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ORIGINAL ARTICLE

Single center experience with salvage surgery for chronic pelvic sepsis

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Abstract
Chronic pelvic sepsis eventually requires salvage surgery in half of all patients. The goal of surgery is to resolve pelvic inflammation while restoring intestinal continuity. Our salvage procedure achieves this by bringing a healthy conduit into the pelvis and creating an anastomosis beyond the source of sepsis. We aimed to review our single center experience with this procedure for the treatment of chronic pelvic sepsis. All patients requiring the procedure from 2010 to 2018 were retrospectively reviewed using a prospective database. Morbidity and mortality were evaluated, and restoration of bowel continuity at 1-year rate was the endpoint. Twenty patients were included. The main indication was pelvic sepsis after anastomotic leak (AL). The median age was 60 (42–86) years and the median BMI was 26 (18–37) kg/m^2. The median time carrying a stoma before the intervention was 15 months, and median time to intervention was 32 months. All patients had a diverting stoma. There were no death and overall morbidity reached 60%, and AL rate was 10%. At 1 year, 70% of the patients had their intestinal continuity restored. In expert hands, salvage surgery for chronic pelvic sepsis has acceptable morbidity rates, an acceptable rate of AL, and a bowel restoration success rate 70% at 1 year, and is a valuable option for patients failing conservative treatment.

Keywords Chronic pelvic sepsis · Transanal pull through · Colonanal anastomosis

Introduction

Chronic pelvic sepsis (CPS) is defined as a process of local inflammation within the pelvic cavity which does not resolve with conservative treatment and lasts longer than 6 months. [1]. CPS is a complicated disease and can originate from different causes.

A major cause of CPS is restorative proctectomy complicated by anastomotic leakage (AL). Treatment of AL in emergency setting providing control of inflammation and sepsis can be achieved with local drainage, lavage, antibiotics, and proximal diversion with ostomy or complete deconstruction of the anastomosis. [2, 3]

Unfortunately, half of these patients will eventually develop chronic fistula, sinuses, and cavities within the pelvis leading to leak-related CPS. [4] Given the complexity of this disease, a surgical step-up approach following a spectrum from local treatment up to salvage surgery is advocated and patients are often referred to expert centers. Local treatments such as endosponge show promising results with healing rates up to 50% in expert hands. However, this type of treatment requires a specific endoscopic setup which not all surgical units have available and has an extra cost. [5] Moreover as noted above, half of these patients do not heal with local intervention and will eventually require a more aggressive treatment. Failure to heal leads to prolonged medical care, multiple interventions, and has a major impact on long-term outcomes, quality of life, and healthcare costs. [6] As shown in the Dutch TME trial, development of a chronic pelvic sinus leads to non-reversal of ostomy in the half of the patients, leaving them with a substantial social and physical burden [7]. To make matters worse, recent data also suggest that this type of sepsis is linked to a delay in adjuvant treatment, higher rates of local recurrence, and negative cancer-specific long-term prognosis. [8]

Other causes of CPS are conditions such as Crohn's disease, post-radiotherapy sequelae, complex anal fistula, and even local recurrence. These diseases create chronic inflammatory tracts and abscesses leading to chronic pelvic sepsis. After exclusion of malignancy, when refractory fistulating or stenotic disease of the rectum is present, formal proctectomy

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combined with curettage is often proposed. Because of the inertia of the tissue to local healing responses, especially after radiotherapy, these interventions are often combined with transposition of healthy tissue into the pelvic cavity such as omental or tissue flaps to provide a scaffold for granulation tissue. [9, 10] However, the ultimate goal of a treatment should be to completely resolve pelvic inflammation while restoring intestinal continuity.

To achieve this, salvage surgery is considered as a viable option and two major techniques with either a direct or delayed anastomosis have been described.

After close rectal dissection, a transanal pull-through procedure (TPT) is used to descend a healthy conduit into the pelvis. In the second phase of the procedure, the surgeon either directly creates a (as described by Turnbull–Cutait) manual colo-anal anastomosis or chooses to delay the confection of this anastomosis. If the anastomosis is delayed, the colon stump is fixed to the anal canal, wrapped in gauzes, and left to heal for 1 week. After 1 week, the stump is sectioned and a definitive anastomosis is made beyond the source of sepsis as described by Beaulieu [11–14].

