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Video-assisted retroperitoneal debridement for necrotizing pancreatitis: a single center experience in Colombia

Carlos Eduardo Rey Chaves^{1*}, María Camila Azula Uribe², Sebastián Benavides Largo², Laura Becerra Sarmiento³, María Alejandra Gómez-Gutierrez³ and Liliana Cuevas López²

Abstract

Introduction Acute pancreatitis (AP) is a common and potentially lethal disease. Approximately 10–20% of the patients progress to necrotizing pancreatitis (NP). The step-up approach is the gold standard approach to managing an infected necrotizing pancreatitis with acceptable morbidity and mortality rates. Video-assisted retroperitoneal debridement (VARD) has been described as a safe and feasible approach with high success rates. Multiple studies in the American, European, and Asian populations evaluating the outcomes of VARD have been published; nevertheless, outcomes in the Latin American population are unknown. This study aims to describe a single-center experience of VARD for necrotizing pancreatitis in Colombia with a long-term follow-up.

Methods A prospective cohort study was conducted between 2016 and 2024. All patients over 18 years old who underwent VARD for necrotizing pancreatitis were included. Demographic, clinical variables, and postoperative outcomes at 30-day follow-up were described.

Results A total of 12 patients were included. The mean age was 55.9 years old (SD 13.73). The median follow-up was 365 days (P25 60; P75 547). Bile origin was the most frequent cause of pancreatitis in 90.1% of the patients. The mean time between diagnosis and surgical management was 78.5 days (SD 22.93). The mean size of the collection was 10.5 cm (SD 3.51). There was no evidence of intraoperative complications. The mean in-hospital length of stay was 65.18 days (SD 26.46). One patient died in a 30-day follow-up. One patient presented an incisional hernia one year after surgery, and there was no evidence of endocrine insufficiency at the follow-up.

Conclusion According to our data, the VARD procedure presents similar outcomes to those reported in the literature; a standardized procedure following the STEP-UP procedure minimizes the requirement of postoperative drainages. Long-term follow-up should be performed to rule out pancreatic insufficiency.

Keywords Necrotizing pancreatitis, Infected necrotizing pancreatitis, Video-assisted retroperitoneal debridement, Step-Up approach, Outcomes, Latin America

*Correspondence:

Carlos Eduardo Rey Chaves
carlosrey991@gmail.com

¹Estudiante de Posgrado Cirugía General, Pontificia Universidad Javeriana, Facultad de Medicina, Carrera 6A #51A-48, Bogotá D.C. 111711, Colombia

²Cirugía General, Pontificia Universidad Javeriana, Facultad de Medicina, Hospital Universitario San Ignacio, Bogotá, Colombia

³Médica General, Pontificia Universidad Javeriana, Facultad de Medicina, Bogotá, Colombia



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Background

Acute pancreatitis is a common and potentially lethal disease [1]. Complications derive from local injury, systemic inflammatory response, and organic failure [1]. The principal etiology of the disease in Colombia is gallstone disease, causing approximately 40–70% of cases, yet only 3–7% of patients with cholelithiasis develop acute pancreatitis. The second most common cause is excessive alcohol consumption, responsible for 25–35% of cases; about 10% of chronic alcoholics develop a clinical episode of AP [1–3].

The most frequent course of acute pancreatitis is mild, which is treated with early fluid resuscitation, pain management, and dietary control; mortality in these patients reaches 5% [1, 2]. However, 20–30% of patients present a severe form of the disease where mortality goes up to 15%, and the highest mortality rates reach up to 35% in patients with organic failure and infected necrosis [1]. Necrotizing pancreatitis is the most severe form of acute pancreatitis and is characterized by necrosis of the pancreatic parenchyma or peripancreatic tissue; after 72 h, heterogeneous peripancreatic collections are found in computed tomography [1, 2]. Approximately 10–20% of the patients with acute pancreatitis progress to necrosis [1–3]. Between 40 and 70% of NPs will have an associated infection, with an increased risk of mortality due to organ dysfunction. Clinical worsening and the presence of gas in the collection on imaging studies can indicate an associated infection in NP [1, 2].

