E-mail address: braulioaaroncc@hotmail.com (B.A. Crisanto-Campos).

Results: A total of 38 patients were diagnosed with PP within the last 3 years, but only 20 of them had invasive treatment. Laparoscopic surgery was performed on 17 of those patients (mean pseudocyst diameter of 15.3, primary drainage success rate of 94.1%, complication rate of 5.9%, and a 40-month follow-up).

Conclusions: The results obtained with the laparoscopic technique used at our hospital center showed that this approach is feasible, efficacious, and safe. Thus, performed by skilled surgeons, it should be considered a treatment option for patients with PP.

© 2015 Asociación Mexicana de Gastroenterología. Published by Masson Doyma México S.A. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

PALABRAS CLAVE

Seudoquiste
pancreático;
Drenaje
laparoscópico;
Necrosis pancreática
encapsulada;
Colecciones
peripancreáticas
agudas

Manejo laparoscópico de los seudoquistes pancreáticos: experiencia de un hospital general en la Ciudad de México

Resumen

Antecedentes: Actualmente el manejo invasivo de los seudoquistes pancreáticos (SP) está indicado en aquellos que ocasionan síntomas en el paciente o que desarrollan complicaciones. Las opciones de tratamiento se clasifican en quirúrgicas (convencionales y laparoscópicas) y no quirúrgicas (endoscópicas y radiológicas).

Objetivo: Describir la morbilidad, la mortalidad y la eficacia en términos de éxito técnico y clínico del abordaje quirúrgico laparoscópico en el tratamiento de los pacientes con SP de los últimos 3 años en el hospital sede.

Materiales y métodos: Se incluyeron pacientes con SP tratados de manera quirúrgica laparoscópica en el periodo comprendido de enero de 2012 a diciembre de 2014. Se determinó la morbimortalidad asociada al procedimiento y los resultados posquirúrgicos en términos de efectividad y recurrencia.

Resultados: Treinta y ocho pacientes fueron diagnosticados con SP en los últimos 3 años de los cuales 20 tuvieron indicación de tratamiento invasivo; a 17 se les sometió a tratamiento quirúrgico laparoscópico (diámetro promedio del SP 15.3 cm, éxito primario de drenaje del 94.1%, el 5.9% presentó complicaciones, 40 meses de seguimiento).

Conclusiones: Los resultados obtenidos con la técnica laparoscópica utilizada en el hospital sede demuestran que dicho abordaje es factible, eficaz y seguro; por lo que, en manos expertas debe considerarse como una opción para el tratamiento de pacientes con SP.

© 2015 Asociación Mexicana de Gastroenterología. Publicado por Masson Doyma México S.A. Este es un artículo Open Access bajo la licencia CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Pancreatic and peripancreatic collections are divided into 4 categories (acute collections, post-necrotic acute collections, pancreatic pseudocysts [PPs], and encapsulated pancreatic necrosis). At present, PPs are the most common cause of cystic lesions of the pancreas.^{1,2}

Current PP management indications are based on the presence of symptoms (abdominal pain, early satiety, weight loss, persistent fever) or complications (infection, gastric or biliary obstruction, rupture, vascular thrombosis, or pseudoaneurysm formation).^{3,4}

Treatment options for PPs are classified as surgical (open and laparoscopic) and nonsurgical (endoscopic and radiologic).^{5,6}

Internal drainage of PPs through conventional open surgery was first described in 1923 when Jedlica published the cystogastrostomy technique.⁷ In 1996 Gumaste et al.

published a systematic review of the literature that included 1,032 patients from 14 different studies that underwent conventional open surgery for internal PP drainage and reported morbidity of 40% and mortality of 5.8%.⁸

Because of this elevated morbidity and mortality rate, in the 1990s interest was sparked in developing minimally invasive surgical treatment options that resulted in the description of different internal drainage techniques with the laparoscopic approach, such as laparoscopic posterior or exogastric cystogastrostomy reported by Morino et al. in 1995 and by Park and Schwartz in 1999, transgastric or anterior cystogastrostomy, endogastric cystogastrostomy, and cystojejunostomy with a Roux-en-Y jejunal loop.^{9,10}

Since then, there have been numerous case series describing the success and morbidity and mortality rates of different laparoscopic drainage techniques (table 1). In 2007 Aljarabah and Ammori carried out a systematic review of the literature and reported complication, mortality, and

Table 1 Laparoscopic pancreatic pseudocyst treatment case series.

