

## Comparative Study of Conventional and Transgastric Necrosectomy for Wide Extended Walled-off Pancreatic Necrosis

Szentkereszty Zs<sup>1\*</sup>, Krasnyánszky N<sup>2</sup>, Kammili A<sup>2</sup>, Balog K<sup>1</sup>, Berhes M<sup>3</sup>, Sáy P Gy<sup>1</sup>

<sup>1</sup>Institute of Surgery, University of Debrecen, Debrecen, Hungary; <sup>2</sup>University of Debrecen, Debrecen, Hungary; <sup>3</sup>Department of Anesthesiology and Intensive Care, University of Debrecen, Debrecen, Hungary

### ABSTRACT

**Purpose:** Even though endoscopic necrosectomy for walled-off pancreatic necrosis is safe and effective, open surgery has an important role in cases with extended necrosis when the non-surgical approaches are not feasible. Authors compare their results of conventional and transgastric open necrosectomy.

**Methods:** A total of 29 patients were treated with extended walled-off pancreatic necrosis. Conventional open necrosectomy with closed bursal lavage was performed in group A (18 patients) and transgastric necrosectomy was performed in group B (11 patients). There were no significant differences between the two groups related to sex, age, etiology of pancreatitis, size of WOPN and time elapsed from the onset of disease and surgery.

**Results:** For all complications, the difference was significant between both groups ( $p=0.003$ ). In group A, 13 reoperations were performed in 9 patients and none were required in group B. The difference between both groups was significant ( $p=0.01$ ). The length of hospital stay was  $23 \pm 14.16$  days in group A and  $12 \pm 2.2$  days in group B. The difference was significant ( $p=0.001$ ). The mortality in group A was higher than in group B ( $p=0.143$ ), but it was not significant. The mean mortality rate was 13.8% in 29 patients.

**Conclusion:** In patients with extended walled-off pancreatic necrosis, the open transgastric necrosectomy has better results than conventional necrosectomy.

**Keywords:** Walled-off pancreatic necrosis; Open surgery

**Abbreviations:** WOPN: Walled-off Pancreatic Necrosis; LOS: Length of Hospital Stay

### INTRODUCTION

Although many authors present excellent results of endoscopically treated patients with walled-off pancreatic necrosis (WOPN), surgical treatment also has an important role in the treatment. While endoscopic transgastric necrosectomy (TN) is safe and effective [1-16], this approach is generally not effective enough in cases of extended necrosis. Although surgical treatment is also effective, it has a higher rate of complications and does not have the advantages of minimally invasive surgery. Patients with extended WOPN require open surgical necrosectomy since the location and gross of the necrotic mass

are not suited for other non-surgical interventions [2,6,7,11-14,17-30].

Due to classic prandial habits – fatty food with strong alcoholic drinks – most of the WOPNs are extended and not available for endoscopic or minimal invasive approaches.

The aim of this paper is to compare results of conventional open necrosectomy with closed bursa omental lavage and open transgastric necrosectomy for extended, retrocolic WOPN.

**Correspondence to:** Szentkereszty Zs, University of Debrecen, Institute of Surgery, Debrecen, Hungary, Tel: +36 20 3975553, E-mail: szentkerzs@gmail.com

**Received:** May 18, 2020; **Accepted:** June 08, 2020; **Published:** June 16, 2020

**Citation:** Szentkereszty Zs, Krasnyánszky N, Kammili A, Balog K, Berhes M, Sáy P Gy (2020) Comparative Study of Conventional and Transgastric Necrosectomy for Wide Extended Walled-off Pancreatic Necrosis. *Pancreat Disord Ther* 9:199. DOI: 10.4172/2165-7092.20.10.1000199

**Copyright:** © 2020 Zsolt S, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

## METHODS

In all cases of severe acute pancreatitis step-up treatment (conservative and semiconservative therapy) was used as basic therapy. Beside naso-jejunal feeding the developed SIRS was treated by intensive therapeutics. Routine antibiotic prophylaxis was not used, but in case of bacterial superinfection antibiotics (e.g. Imipenem or Fluorochinolones) were started than they were changed if needed on the results of bacterial stains. In cases of sterile or infected peripancreatic fluid collections that did not showed spontaneous resolving tendency and/or necrosis percutaneous drainage was indicated. Through the drain(s) lavage was performed if the drainage was not effective alone. Surgery was indicated only in selected cases if conservative or semiconservative therapy were unsuccessful. The ideal surgical indication was WOPN that were not suited for endoscopic or radiologic interventions because of the gross and location of the necrotic mass. In a 5-year period 29 patients with symptomatic extended WOPN were operated on. Only those patients with WOPN that failed conservative or semiconservative treatment were analysed in this study.