Surgical intervention in the first two weeks of severe acute pancreatitis is avoided due to its association with high mortality rates [3]. Intervention should be delayed until septate necrosis is developed, which usually occurs in the 3rd to 5th week after the beginning of symptoms [4]. Surgical treatment has evolved over the years; historically, surgical debridement with open necrosectomy was considered the gold standard treatment, with considerable rates of morbidity and mortality [5]. The STEP-UP approach has demonstrated an effective infection control of NP, with lesser mortality and morbidity rates than open approaches [6]. The STEP-UP approach includes percutaneous drainage [7] combined with other minimally invasive techniques such as endoscopic necrosectomy (ETN) or video-assisted retroperitoneal debridement (VARD) [8, 9]. Open necrosectomy is an option for use when there is no improvement with the STEP-UP approach [10–12].

Multiple studies in the American, European, and Asian populations describe VARD outcomes; nevertheless, outcomes in the Latin American population are unknown, and most studies have not reached long-term follow-up. This study aims to describe a single-center experience of VARD for necrotizing pancreatitis in Colombia in patients with a long-term follow-up.

Materials and methods

Study population

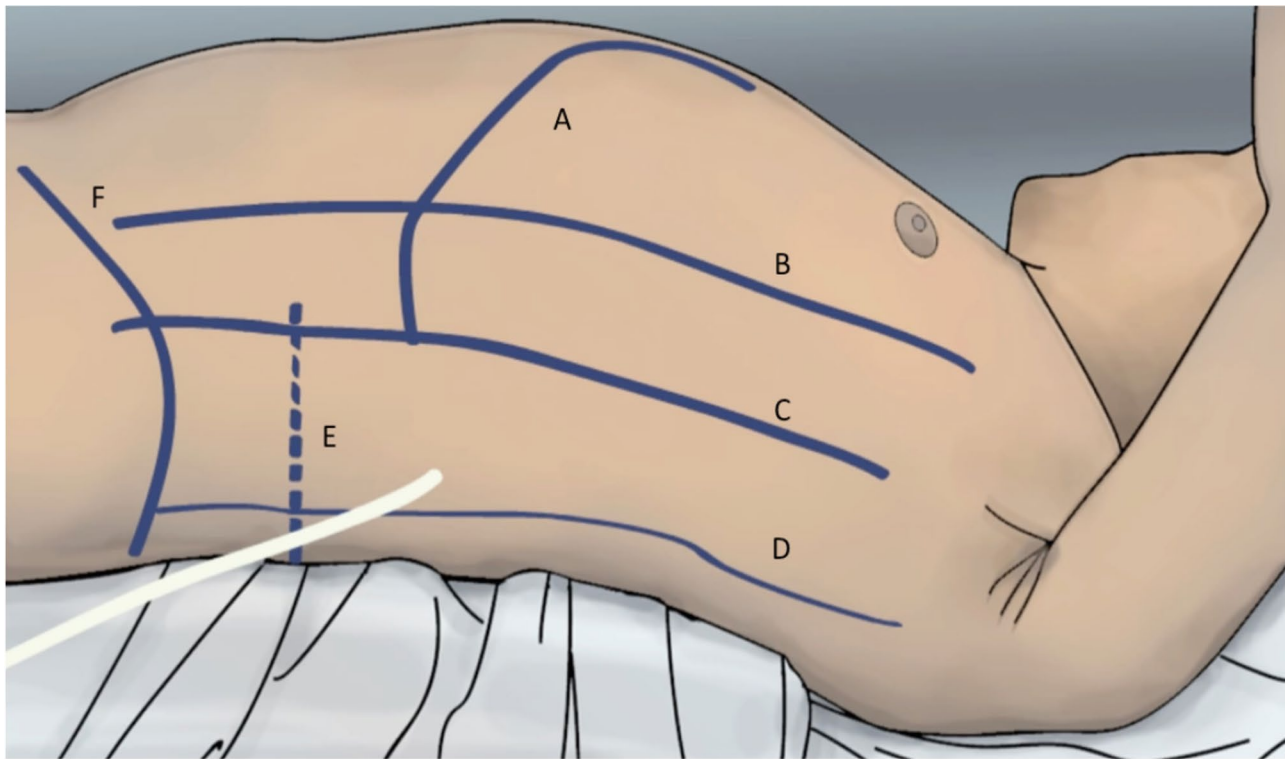
A prospective cohort study was performed between 2016 and 2024. The Institutional Review Board and the Ethics and Research Institutional Committee (IRB) approved this research. All patients over 18 years old who underwent video-assisted retroperitoneal debridement for necrotizing pancreatitis between 2016 and 2024 were included. Demographic, clinical variables, postoperative outcomes, and long-term follow-up were described. Patients treated previously in other institutions were excluded. Perioperative variables included demographics, step-up management, and characterization of pancreatitis; operative variables included operative time, surgical bleeding, postoperative characteristics including associated morbidity, bacteriological description, and long-term follow-up.