Patients and methods

Patients

A prospective database of all patients who underwent salvage surgery over an 8 year period at the Colorectal Surgery Unit of the Cliniques universitaires Saint-Luc (UCL), a regional tertiary referral center with expertise in complex colorectal surgery, was analyzed starting from the first procedure performed in November 2010 up to November 2018. All patients were counseled before surgery and signed an informed consent. All procedures performed were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Surgical technique

The surgery is performed through a combined abdominal and perineal approach. The patient is placed in a classic lithotomy position.

Ureteric stents are not systematically placed. The abdominal phase starts with a xyphopubical laparotomy with adhesiolysis if necessary, followed by high ligation of IMV/IMA if not yet divided previously and complete mobilization of the splenic flexure. Supplementary maneuvers such as Deloyers procedure (mobilization and rotation of the right colon over the superior mesenteric artery) or creation of a transmesenteric passage of the transverse colon are executed if estimated necessary to gain extra length for a safe anastomosis [15].

The pelvic dissection follows a plane from the promontory close to the original colonic conduit down to the pelvic floor (as described by Soave and Parks) [16, 17].

We modified this technique with a close colon dissection plane that does not enter the wall of the bowel and descends to the pelvic floor.

During the perineal approach, a circumferential distal mucosectomy is started at the dentate line, and after 2 cm is changed to a full-thickness dissection toward the levator plate.

Circumferential dissection of the remaining rectum/conduit is carried on until it is completely freed to be extracted through the anal canal.

Subsequently, an immediate colo-anal manual anastomosis with separated Vicryl 2-0 (Ethicon, Cincinatti, USA) sutures is performed. A surgical drain is left in place in the pelvis as well as a transanal drain through the anastomosis. At the end of the intervention, a double-loop ileostomy is created at 60 cm from the terminal ileum in the right iliac fossa.

When a deferred anastomosis is planned, a colonic segment of 6–8 cm is exteriorised and fixed to the anal canal with 4 Vicryl 2-0 sutures. The stump is checked on a daily basis and the anastomosis is completed as a delayed CAA (DCAA) at an interval of 7 days as described above.

Data

Patient and index surgery characteristics, surgical details, and postoperative outcome parameters were collected using a prospective electronic patient database.

Data about long-term outcomes (incontinence, stenosis, and chronic fistula) were extracted from outpatient clinic data files, and regular visits were scheduled at 3-monthly intervals from surgery.

The overall condition of patients was graded according to American Society of Anesthesiology score (ASA) and short-term morbidity was graded according to Dindo–Clavien classification [18, 19]. Since there is currently no clear definition of CPS in the literature, we defined it as clinical, endoscopic, or radiological evidence of pelvic inflammation during 6 months despite optimal medical treatment. We defined two patient groups based on etiology of CPS: non-leak related and leak related. AL was not clearly defined, but currently the only consensus definition of AL is leakage of contrast with enema or intra-operative image. [20]

Data were analyzed with SPSS (IBM). To compare outcomes between groups, a Fisher's exact test for dichotomous variables given the small sample sizes and a *T* test for continuous variables was used. A p value of 0.05 was considered significant.

Results

Patients

The median (range) age of the 20 patients (10 males) was 60 (42–86) years, median BMI was 26 (18–37) kg/m^2, and median ASA-score was 2. Demographics as well as the different indications are listed in Table 1. The main indication was AL due to AF after rectal cancer surgery (15 patients, 75%, LR-CPS). Sixteen patients were treated with pelvic radiotherapy. The median number of procedures before TPT with CAA was three, six patients already had a colostomy to defunction the failed anastomosis, and nine patients a diverting ileostomy. Seven patients had a local treatment before the intervention (four interposition flaps, one radiological drainage, and two patients with multiple anastomotic dilatations). Three patients had already undergone a redo colorectal procedure with creation of a new and stapled low colorectal anastomosis. The median time carrying a stoma before the intervention was 15 (0–55) months, while the median time from primary surgery to intervention was 32 (4–168) months. Median (range) follow-up was 18 months (6–94). There was no statistical difference between sepsis etiology groups when comparing patient and intervention characteristics as well as outcomes (Table 2).