The 29 patients were divided into two groups based on the type of the surgical technique. Patients in group A (18 patients) underwent conventional necrosectomy and those in group B (11 patients) received transgastric necrosectomy. The demographic data of the two groups were compared and statistical analysis was performed (Table 1).

There were 16 males and 13 females. The male/female ratio was 9/9 in group A and 7/4 in group B. The mean age of all patients was  $59.9 \pm 14.56$ . It was  $59.4 \pm 14.34$  and  $60 \pm 15.59$  years in groups A and B respectively.

The most common etiology was fatty diet with alcohol abuse in 20 cases. There was a biliary etiology in 7 cases and

hyperlipidemia in two cases could be verified as the cause of pancreatitis. In group A, 14 patients had a high-fat diet with alcohol abuse, 2 patients with biliary origin and 2 patients with hyperlipidemia were observed. In group B, 6 had fatty diet with alcohol abuse and 5 with biliary pancreatitis were the possible cause of the disease.

The mean time between surgery and the onset of the disease was  $76 \pm 62.45$  days. This was  $73.8 \pm 62.54$  and  $81 \pm 65.07$  days in groups A and B respectively.

The mean diameter of retrogastric part of the WOPN was  $13.15 \pm 4.69$  cm in group A and  $12 \pm 4.26$  cm in group B. In addition to retrogastric localization of WOPN retrocolic extension was also observed in all patients (Figure 1).

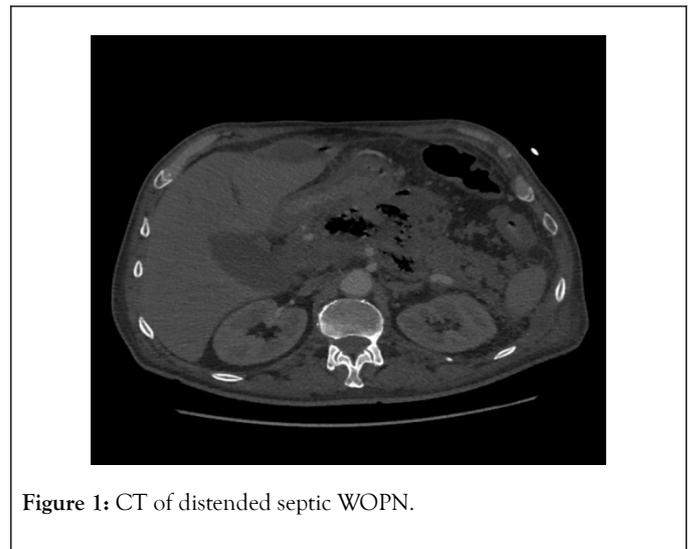


Figure 1: CT of distended septic WOPN.

Table 1: Demography of patients, NS: Not significant difference, WOPN: Walled-off pancreatic necrosis.

	Group A (18)	Group B (11)	Total (29)	p<0.05
Sex	9 Male	7 Male	16 Male	p=0.702 'NS' Chi-Squared Test
	9 Female	4 Female	13 Female	
Age (year)	$59.4 \pm 14.34$	$60 \pm 15.59$	$59.9 \pm 14.56$	p=0.835 'NS' Two-sample t-test
Etiology	14 Alcohol abuse & fatty diet	6 Alcohol abuse & fatty diet	20 Alcohol abuse & fatty diet	p=0.068 'NS' Chi-Squared Test
	2 Biliary origin	5 Biliary origin	7 Biliary origin	
	2 Hyperlipidemic	0 Hyperlipidemic	2 Hyperlipidemic	
Elapsed time (day)	$73.8 \pm 62.54$	$81 \pm 65.07$	$76 \pm 62.45$	p=0.368 'NS' Mann-Whitney Test
Size of WOPN (cm)	$13.16 \pm 4.69$	$12 \pm 4.26$	$12 \pm 4.49$	p=0.507 'NS' Two-sample t-test

As it is seen in Table 1, there was no significant difference between both groups in relation to age, gender, etiology, size of WOPN and the interval between the onset of the pancreatitis

and the operation using chi-squared and two-sample t-test with a p value less than 0.05.