Data management - statistical analysis

Descriptive statistics were reported in terms of variable nature. Normality was evaluated using the Shapiro-Wilk test. Qualitative analysis was performed in frequencies and percentages. In contrast, quantitative analysis was done regarding mean and standard deviations of normally distributed data and medians and interquartile ranges (IQRs) for non-normally distributed data. Statistical analysis was performed in Stata version 17.0.

Surgical technique

The surgical technique was the same and was performed by one of two general surgeons who performed surgical procedures in all cases. The procedure was performed under general anesthesia. With previous anatomic landmarks highlighted (xiphoid process, left costal border, anterior iliac crest, abdominal midline, anterior median, and posterior axillary line). The incision site is defined according to the localization of the necrosis and the percutaneous drainage. The patient position was left decubitus with reverse Trendelenburg position (Fig. 1). A skin incision was performed 2 cm below the drainage catheter with approximately 3–5 cm in a transverse direction. A controlled dissection of muscular planes was performed to enter the retroperitoneal space, followed by blunt dissection of the percutaneous catheter until the necrotic collection was found (Fig. 2). A 12 mm trocar was positioned, pneumoperitoneum was initiated at 15mmHg, and under laparoscopic vision, debridement was performed using forceps, foster clamp, or Yankauer cannula (See surgical video on supplementary material and arrow). The necrotic pancreas was differentiated if devitalized tissue was identified with absence of bleeding. (See surgical video on supplementary material) After debridement, cavity lavage was performed in all cases with approximately 2 L of 0.9% saline solution



A) Left costal margin B) Anterior axillary line C) Middle axillary line D) Posterior axillary line E) Incision F) Antero superior iliac crest. (Own source)