Author	Number of patients	Etiology	Surgical approach	Surgery duration (min)	Technical success (%)	Days of postoperative hospital stay	Complications (%)	Follow-up (months)	Recurrence rate (%)
Palanivelu et al.	108	54% biliary ethylic 18.5%	83.4% LTCCG 7.4% LCJ 7.4% LED 1.8% LEnCG	86 126 58 110	100	5.6	4.6%	54	0
Park et al.	29	48% biliary ethylic 34%	38% LTCCG 31% LPCG 17% LEnCG 11% LCJ 3% LED	168 168 150 234 105	97	4.4	0	15.8	0
Hamza et al.	28	46% biliary ethylic 29%	57% LTCCG 14% LPCG 11% LEnCG 14% LCJ 4% LCD	70 120 165 135 NR	97	2	3.3%	15	7.1
Hauters et al.	17	59% biliary ethylic 30%	35% LEnCG 24% LTCCG 41% LCJ	105 85 240	96	6	12%	12	0
Mori et al.	14	50% biliary ethylic 29%	100% LEnCG	NR	71	8.6	7%	19	7
Dávila-Cervantes et al.	10	40% biliary ethylic 40%	40% LTCCG 20% LEnCG 40% LCJ	240	100	7	20%	22	0

LED: Laparoscopic cystoduodenostomy; LCJ: Laparoscopic cystojejunostomy; LEnCG: Laparoscopic external drainage; LEnCG: Laparoscopic endogastric cystogastrostomy; LPCG: Laparoscopic posterior cystogastrostomy; LTCCG Laparoscopic transgastric cystogastrostomy; NR: Not reported.

recurrence rates of 4.6, 0, and 0%, respectively, in patients with laparoscopically treated PP.¹¹

In 2014 Khaled published a retrospective study that directly compared the laparoscopic surgical technique with the conventional open approach for PP treatment and concluded that the former offered advantages in terms of shorter surgery duration, a lower morbidity rate, and shorter hospital stay, and therefore should be considered the first choice approach in centers that have the adequately trained personnel.¹²

Minimally invasive treatment techniques have recently been described for pancreatic and peripancreatic collections different from PP. In 2010 Van Santvoort et al. carried out a multi-center, prospective, randomized study showing that patients with infected necrotic pancreatitis treated through a minimally invasive technique (the step-up approach) using computerized axial tomography-guided fine needle aspiration and/or laparoscopic necrosectomy had a lower rate of multiple organ failure, a lower incidence of incisional hernia, and a lower incidence of new-onset diabetes than the patients treated through open necrosectomy.¹³

Aim

Our aim was to describe the morbidity, mortality, and efficacy in terms of technical and clinical success associated with the laparoscopic surgical approach in patients with PP treated at the Hepatobiliary and Pancreatic Clinic of our hospital center over the last 3 years.

Methods

A retrospective, cross-sectional, observational, and descriptive study was conducted. The case records were reviewed of the patients 18 years of age or older that were diagnosed with PP and treated through laparoscopic posterior cystogastrostomy at our hospital center within the time frame of January 2012 and December 2014.

A contrast-enhanced computerized axial tomography scan was carried out on the patients with a history of acute pancreatitis that were seen as outpatients 4 weeks after the inflammatory pancreatic event and presented with epigastric pain, early satiety, or persistent fever. PP was defined as a peripancreatic collection meeting the following tomographic criteria: round or oval, with a well-defined wall, content with a fluid density in Hounsfield units, and no evidence of solid debris or necrotic tissue in its interior. Infected PP was defined as a collection presenting tomographic evidence of gas in its interior.

The patients that fit the abovementioned criteria underwent internal drainage through laparoscopic cystogastrostomy as a first treatment option, performed by a surgeon and an assistant. The technique employed at our hospital center is described in detail in the 2012 *Revista Mexicana de Gastroenterología*¹⁴ and the most important steps are the following: the patient under general anesthesia, the pneumoperitoneum is insufflated with a Veress needle, inserting a 10mm supraumbilical optical port and three 5mm working ports at the subxiphoid location and the mid-clavicular line in the right and left subcostal

regions, respectively. To gain access to the pancreas, the gastrocolic ligament is dissected with monopolar and bipolar cautery. The posterior surface of the stomach and the anterior surface of the pseudocyst are located and dissected. The pseudocyst is incised using a monopolar hook and its content is aspirated. The posterior surface of the stomach is then incised at the level corresponding to the incision in the wall of the PP. A 3 cm anastomosis is performed with 0 polypropylene separate sutures using an extracorporeal Gea knot. The procedure is finished by placing 2 Jackson-Pratt drains at the surgical site and closing the aponeurosis with Vicryl 1 and the skin with 3-0 polypropylene simple sutures. In cases with a biliary etiology of the patient's acute pancreatitis episode culminating in PP formation, conventional laparoscopic cholecystectomy following the Strasberg principles was performed as the initial step of the surgical procedure.