Table 1 Main indications for TPT procedure

Failed previous restorative proctectomy with fistula	15 (65%)
Recto-urethral fistula after pelvic radiotherapy	1
Recto-urethral fistula after prostatectomy	1
Rectovaginal fistula after Longo's hemorrhoidectomy	1
Rectovaginal fistula	1
Refractory Crohn's disease with fistula and stenosis	1
Total	$N=20$

Table 2 Patients included divided into 2 groups: LR (leak-related) and NLR (non-leak related CPS) with comparison between both groups

Characteristics	All ($n=20$)	LR-CPS ($n=15$)	NLR-CPS ($n=5$)	p Value
Male	9	6	3	0.62
Female	11	9	3	
Median age, y (range)	60 (42–86)	60 (46–86)	53 (42–73)	0.3
Median BMI, kg/m^2 (range)	26 (18–37)	26.6 (18–37)	26 (19–37)	0.8
Median ASA-score	2	2	2	**0.007**
Median number of previous procedures	3	3	2	0.51
Median follow-up, *m* (range)	18 (6–94)	16 (6–90)	23 (8–94)	0.83
Defunctioning ileostomy at time of surgery, *n* (%)	18 (90%)	13/15 (87%)	5/5 (100%)	0.84
Median time with stoma before intervention, *m* (range)	15 (0–55)	15 (1–46)	8 (0–55)	0.77
Radiotherapy, *n* (%)	17	13 (87%)	4 (80%)	1
Ureteric stents	8 (40%)	6 (40%)	2 (40%)	1
Median operative time, *m* (range)	383	352 (206–600)	352 (270–540)	0.83
Type of anastomosis, *n* (%)				
Colon J-pouch	4	4	0	
Straight	16	11	5 (100%)	0.76
Hand sewn	20	15 (100)	5 (100%)	1
Delayed	2	2	0	
Median length of stay, *d* (range)	12	11 (7–20)	11 (6–15)	0.51
Overall mortality, *n* (%)	0	0	0	
Overall morbidity, *n* (%)	60%	10 (67%)	2 (40%)	**0.072**
Overall anastomotic leak rate	2 (10%)	2 (13%)	0	1
Median time to stoma closure, *m* (range)	4 (2–34)	6 (2–34)	4 (2–6)	0.29
Intestinal continuity restored at 1 year	70%	9 (60%)	4 (80%)	**0.61**
Fecal incontinence				
Continent (< 4 bowel movements/day)				
Incontinent (> 4 bowel movements/day)				
Unknown				

Bold values represent statistical significance

Interventions

Prophylactic ureteric stents (PUS) were used in 8 (40%) patients. There were no intra-operative surgical complications. There was one bladder lesion closed with suture and one ureteric lesion treated with resection and anastomosis over the stent. Two patients had a delayed anastomosis, one for a ureteric lesion and doubt about the viability of the colonic conduit and one because of a combined V–Y plasty for closure of a fistula tract. Salvage surgery was combined with a V–Y plasty, a musculocutaneous flap, a left hemihepatectomy for metastases, and a resection of a rectopexy mesh, each time in a single patient. In the majority of the patients ($n = 16$), a straight anastomosis was constructed, and four patients had a colon J-pouch (CJP) anastomosis. A diverting stoma was created in all patients, and one patient had a double-loop colostomy.

Outcomes

Median (range) length of stay was 11 days (6–20). There were no peri-operative death and overall 30-day morbidity reached 60% (Table 3). One patient died within 6 months after the intervention. Overall leak rate during follow-up was 10% (2 patients) and both leaks occurred in the leak-related group. Three patients required readmission for high output ileostomy and subsequent dehydration. There were two reinterventions for the placement of a DJ stent to treat a ureteric lesion discovered after removal of stents. The two patients with a leak developed a chronic anastomotic fistula, and six patients developed an anastomotic stenosis (AS). Three patients eventually had conversion to a terminal colostomy, and reasons are described in Table 4. At 1 year, we achieved a bowel restoration success rate of 70%.

Table 3 Morbidity as classified by Dindo–Clavien

Overall morbidity	60% (12/20)	Treatment
Dindo–Clavien II		
UTI	1	Antibiotics
Anemia	1	Transfusion
Pneumonia	1	Antibiotics
Ileus	1	NG tube
SSI	1	Antibiotics
Pelvic abscess	2	Antibiotics
Anastomotic leak	2	Antibiotics
Dindo–Clavien IIIA Biloma	1	Radiological drainage
Dindo–Clavien IIIB Ureter lesion	2	DJ stent

Discussion

Pelvic surgery in a local inflammatory environment as created by CPS remains to this day technically challenging, linked to high morbidity and moderate long-term outcomes. The main challenge lies in restoring bowel continuity in a hostile pelvis in patients with multiple risk factors for anastomotic failure such as previous radiotherapy and chronic inflammation with good functional outcomes despite a plethora of previous interventions and a hostile pelvis.