Fig. 1 Patient position and anatomical mark landing

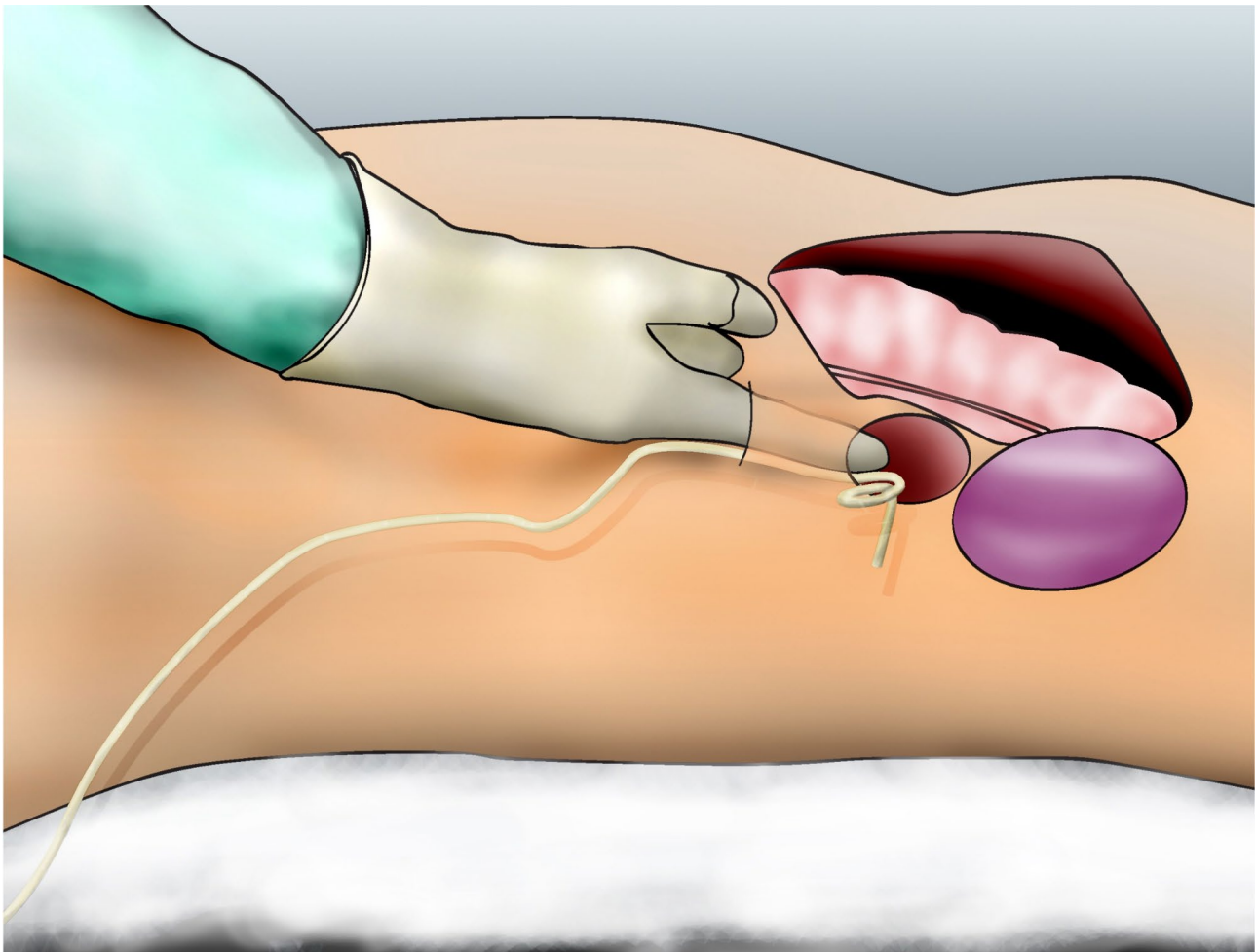
until the cavity was observed without purulent material. In the end, 2 Blake drains (19Fr) were placed under direct vision, and after complete hemostasis, closure was reached with polyglactin 1–0. (See surgical video on supplementary material)

Results

Between January 2016 and March 2024, 12 patients with acute pancreatitis and infected walled-off necrosis who underwent VARD with complete data were included in the study. Male patients constituted most of the population (75% $n=9$), with a mean age of 55.90 ± 13.73 years old. In most of the cases, pancreatitis developed due to biliary causes in 91.66% ($n=11$); in just one patient (8.34%), the origin of AP was alcoholic. The mean APACHE II score was 16.63 ± 3.23 points, and all patients were studied with a computed tomography scan; in most of the cases, the modified severity index score (CTSI) was higher than 8 (83.33% $n=10$), and, in most of the cases (75% $n=9$) pancreatic necrosis was $>50\%$. The diameter of the collection had a mean of 10.5 ± 3.51 cm.

In the preoperative period, in 41.66% ($n=5$) of the cases, an endocrine insufficiency of the pancreas was evidenced, and in just one patient (8.33%), there was evidence of exocrine insufficiency (Table 1).