Of the 29 patients, 18 (group A) were operated with conventional open necrosectomy through the gastrocolic ligament using blunt and water-jet techniques (Figure 2).

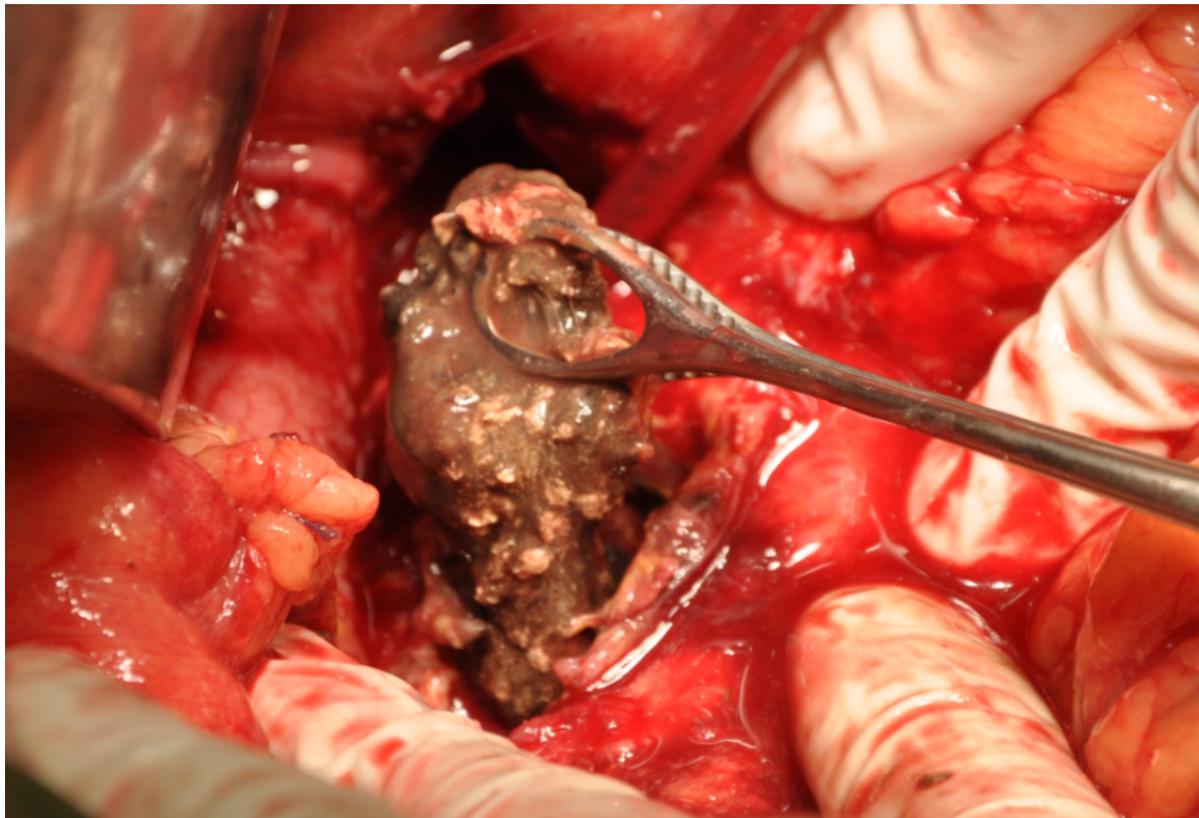


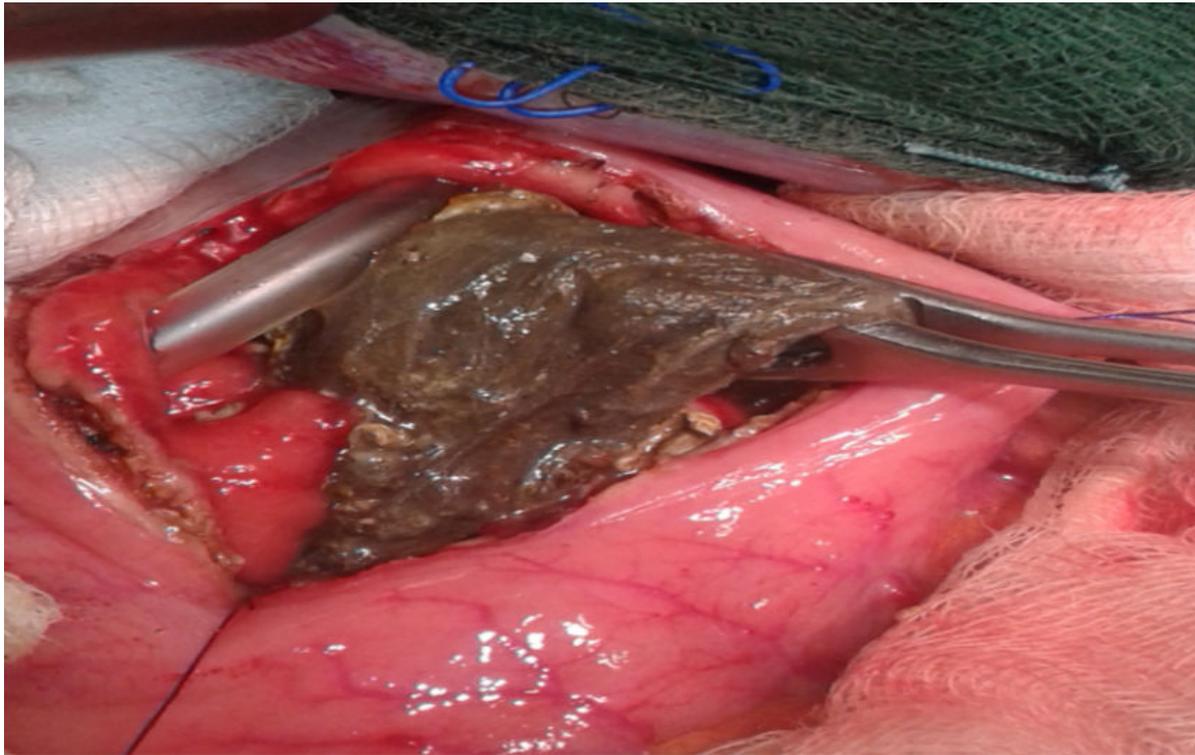
Figure 2: Open conventional necrosectomy.

Table 2: The results of the two different surgical therapy, LOS: Length of Hospital Stay, NS: Not significant difference, S: significant difference.

	Group A	Group B	Total	p<0.05
LOS (day)	23 ± 14.16	12 ± 2.2	19 ± 13.02	p=0.001 'S' T-test
Complication	5 Pseudocyst 4 Subsequent septic focus 3 Bleeding 1 Peritonitis	1 Stenosis of gastrostomy	5 Pseudocyst 4 Subsequent septic focus 3 Bleeding 1 Peritonitis 1 Stenosis of the cysto-gastrostomy	p=0.003 'S' Chi-Squared Test
Reoperation	13	0	13	p=0.01'S' Chi-Squared Test
Mortality	4	0	4	p=0.143 'NS' Chi-Squared Test

In these patients, postoperative closed omental bursa drainage was performed. The 11 patients (Group B) with evidence of

retrogastric localization of the WOPN were operated transgastrically (Juras operation) (Figure 3).



**Figure 3:** Open transgastric necrosectomy.

The necrosectomy was performed bluntly with water-jet technique. In these patients, a nasogastric tube was inserted into the cavity site after necrosectomy. The retroperitoneal spaces were also necrosectomized in all cases.

The groups were compared in relation to complication rates and reoperations, postoperative length of hospital stay (LOS) and mortality.

## RESULTS

There were no intraoperative complications except one in group A; during blunt necrosectomy, a duodenal perforation was observed on the second postoperative day. This did not need reoperation and it closed spontaneously after 10 days.