Patients resumed oral intake in the postoperative period as soon as gastrointestinal function was recovered (bowel sounds and the passage of flatus) and they were released from the hospital when they tolerated that diet and the drains had a serous output under 100 cc for 24 h (the drains were removed on the day of release).

The drained pseudocyst diameter (measured through tomography), the percentage of conversion to open surgery, primary drainage success defined as the clinical and tomographic resolution of the pseudocyst in a single surgery, surgery duration, intraoperative blood loss, days of postoperative hospital stay, and complications requiring surgical or endoscopic intervention under general anesthesia (III b according to the Clavien-Dindo classification) during the first 30 postoperative days were recorded.

Outpatient follow-up consisted of monthly consultations for the first 6 postoperative months and then appointments every 3 months. At each consultation the patient was asked about possible recurrence symptoms, such as early satiety, abdominal pain, and weight loss. In addition, control tomography scans were done at the 2nd and 6th months of follow-up. Recurrence was considered if there were persistent symptoms or tomographic evidence of residual pseudocyst during the follow-up.

Statistical analysis

The data were registered on a data collection sheet specifically designed for this line of investigation and then put in a database (Microsoft Excel; Microsoft Corporation, Seattle, WA, USA). Descriptive statistics with simple percentages, means, and minimum and maximum values were used for establishing the results of the laparoscopic surgical approach in the treatment of patients with PP.

Results

A total of 38 patients diagnosed with PP were attended to at our hospital center over the last 3 years. Twenty-three were men and 15 were women and their mean age was 38.8 years (13-76 years).

A total of 18 patients (47.3%) did not meet the criteria for invasive management and remained under surveillance. The peripancreatic collection was reabsorbed in 100% of

the cases and there were no remaining or residual local complications. Twenty patients (52.7%) met the criteria for invasive management (symptoms and complications).

Of the 20 patients that required invasive management, 13 (64%) had a history of acute biliary pancreatitis. Of those patients, the underlying etiology of the acute pancreatitis was alcohol-related in 6 (32%) and in one (4%) it was due to hypertriglyceridemia. Of the 20 patients, 13 were men and 7 were women.

In the group of patients requiring invasive management, 17 (77.2%) underwent laparoscopic posterior cystogastrostomy as the first treatment option (table 2). The indication for invasive treatment was the presence of symptoms in 88.2% of the patients and infected pseudocyst in the remaining 11.8%. Of those patients, 11 were men and 6 were women and their mean age was 39.7 years (20-63 years). Acute pancreatitis etiology was biliary in 64.7% of the cases, alcohol-related in 29.4%, and due to hypertriglyceridemia in 5.8%.

The mean transverse length of the laparoscopically-drained pseudocysts was 15.3 cm (5.5-25 cm). The entire procedure was laparoscopic and there was no need for conversion to open surgery in any of the 17 cases. The pseudocyst was resolved in 16 patients (94.1%) with a single surgical intervention (primary drainage success). In the remaining case (5.9%), despite having a preoperative computerized axial tomography scan that showed a collection with fluid content and no necrosis, abundant necrotic detritus was encountered during the procedure. Once the detritus was debrided, the cystogastrostomy continued with the previously described technique. In the postoperative period the patient presented with obstruction of the anastomosis by necrotic debris, which was resolved through endoscopic dilation. The mean surgery duration was 177 min (range: 90-350 min), being longer in the first cases. The mean intraoperative blood loss was 151 ml (20-300 ml).

Only one patient (5.9%) had a complication associated with the procedure. Due to the presence of blood output through the drain, he underwent a diagnostic laparoscopy that revealed bleeding from the subxiphoid trocar insertion site, which was controlled laparoscopically.

Postoperative hospital stay was a mean of 6.8 days (2-18 days). The current follow-up period is 40 months and so far no disease recurrence has been registered (table 3).