In just one case (8.33%), ascites were evidenced due to malnutrition and hypoalbuminemia. All patients received preoperative antibiotic therapy, with meropenem being the most frequently administered drug in 66.66% ($n=8$) of the cases. The mean duration of treatment was 42.54 ± 27.95 days (Table 2). In just one patient, endoscopic drainage was performed; nevertheless, after two weeks, there was evidence of failure in the endoscopic approach. According to what was described in the surgical technique and due to the nature of the stepped method, all patients underwent percutaneous drainage. The mean days between the initial diagnosis of AP and percutaneous drainage were 43.09 ± 21.9 days; the mean time between percutaneous drainage and VARD was 35.45 ± 19.35 days. In cases where patients required cholecystectomy, the median time between AP episode and cholecystectomy was 126 days (IQR 66; 141).



Tracking the course of the percutaneous drain to access the pancreatic necrosis. (Own source)

Fig. 2 Blunt dissection of the percutaneous catheter until the necrotic collection

The surgical time mean for VARD was 101.8 ± 35.16 min, and the intraoperative bleeding median was 200 CC (IQR 100; 300). There were no intraoperative complications, and no patient required an intensive care unit stay. All patients received postoperative antibiotic therapy with a mean time of 22.45 ± 11.7 days, the most frequent being ertapenem in 63.64% ($n=7$). The most frequent bacteria isolated in the cultures was *Klebsiella Pneumoniae* at 41.66% ($n=5$), followed by *Enterococcus faecalis* at 27.27% (3); summarized data is displayed in Table 2. All patients underwent postoperative computed tomography scans with a mean time of 26 ± 17.64 days, and in all cases, there was evidence of complete resolution of the collection; this was a condition for removal of the drains. At the initial follow-up

of 30 days, 16.66% ($n=2$) patients evidenced superficial surgical site infection and 8.33% ($n=1$) deeper surgical site infection. One patient (8.33%) presented persistent and chronic pancreatic fistula, in the follow-resolution, was evidenced at four months postoperatively and was related to chronic malnutrition due to socioeconomic disparities, and Wirsung's disruption was ruled out. Also, one patient presented an intestinal fistula related to severe necrosis and colon compromise; medical management was indicated; nevertheless, the patient died due to severe metabolic and infectious deterioration. New onset endocrine or exocrine insufficiency was not evidenced in the follow-up. Overall hospital length of stay was 65.18 ± 26.46 days, with a median postoperative stay of 16 days (IQR 8; 22). The readmission rate was 8.33

Table 1 Demographic and clinical characteristics

Variable	Result
Age mean (SD)	55.90 (13.73)
Gender	
Male % (n)	75% (9)
Cause of pancreatitis % (n)	
Billiary	91.66% (11)
Alcohol	8.33% (1)
Comorbidities % (n)	
Chronic obstructive pulmonary disease	8.33% (1)
Arterial hypertension	25% (3)
Diabetes mellitus	41.66% (5)
Intensive care unit requirement prior to surgery % (n)	16.66% (2)
Acute pancreatitis characteristics	
Marshall 1	8.33% (1)
Marshall 2	58.33% (7)
Marshall 3	33.33% (4)
Mild	0% (0)
Moderately severe	83.33% (10)
Severe	16.66% (2)
APACHE II Score mean (SD)	16.63 (3.23)
CTSI Score	
> 8	83.33% (10)
< 8	16.66% (2)
Necrosis size at CT	
> 50%	75% (9)
< 50%	25% (3)
Collection diameter at CT mean (SD)	10.5 (3.51)