Endoscopic lavage and necrosectomy were required after transgastric necrosectomy two times in one patient.

Early and late postoperative complications (bleeding, subsequent septic focus, peritonitis, bowel perforation-necrosis, metabolic acidosis and pseudocyst) occurred in 9 patients (47.4%) in group A and in one patient (9.1%) (stenosis of the cystogastrostomy) in group B. Total complications were analyzed using a non-parametric chi-squared test ( $p < 0.05$ ) and the difference was significant ( $p = 0.003$ ) between both groups.

Reoperation was performed 13 times in 9 patients in group B, but none were necessary in group A. The difference between groups A and B was significant ( $p = 0.01$ ) (non-parametric chi-squared test,  $p < 0.05$ ).

In group B, there was no mortality. Using chi-squared test, the mortality in group A was not significantly higher than in group

B with a  $p$  value of 0.143. The mean mortality of all 29 patients was 13.8%.

There were no late complications, such as pseudocyst formation, in group B. However, 5 patients in group A needed later reoperation due to a large pseudocyst.

Mean length of hospital stay (LOS) after necrosectomy was  $19 \pm 13.02$  days. LOS was  $23 \pm 14.16$  days in group A and  $12 \pm 2.2$  days in group B. The difference between the two groups was significant ( $p = 0.001$ ), which was determined by using a two-sample  $t$ -test ( $p = 0.05$ ).

## DISCUSSION

On the basis of the revised Atlanta Classification, walled-off pancreatic necrosis is a well-defined entity as a local complication in severe acute pancreatitis. Then this entity develops, it is generally accepted that surgical or endoscopic intervention should be performed at this time for. This is a minimum of 4-6 weeks, but the optimal time is more than 6-8 weeks from the onset of the diseases [1,3,4,6-8,11-14,16,18,23,26,27,29,30].

There are many options for the treatment of WOPN. Progressively more publications are presented about endoscopic approaches. During this procedure, the necrotic tissue with pus can be removed with different transgastric or transduodenal endoscopic maneuvers or with external precutaneous drainage. Some authors suggest performing necrosectomy through self-expandable stents [1-16].

Although transluminal endoscopic necrosectomy is safe and effective, there are some limits to this approach. For extremely thick walls ( $\geq 10$  mm), endoscopic treatment is not possible [8,10,12,14]. Other limits of this treatment include cases where the WOPN is not accessible with the gastroduodenoscope and the amount of necrotic tissue is too large [1,11].

There are many types of surgical procedures for the treatment of WOPN. Some are minimally invasive such as the laparoscopic or retroperitoneoscopic modalities. Minimally invasive procedures also have limits based on the location and extension of necrosis [6,7,9,11-14,16,18,24,27].

The most common surgical interventions for WOPN is open necrosectomy through laparotomy. The open necrosectomy (through the gastrocolic ligament or the mesocolon) can be completed with open packing of the omental bursa with planned reoperation or with postoperative closed lavage [6,7,11-14,17,19-23,31]. The necrosectomy can also be performed transgastrically via laparotomy or laparoscopically [12-14,24,22-27,29,30].

Surgical Transgastric necrosectomy is indicated mostly when the WOPN is large, has connection to the stomach, has also retrocolic extension and if minimal invasive surgery is impossible (adhesions, previous operations, etc.) or the endoscopic approach failed. Cholecystectomy can also be performed simultaneously with TN.

The advantage of transgastric operations is that pancreas fistula and pseudocyst formation is impossible after this procedure because of the anastomosis formation between the stomach and the WOPN. After these operations, a second surgery is rare in contrast to the conventional open necrosectomy with closed bursal sac irrigation and drainage. As in 5 of the 18 patients pseudocyst can develop after conventional open necrosectomy and necessitate the need for one more operation or other interventions. After transgastric necrosectomy, there was no need for reoperation due to pseudocyst formation in the presented series [16-20,22,24-27,29,30].

TN for WOPN has an acceptable rate of morbidity and mortality with good results.

On the basis of their experience, the authors suggest the transgastric necrosectomy if it is possible. After the transgastric approach, the possible pancreatic fistula and pseudocyst formation are cured at the same time with the necrosectomy.