Discussion

This is the largest published case series to date in a Mexican population on the laparoscopic surgical treatment of PPs. In 2004 Dávila-Cervantes et al. reported complications of 20% and 0% recurrence in 22 months of follow-up on 10 Mexican patients with PP treated through laparoscopic internal drainage.¹⁵

Our data show that the minimally invasive technique for treating patients with PP employed at our hospital center is a feasible, safe, and effective option in our medical environment and the results are comparable to those published in the largest and most recent article on laparoscopic drainage of PP. In that case series by Palanivelu et al., which included 108 patients, they reported a mean postoperative hospital

Table 2 Patients with pancreatic pseudocyst treated through the laparoscopic surgical approach at our hospital center.

	Age (years)	Sex	AP etiology	Drainage indication	PP diameter (cm)	PP location	Conversion to open surgery	Primary drainage success	Surgery duration (min)	Surgical bleeding (ml)	Complications	Days of postoperative hospital stay	Recurrence	Mortality
1	27	M	Ethylic	EP, ES	15	Body and tail	No	Yes	90	200	No	4	No	No
2	34	M	Biliary	EP,ES	13	Body and tail	No	Yes	180	100	subxiphoid port insertion site bleeding	4	No	No
3	44	M	Ethylic	EP	9	Head	No	Yes	210	150	No	2	No	No
4	39	M	Tg	EP,WL	18	Body and tail	No	Yes	180	240	No	8	No	No
5	49	M	Biliary	IPP	17	Body and tail	No	Yes	210	20	No	4	No	No
6	62	W	Biliary	EP	11	Body	No	Yes	350	80	No	6	No	No
7	54	M	Ethylic	EP	10	Tail	No	Yes	121	100	No	3	No	No
8	20	W	Biliary	EP	14	Body and tail	No	Yes	90	30	No	6	No	No
9	34	W	Biliary	EP,ES	11	Body	No	Yes	150	200	No	4	No	No
10	21	M	Ethylic	EP	5.5	Body	No	Yes	175	150	No	12	No	No
11	25	M	Biliary	EP, ES, WL	24	Body and tail	No	Yes	101	150	No	4	No	No
12	51	M	Biliary	EP, ES	14	Body	No	No	100	300	No	5	No	No
13	43	M	Biliary	EP	18	Body	No	Yes	280	300	No	10	No	No
14	63	W	Biliary	IPP	21	Body	No	Yes	260	150	No	10	No	No
15	24	M	Ethylic	EP	19	Tail	No	Yes	180	100	No	10	No	No
16	32	W	Biliary	EP, ES, WL	25	Body	No	Yes	180	160	No	18	No	No
17	53	W	Biliary	EP	16	Body	No	Yes	160	150	No	7	No	No

AP: Acute pancreatitis; EP: Epigastric pain; ES: Early satiety; IPP: Infected Pancreatic pseudocyst; M: Men; PP: Pancreatic pseudocyst; Tg: Triglycerides; W: Women; WL: Weight loss.

Table 3 Results of the laparoscopic surgical approach.

Mean age	39.7 years (20-63)
Sex (Men: Women)	11:6
AP etiology	64.7% biliary 29.4% ethylic 5.8% triglycerides
Mean PP diameter	15.3 cm (5.5-25)
Conversion to open surgery	0%
Primary drainage success	94.1%
Mean surgery duration	177 min (90-350)
Mean surgical bleeding	151 ml (20-300)
Complications	5.9%
Days of postoperative hospital stay	6.8 days (2-18)
Recurrence	0%
Follow-up	40 months
Mortality	0%

AP: acute pancreatitis; PP: pancreatic pseudocyst

stay of 5.6 days and conversion, morbidity, mortality, and recurrence rates of 0, 8.3, 0, and 1%, respectively.¹⁶

It is important to point out that in contrast to the other case series published in the international literature that use different types of laparoscopic internal drainage (transgastric cystogastrosopies, cystojejunoscopies, etc.), only one laparoscopic technique (posterior cystogastrostomy) is used at our hospital, which facilitates the teaching/learning process and the reproducibility of the technique.