At our hospital, patients are offered salvage surgery as a last resort after failure of multiple local treatments. One can postulate that patients who present with non-leak related chronic sepsis intrinsically have higher success rates, because they have no previous colorectal dissection or anastomosis. When comparing both groups, bearing in mind the small numbers of included patients, there is no statistical difference to be found. There is, however, a 100% bowel restoration-rate after 1-year follow-up in this small subgroup. Despite the risk of bias and because the low overall number of these type of interventions, we opted to include also the cohort of non-leak-related patients in our final analysis.

The overall use of prophylactic ureteric stenting (PUS) to avoid iatrogenic injury was at 40% (8 patients). In all cases of ureteric lesion, stents were in place, but could not prevent this complication. One might suggest that although stents do not prevent iatrogenic injury, they lead to easier identification of a lesion. In our series, we detected one lesion peri-operatively and we still missed one case of iatrogenic injury to the left ureter, which presented after PUS removal. Although routine use of stents in complicated pelvic surgery

Table 4 Incidence of complications during long-term follow-up and associated treatments

Long-term follow-up	8/20 (40%)	Treatment
Chronic anastomotic fistula	2 (10%)	Terminal colostomy 4 years after intervention (1) Redo-procedure 5 years after intervention and eventually terminal colostomy (1)
Stenosis	6 (30%)	Dilatation (3) Strictureplasty (1) Redo-procedure 1 year after intervention (1) Terminal colostomy (1)

could be implemented, we, however, still retain a case-by-case approach based on pre-operative imaging given the increased cost, operative time, and risk of stent-related major complications (4%) and renal dysfunction. [21] The main concern with the creation of a very low anastomosis to the anal canal is the overall lack of a functional satisfying result. For this, reason surgeons have used several anastomotic techniques to improve continence. We believe that there is currently no real evidence to guide the surgeon in choosing a certain anastomotic type, although intuitively one might suggest that a colonic reservoir leads to better function. The latest data from a randomized control trial comparing J-pouch, straight, and side-to end anastomosis showed no difference in composite evacuation and incontinence scores at 2-years after index surgery and no difference in short-term surgical outcomes and anastomotic leak rate. [22]

To lower complication rates, some surgeons choose to delay the creation of their anastomosis. As shown by Westerduin et al., overall success rates with delayed anastomosis are lower (79 vs 71%); however, results were only available for a small group given the high specificity of the procedure. [23] Furthermore, one can imagine that if a surgeon decides to perform a delayed anastomosis, there is probably an intrinsically higher suspicion of future anastomotic failure, a higher complexity to the case, a possible peri-operative event, or an overall feeling of unease. It is important to mention that with a delayed anastomotic technique, there is only the possibility of a straight anastomosis and no reservoir can be created.

Hand-sewn or manual colo-anal anastomosis is notorious for increased risk of anastomotic stenosis. Lee et al. reported in a series of 568 patients with low rectal cancer (< 4 cm anal verge) an overall incidence of 8% anastomotic stenosis; risk factors were intersphincteric dissection, hand sewn anastomosis, and postoperative radiotherapy [24]. Several treatment options with moderate results starting from digital, instrumental, and endoscopic dilatation and moving up toward eventually surgical intervention with strictureplasty or redo-anastomosis are available. Success rates of 36, 40, and 20% are reported for dilatation and for surgical intervention 89% and 73%, respectively [25]. We reported an overall incidence of anastomotic stenosis of 30%. This higher number is probably related to patient and case selection, chronic inflammation, and location of anastomosis. Fortunately, because of recurring anastomotic stenosis, only one patient eventually was converted to a definitive colostomy after a redo-procedure that failed as well (Table 4).

Most of these patients are at high risk for anastomotic leak given their presentation and need for a low anastomosis. Other local factors typical for chronic pelvic sepsis are not investigated in the literature, but one can think that chronic inflammation leads to inertia of tissues, reduced healing, and a higher rate of leakage. Given the necessity of mobilizing a healthy conduit to the anal canal in these procedures, local tension might be elevated, and the perfusion of the anastomosis might be more compromised than in classical colorectal surgery. These conduits often depend on collateral vascularization via the arc of Riolan and might pose higher risks of ischemia at their distal end leading to increased leak-rates.