Table 2 Bacteriological characteristics

Variable	Result
Preoperative antibiotic therapy	100% (12)
Ampiciline - Sulbactam	36.36% (4)
Piperaciline - Tazobactam	45.45% (5)
Meropenem	66.66% (8)
Preoperative cultures	
Klebsiella pneumoniae	41.66% (5)
Enterococcus faecalis	16.66% (2)
Enterococcus faecium	8.33% (1)
Preoperative antibiotic therapy duration mean (SD)	42.54 (27.95)
Postoperative antibiotic therapy	100% (12)
Ampiciline - Sulbactam	25% (3)
Piperaciline - Tazobactam	25% (3)
Ertapenem	63.64% (7)
Postoperative cultures	
Klebsiella pneumoniae	41.66% (5)
Escherichia coli	16.66% (2)
Enterococcus faecalis	25% (3)
Candida albicans	8.33% (1)
Postoperative antibiotic therapy duration mean (SD)	22.45 (11.7)

Table 3 Surgical characteristics

Variable	Result
Days between initial diagnosis of AP and percutaneous drainage mean (SD)	43.09 (21.9)
Days between percutaneous drainage and VARD mean (SD)	35.45 (19.35)
Days between initial diagnosis of AP and VARD mean (SD)	78.54 (22.93)
Days between initial diagnosis of AP and cholecystectomy median (IQR)	126 (66;141)
Surgical time mean – Hours - (SD)	101.8 (35.16)
Intraoperative bleeding median (IQR)	200 (100;300)
Intraoperative complications % (n)	0% (0)
Intensive care unit requirement % (n)	0% (0)
Postoperative morbidity	
Superficial surgical site infection % (n)	16.66% (2)
Deep surgical site infection % (n)	8.33% (1)
Organ-space surgical site infection % (n)	0% (0)
Intestinal fistula % (n)	8.33% (1)
Pancreatic fistula % (n)	8.33% (1)
Exocrine pancreatic insufficiency	0% (0)
Endocrine pancreatic insufficiency	0% (0)
Incisional hernia % (n)	8.33% (1)
Time of postoperative drainage use median (IQR)	33 (20;73)
In hospital length of stay mean (SD)	65.18 (26.46)
Overall postoperative length of stay median (IQR)	16 (8;22)
Readmission rate % (n)	8.33% (1)
Mortality % (n)	8.33% (1)
Follow - up median (IQR)	365 (60;547)

($n=1$) due to postoperative pain, and none of the patients required reintervention. The mortality rate was 8.33% ($n=1$). Just one patient presents with an incisional hernia after one year of follow-up. The median follow-up time was 365 days (IQR 45;547) (Table 3).

Discussion

Our study describes the outcomes of patients with NP treated with the minimally invasive VARD inside the STEP-UP approach. The long—and short-term mortality and morbidity found were low, and there was no need for reinterventions or additional procedures to resolve pancreatic necrosis.

To date, the STEP-UP approach is considered the gold standard treatment for patients with infected pancreatic necrosis. Even open necrosectomy is still an option for extensive necrosis, according to the present literature [13, 14]; according to the PANTER trial, a minimally invasive step-up approach reduces the rate of major complications or death in comparison with open procedures [13]. This approach was evaluated in a clinical trial by Wei et al. [5], and it is proposed as a single procedure required for the resolution of the NP with a mortality rate of 10% [5]. Other authors, such as Hollemans et al. [6], demonstrate

the superiority of minimally invasive techniques versus open approaches, with statistical significance in mortality (44% vs. 73% $p=0.005$). Our data shows a mortality rate of 8.33%, which aligns with the one reported by worldwide literature [15–20].

One of the outcomes evaluated in multiple studies is the requirement of additional procedures to control the infection or necrotic process. In a randomized clinical trial in 2019 that assessed the step-up approach compared with open necrosectomy [6], the authors found an 11% rate of additional drainage and requirement of pancreatic surgery after the VARD procedure. Nevertheless, other studies, such as Wei et al. [5], demonstrate different results, with patients requiring other drainage procedures. In our study, no patients required additional surgical procedures to control the extension of the necrosis or an infected collection. Our surgical technique, as described previously, is standardized, and the use of large-diameter drains, continuous irrigation, and lavage of the cavity are related to favorable outcomes.