## CONCLUSION

Open and transgastric necrosectomy are safe and effective. The open surgery is indicated in cases with large WOPNs with retrocolic extension. On the basis of better early and late results, the transgastric approach is suggested. On the other hand, this procedure is prophylactic in nature as it prevents pancreas fistulas or pseudocyst formation.

The limits of this study is first the relative small number of patients, second this study is a retrospective comparison.

## REFERENCES

1. Ang TL, Kwek AB, Tan SS, Ibrahim S, Fock KM, Teo EK. Direct endoscopic necrosectomy: a minimally invasive endoscopic

technique for the treatment of infected walled-off pancreatic necrosis and infected pseudocysts with solid debris. *Singapore Med J*. 2013;54(4):206-211.

2. Bang JY, Wilcox CM, Trevino J, Ramesh J, Peter S, Hasan M et al. Factors impacting treatment outcomes in the endoscopic management of walled-off pancreatic necrosis. *J GastroenterolHepatol* 2013; 28(11):1725-1732.
3. Baron TH, Kozarek RA. Endotherapy for organized pancreatic necrosis: perspectives after 20 years. *ClinGastroenterolHepatol*. 2012; 10(11):1202-1207.
4. Belle S, Collet P, Post S, Kaehler G. Temporary cystogastrostomy with self-expanding metallic stents for pancreatic necrosis. *Endoscopy* 2010; 42(6):493-495.
5. Boškoski I, Costamagna G. Walled-off pancreatic necrosis: where are we? *Ann Gastroenterol*2014; 27(2):93-94.
6. da Costa DW, Boerma D, van Santvoort HC, Horvath KD, Werner J, Carter CR et al. Staged multidisciplinary step-up management for necrotizing pancreatitis. *Br J Surg* 2014; 101(1): 65-79.
7. Bugiantella W, Rondelli F, Boni M, Stella P, Polistena A, Sanguinetti A et al. Necrotizing pancreatitis: A review of the interventions. *Int J Surg* 2016 Suppl 1; S163-S171.
8. Hritz I, Fejes R, Székely A, Székely I, Horváth L, Sárkány A et al. Endoscopic transluminal pancreatic necrosectomy using a self-expanding metal stent and high-flow water-jet system. *World J Gastroenterol* 2013; 19(23):3685-3692.
9. van Brunschot S, van Grinsven J, Voermans RP, Bakker OJ, Besselink MG, Boermeester MA et al. Dutch Pancreatitis Study Group. Transluminal endoscopic step-up approach versus minimally invasive surgical step-up approach in patients with infected necrotising pancreatitis (TENSION trial): design and rationale of a randomised controlled multicenter trial. *BMC Gastroenterol* 2013; (13):161.
10. Puli SR, Graumlich JF, Pamulaparthi SR, Kalva N. Endoscopic transmuralnecrosectomy for walled-off pancreatic necrosis: a systematic review and meta-analysis. *Can J GastroenterolHepatol* 2014; 28(1):50-53.
11. Ramia JM, de la Plaza R, Quiñones-Sampedro JE, Ramiro C, Veguillas P, García-Parreño J. Walled-off pancreatic necrosis. *Neth J Med* 2012; 70(4):168-171.
12. Sabo A, Goussous N, Sardana N, Patel S, Cunningham SC. Necrotizing pancreatitis: a review of multidisciplinary management. *JOP* 2015; 16(2):125-135.
13. Stamatakos M, Stefanaki C, Kontzoglou K, Stergiopoulos S, Giannopoulos G, Safioleas M. Walled-off pancreatic necrosis. *World J Gastroenterol* 2010; 16(14):1707-1712.
14. Kokosis G, Perez A, Pappas TN. Surgical management of necrotizing pancreatitis: an overview. *World J Gastroenterol* 2014; 20(43):16106-16112.
15. Yasuda I, Nakashima M, Iwai T, Isayama H, Itoi T, Hisai H et al. Japanese multicenter experience of endoscopic necrosectomy for infected walled-off pancreatic necrosis: The JENIPaN study. *Endoscopy* 2013; 45(8):627-634.
16. van Brunschot S, Bakker OJ, Besselink MG, Bollen TL, Fockens P, Gooszen HG et al. Dutch Pancreatitis Study Group. Treatment of necrotizing pancreatitis. *ClinGastroenterolHepatol* 2012; 10(11): 1190-1201.
17. Busse MJ, Ainsworth AP. Ten years of experience with transgastric necrosectomy for walled-off necrosis in acute pancreatitis. *Dan Med J* 2015; 62(9): A5131.
18. Kulkarni S, Bogart A, Buxbaum J, Matsuoka L, Selby R, Parekh D. Surgical transgastric debridement of walled off pancreatic necrosis:

- an option for patients with necrotizing pancreatitis. *SurgEndosc* 2015; 29(3):575-582.
19. Gibson SC, Robertson BF, Dickson EJ, McKay CJ, Carter CR. 'Step-port' laparoscopic cystgastrostomy for the management of organized solid predominant post-acute fluid collections after severe acute pancreatitis. *HPB (Oxford)* 2014; 16(2):170-176.
  20. Munene G, Dixon E, Sutherland F. Open transgastric debridement and internal drainage of symptomatic non-infected walled-off pancreatic necrosis. *HPB (Oxford)* 2011; 13(4):234-239.
  21. Madenci AL, Michailidou M, Chiou G, Thabet A, Fernández-del Castillo C, Fagenholz PJ. A contemporary series of patients undergoing open debridement for necrotizing pancreatitis. *Am J Surg* 2014; 208(3):324-331.
  22. Sasnur P, Nidoni R, Baloorkar R, Sindgikar V, Shankar B. Extended Open Transgastric Necrosectomy (EOTN) as a Safer Procedure for Necrotizing Pancreatitis. *J ClinDiagnRes* 2014; 8(7):NR01-NR02.
  23. Vasiliadis K, Papavasiliou C, Al Nimer A, Lamprou N, Makridis C. The role of open necrosectomy in the current management of acute necrotizing pancreatitis: a review article. *ISRN Surg* 2013:579435.
  24. Mathew MJ, Parmar AK, Sahu D, Reddy PK. Laparoscopic necrosectomy in acute necrotizing pancreatitis: Our experience. *J Minim Access Surg* 2014; 10(3):126-131.
  25. Worhunsky DJ, Qadan M, Dua MM, Park WG, Poultsides GA, Norton JA et al. Laparoscopic transgastric necrosectomy for the management of pancreatic necrosis. *J Am CollSurg* 2014; 219(4):735-743.
  26. Gerin O, Prevot F, Dhahri A, Hakim S, Delcenserie R, Rebibo L et al. Laparoscopy-assisted open cystgastrostomy and pancreatic debridement for necrotizing pancreatitis (with video). *SurgEndosc* (2016); 30(3):1235-1241.
  27. Simo KA, Niemeyer DJ, Swan RZ, Sindram D, Martinie JB, Iannitti DA. Laparoscopic transgastricendolumenalcystogastrostomy and pancreatic debridement. *SurgEndosc* 2014; 28(5):1465-1472.
  28. Kiss L, Sarbu G, Bereanu A, Kiss R. Surgical strategies in severe acute pancreatitis (SAP): indications, complications and surgical approaches. *Chirurgia (Bucur)* 2014; 109(6):774-782.
  29. Dua MM, Worhunsky DJ, Malhotra L, Park WG, Poultsides GA, Norton JA et al. Transgastric pancreatic necrosectomy-expedited return to prepancreatitis health. *J Surg Res.* 2017; (219):11-17.
  30. Driedger M, Zyromski NJ, Visser BC, Jester A, Sutherland FR, Nakeeb A et al. Surgical Transgastric Necrosectomy for Necrotizing Pancreatitis: A Single-stage Procedure for Walled-off Pancreatic Necrosis. *Ann Surg.* 2018 Sep 13.
  31. Bakker OJ, van Santvoort HC, van Brunschot S, Geskus RB, Besselink MG, Bollen TL, van Eijck CH et al. Dutch Pancreatitis Study Group. Endoscopic transgastric vs surgical necrosectomy for infected necrotizing pancreatitis: a randomized trial. *JAMA.* 2012; 307(10):1053-1061.