The majority of data focusing on redo colorectal surgery after AL was recently summarized in a systematic review by Westerduin et al. The authors conclude that there is a lack of randomized controlled trials and high-quality studies, and that small sample sizes and heterogeneous patient populations in the current studies lead to a limited value of current available data. In a pooled patient database of 291 patients, they report a high overall bowel restoration success rate of 79% at different follow-up intervals. [23]

In our opinion, other problems with current data are the difference in technique used by each center, other definitions of success, failure, anastomotic leak, morbidity, and the overall poor definition and investigation of long-term outcomes such as incontinence, which was only reported in 5 studies (Table 5). We acknowledge the low number of patients included in our study leading to limited interpretation of the results. They, however, represent real life clinical data about a complex procedure in a very heterogenic group of patients and form an addition of 7% to the current pooled data. We suggest that future studies should try to case-matched patients, strictly define outcomes, and try to overcome the overall heterogeneity of indications and patients with a strict study protocol.

Conclusions

In conclusion, the salvage surgery for chronic pelvic sepsis has acceptable morbidity rates, an acceptable leak rate, and a bowel restoration success rate 70% at 1 year, and is a valuable option for patients failing conservative treatment. Patients should be counseled about the high morbidity, the risk of leak and stenosis, and the functional outcomes of this complex procedure.

Table 5 Summary of studies published concerning TPT and CAA

Study	Country	Center	Year of publication	Type	Number of patients	Procedure, *n* (%)	Colo-anal anastomosis, *n* (%)	Years	Indication	Leak rate %	Morbidity %	% Restored bowel continuity (interval)	Mean ± sd follow-up, *m* (range)	Median follow-up, *m* (range)	Diverting ostomy, *n* (%)	Immediate operative failure *n* (%)
Schlegel et al.	FR	Saint-Antoine, Paris	1997	RS	27	Soave	20 (74)	1992–1996	Anastomotic stricture	NR	18.5	**100 (NR)**	28.7 ± 14 (5–60)	33	24 (88.8)	0
Lefevre et al.	FR	Beaujon, Paris	2011	RS	33	NR	12 (36)	1999–2008	All	12	55	**79 (end FU)**	28.7 ± 26.6 (3–91)	NR	31 (93.9)	2 (6)
Pitel et al.	FR	Saint-Antoine, Paris	2012	RS	66	Soave, 27 (41) DCAA 2 (3)	65 (98)	2000–2010	All	7.7	32.3	**78.8 (end FU)**	47.9 ± 37.8 (0–122.4)	NR	66 (100)	3 (4.5)
Patsouras et al.	UK	St Marks, London	2013	RS	34	Soave	34 (100)	1998–2012	All	NR	41	**NR**	NR	23 (3–71)	NR	NR
Genser et al.	FR	Pitié-Salpêtrière, Paris	2013	RS	50	Soave, 5 (10) DCAA, 2 (4)	24 (48)	1998–2011	All	0	26	**92 (median FU)**	NR	3 (2–10)	37 (74)	0
Maggiori et al.	FR	Beaujon, Paris	2015	RS	24	TPT + DCAA (100)	24 (100)	2007–2013	CPS	NR	54	**79 (median FU)**	29 ± 19 (4–82)	14	16 (66.7)	0
Westerduin et al.	BEL/NL	UZ Leuven/AMC Amsterdam	2017	RS	59	TPT + ICAA (91) TPT + DCAA (9)	59 (100)	2010–2014	AF after rectal surgery	15	NR	**66 (median FU)**	21 ± 23 (1–147)	27	59 (100)	0
Woo IT et al.	SKO	Kyungpook, Daegu	2018	RS	32	Close-colon dissection, completion proctectomy (34.3)	15 (47)	2004–2016	AF	12.5	40.6	**78 (end FU)**	43.4	30.3 (5–137)	22 (68.7)	0
Ryckx et al.	BEL	UCL Louvain, Brussels		RS	20	TPT + ICAA (91) TPT + DCAA (9)	20 (100)	2010–2018	CPS AF (25%)	10	60	**70 (1 year)**	32.6 ± 27.5	18 (6–94)	20 (100)	0

NR not reported, *DCAA* delayed colo-anal, *ICAA* immediate colo-anal, *RS* retrospective study, *AF* Anastomotic failure after rectal resection, *TPT + DCAA* transanal pull-through + delayed colo-anal anastomosis, *CPS* chronic pelvic sepsis

Values in bold are all the data on restoration of continuity which will probably interest the reader the most

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Declarations

Conflict of interest None.

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