Evaluation of postoperative morbidity associated with the VARD procedure includes incisional hernia, surgical site infection, and pancreatic insufficiency [5, 15, 18–20]. Compared with open procedures, there is a lesser risk of these complications using minimally invasive techniques. In our population, the incisional hernia was evidenced in one patient (8.33%), results that are comparable with the one reported by Stantvort et al. [13, 19], who shows an incisional hernia rate of 7%, or Hollemans et al. [6] who shows a rate of 23% after minimally invasive techniques. Long-term follow-up is required to evaluate patients treated with VARD regarding new-onset pancreatic insufficiency. In our study, none of our patients showed endocrine or exocrine pancreatic insufficiency after the VARD procedure after a median follow-up of 365 days; however, this morbidity has been reported between 14 and 55%, depending on the extension of the necrosis [15–18]. Patients treated with VARD have a high risk of wound infections due to the contamination of the procedure. Our study demonstrates positive postoperative cultures in all patients, and in fact, one patient had fungi detected in the collection, with a 25% rate of surgical site infection (deep and organ space); this rate is lower than the data reported worldwide [5]. Regarding the bacteriological description of the NP infections in Colombia, similar cultures are the most frequently isolated microorganisms, *K. pneumoniae*, *E. coli*, and *enterococcus* sp [18].

Hospital length of stay is also an important outcome that reflects health care costs; Stantvort et al. [13] show a median length of stay of 50 days in minimally invasive approaches versus 60 days in open necrosectomy; however, other authors [15–18] show an increased hospitalization time (71 vs. 73 days), with non-significant

statistical differences regarding this topic. Our population's length of stay is comparable to the reported data by Stantvort and Horvath et al. [15–18].

Some studies suggest an increased rate of postoperative pancreatic fistula after six months of follow-up in minimally invasive approaches [15–20]. That condition sometimes relates to a Wirsung's disruption (WD), representing a persistent fistula. Nevertheless, a single-arm cohort study, including 21 patients [5], did not report any pancreatic fistula in their follow-up and did not specify if there was a diagnosis of Wirsung's disruption. In our study, one patient presented with a pancreatic fistula that resolved <6 months non-related with WD.

In conclusion, our results are similar to those reported in the literature regarding the outcomes after VARD for NP. The benefits and superiority of the minimally invasive approach are well described in the literature. However, secondary outcomes such as pancreatic fistula, pancreatic insufficiency, and incisional hernia require long-term follow-up that, in the present literature, is not achieved in some cases. Nonetheless, open necrosectomy should not be ruled out in the treatment of these patients; appropriate selection of the patients and individualization of each patient are mandatory.

Among the limitations of our study are its retrospective nature, the absence of a comparative group with an open or endoscopic approach, and the small sample size. However, NP is infrequent, and most studies in this area have small populations. Our study shows a single-center experience of VARD procedures with a long-term follow-up. To our knowledge, it is the first study in the Latin American population and increases the evidence in favor of minimally invasive techniques for treating necrotizing pancreatitis.

Conclusion

According to our data, the VARD procedure presents similar outcomes to those reported in the literature; a standardized procedure following the STEP-UP approach minimizes the requirement of postoperative procedures.

Abbreviations

AP	Acute Pancreatitis
NP	Necrotizing Pancreatitis
VARD	Video-Assisted Retroperitoneal Debridement
SD	Standard Deviation
IRB	Research Institutional Committee
IQRs	Interquartile Ranges

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12893-024-02586-x>.

Supplementary Material 1

Acknowledgements

To our patients.

Author contributions

L.C., C.R., and M.C.A.U had the research idea. L.C., C.R., M.C.A.U, L.B.S, and S.B.L, N.T: participated in drafting the article and revised it critically for important intellectual content. L.C., C.R., M.C.A.U., L.B.S, M.A.G.G and S.B.L, N.T. contributed substantially to the conception, design, acquisition, analysis, and interpretation of data.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Following approval of our Institutional Review Board and ethical committee (Pontificia Universidad Javeriana – Hospital Universitario San Ignacio), all procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Consent for publication

Does not apply.

Competing interests

The authors declare no competing interests.

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