Minimally invasive management (laparoscopic and endoscopic) of PPs is currently gaining ground over the open approach.¹² In 2013, Varadarajulu et al. published a randomized, prospective study that compared a minimally invasive approach (endoscopic drainage) with the conventional surgical approach, showing that in select cases, endoscopic management achieves the same success rates as conventional surgical treatment, but with fewer days of hospital stay and a lower economic cost.¹⁷

It remains to be established whether one minimally invasive treatment modality is superior to another. In 2009 Melman conducted a retrospective study comparing laparoscopic drainage with endoscopic drainage. He concluded that the primary success rate for PP drainage was statistically superior with the surgical approach.⁵

Conclusions

The results obtained with the laparoscopic posterior cystogastrostomy technique at our hospital center showed that this approach in our environment is feasible, safe, and effective, and in skilled hands, should be considered a treatment option for patients with PP. Our technique has the added advantage of being standardized and thus facilitates the teaching/learning process of the procedure, making our hospital a human health resource formation center for the minimally invasive treatment of this pathology in the Mexican population.

Ethical responsibilities

Protection of persons and animals. The authors declare that no experiments were performed on humans or animals for this study.

Data confidentiality. The authors declare that they have followed the protocols of their work center in relation to the publication of patient data.

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

Financial disclosure

No financial support was received in relation to this study/article.

Conflict of interest

The authors declare that there is no conflict of interest.

References

1. Brun A, Agarwal N, Pitchumoni CS. Fluid collections in and around the pancreas in acute pancreatitis. *J Clin Gastroenterol.* 2011;45:614–25.
2. Banks P, Bollen T, Dervenis C, et al. Classification of acute pancreatitis-2012: Revision of the Atlanta classification and definitions by international consensus. *Gut.* 2013;62:102–11.
3. Johnson MD, Walsh RM, Henderson JM. Surgical versus nonsurgical management of pancreatic pseudocysts. *J Clin Gastroenterol.* 2009;43:586–90.
4. Cheruvu CV, Clarke MG, Prentice M, et al. Conservative treatment as an option in the management of pancreatic pseudocyst. *Ann R Coll Surg Engl.* 2003;85:313–6.
5. Melman L, Azar R, Beddow K. Primary and overall success rates for clinical outcomes after laparoscopic, endoscopic, and open pancreatic cystgastrostomy for pancreatic pseudocysts. *Surg Endosc.* 2009;23:267–71.
6. Behrns KE, Ben-David K. Surgical therapy of pancreatic pseudocysts. *J Gastrointest Surg.* 2008;12:2231–9.
7. Jedlica R. Eine neue operations methode der pankreaszysten (pancreatogastrostomie). *Zentral Chir.* 1923;50:132.
8. Gumaste V, Pitchumoni CS. Pancreatic pseudocyst. *Gastroenterologist.* 1996;43:3–43.
9. Park A, Schwartz R. Laparoscopic pancreatic surgery. *Am J Surg.* 1999;177:158–63.
10. Morino M, Garrone C, Locatelli C. Laparoscopic management of benign pancreatic cystic lesions. *Surg Endosc.* 1995;9:625.
11. Aljarabah M, Ammori BJ. Laparoscopic and endoscopic approaches for drainage of pancreatic pseudocysts: A systematic review of published series. *Surg Endosc.* 2007;21:1936–44.
12. Khaled Y, Malde D, Parker J, et al. Laparoscopic versus open cystgastrostomy for pancreatic pseudocysts: A case-matched comparative study. *J Hepatobiliary Pancreat Sci.* 2014;21:818–23.
13. Van Santvoort H, Besselink M, Bakker O, et al. A step-up approach or open necrosectomy for necrotizing pancreatitis. *N Engl J Med.* 2010;362:16.

14. Crisanto B, Rojano M, Cárdenas L, et al. Drenaje laparoscópico de un pseudoquiste pancreático: reporte de caso. *Rev Gastroenterol Mex.* 2012;77:148–52.
15. Dávila-Cervantes A, Gomez F, Chan C. Laparoscopic drainage of pancreatic pseudocysts. *Surg Endosc.* 2004;18:1420–6.
16. Palanivelu C, Senthilkumar K, Madhankumar MV. Management of pancreatic pseudocyst in the era of laparoscopic surgery—experience from a tertiary centre. *Surg Endosc.* 2007;21:2262–7.
17. Varadarajulu S, Young J, Sutton B, et al. Equal efficacy of endoscopic and surgical gastrostomy for pancreatic pseudocyst drainage in a randomized trial. *Gastroenterology.* 2013;145:583–90.