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RESEARCH

Omentoplasty versus cecal mobilization after abdominoperineal resection: A propensity score matching analysis

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Abstract

Background Despite the minimally invasive approach and early rehabilitation, abdominal-perineal resection (APR) remains a procedure with high morbidity, notably due to postoperative trapped bowel ileus and perineal healing complications. Several surgical techniques have been described for filling the pelvic void to prevent abscess formation and ileus by trapped bowel loop.

Objective The aim of our study was to compare the post APR complications for cancer of two of these techniques, omentoplasty and cecal mobilization, in a single-center study from an expert colorectal surgery center.

Patients From 2012 to 2022, 84 patients were included, including 58 (69%) with omentoplasty and 26 (31%) with cecal mobilization. They all underwent APR at Bordeaux University Hospital Center.

Settings A propensity score was used to avoid confounding factors as far as possible. Patient and procedure characteristics were initially comparable.

Results The 30-day complication rate was significantly higher in the cecal mobilization group (53.8% vs. 5.2% $p < 0.01$), as was the rate of pelvic abscess (34.6% vs. 0% $p < 0.001$).

Conclusion These findings suggest that, when feasible, omentoplasty should be considered the preferred method for pelvic reconstruction following APR.

Keywords Rectal cancer · Abdominoperineal resection · Omentoplasty · Cecal mobilization

Introduction

Up to 25% of patients with rectal cancer present with locally advanced disease (T4) or/and low rectal tumor involving external anal-sphincter and/or levator-ani muscle invasion. For these tumors, the abdominoperineal resection (APR) is the only procedure to have an R0 oncological resection [1–4]. APR is responsible for a high morbidity rate, particularly concerning pelvic and perineal non healing wound [5, 6] and sepsis or small intestine trapped in pelvis. These complications are associated with increased length of hospital stay, higher readmission and reoperation rates, higher rates of chronic sepsis and of cancer recurrence. Several techniques have been described with the aim of filling the pelvic void post APR to prevent abscess formation and trapped small intestine. Two of these techniques are omentoplasty (or omental flap) and cecal mobilization. The first enables the pelvic cavity to be filled with the greater omentum after it has been mobilized and pediculized on one side [7, 8], while the second enables the pelvis to be filled with the cecum after it has been fully mobilized. However, there is a risk of necrosis of the mobilized tissue, which may lead to pelvic sepsis. To this day in France, there is no consensus on the best technique to avoid a pelvic complication post APR.

The aim of our study was to compare the surgical complications of patients who had undergone APR with omentoplasty or cecal mobilization in a single-center series from a high-volume colorectal surgery unit.

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Materials and methods

Patients and study design

Consecutive patients who underwent APR for rectal cancer between January 2012 to December 2022) in a high-volume rectal cancer center were retrospectively identified in a prospectively maintained database. The omentoplasty procedure was performed since 2012, while cecal mobilization technique were performed since 2015.

The APR decision was taken after staging the tumor with a pelvic magnetic resonance imaging (MRI), when sphincter preservation was not possible in order to ensure R0 resection. All patient were discussed at multidisciplinary staff meetings using the current guidelines to proceed for surgery. Institutional Review Board approval was prospectively obtained.

Surgical procedures

APR was performed cases of intersphincteric space, external anal-sphincter and/or levator-ani muscle invasion and pelvic exenteration when the tumor was invading adjacent organs. All patients were operated on with a curative intent. For abdominal laparoscopic or robotic approach, 5-port approach with the AirSeal® medical device were usually used. Low impact laparoscopic approach using low abdominal pressure at 8 mmHg was usually used [9]. Posteriorly and laterally, the dissection was pushed to the levator ani muscles toward the top of the anal canal. Anteriorly, the dissection was carried out close to the prostate, removing the Denonvillier's fascia. The technique included preservation of the hypogastric nerves, pelvic plexuses, and presacral nerves. The perineal dissection, an elliptical incision is created that extends from the midpoint of the perineal body in the man, or the posterior vaginal introitus in the woman back to a point midway between the coccyx and the anus. The incision should include the entirety of the external sphincter muscle and continued down through the subcutaneous tissue into the ischiorectal fat using electrocautery. The posterior dissection is directed anterior to the coccyx and the anococcygeal raphe is divided. The perineal dissector then uses an index finger to guide resection of the levator muscle.

At the end of the surgical procedure, a cecal mobilization or an omentoplasty were performed to close the pelvic defect. In case of GRECCAR 9 study, a biological mesh was put.

Perioperative management and follow up

During the study period, enhanced recovery after surgery (ERAS) protocol was registered.

Postoperative complications were defined as any adverse event that occurred within 30 days following surgery. These were reported according to the Clavien-Dindo (CD) classification. Severe complications were defined as grade CD III or IV. Post-operative mortality was defined as death from any cause within 30 days of the resection or during the same hospital stay.

Postoperative morbidity was assessed for 90 days. Hospital readmission due to rectal surgery were also noted. Postoperatively, patients were reviewed in the outpatient department one month after surgery then every three months for the first 2 years, and every six months thereafter. All patient who underwent colorectal surgery in our units completed the quality-of-life questionnaire EQ-5D-5L.

Statistical analysis

Categorical variables were expressed as number and percentage. Continuous variables were expressed as mean and standard deviation. A chi-squared test was used to compare categorical variables, and a non-parametric Mann–Whitney U test to compare continuous variables. All tests were two-sided, with type I error set at $\alpha = 0.05$.

Propensity score matching (PSM) was performed to avoid potential confounders in patient selection, including age, sex (male *versus* female), American society of Anesthesiologist (ASA) score, Body Mass index (BMI) and diabetes. A matching group patient was performed with a 1:1 ratio. The caliper width of 0.10 was used for PSM. All data will be made available on reasonable request.

Results

Patient's characteristics

From 2012 to 2022, 84 patients underwent APR with omentoplasty or cecal mobilization procedure, including 58 (69%) in the omentoplasty group and 26 (31%) in the cecal mobilization group (Fig. 1). The baseline characteristics of the two groups before matching are shown in Table 1 and after matching in Table 2. Before PSM, the two groups had significant difference in term of age, diabetes, histological diagnosis and pelvic recurrence. After PSM, the two groups were similar in terms of baseline characteristics.

Surgical approach and operative outcome

The surgical and operative outcomes are shown in Table 3**.** After PSM, the surgical approach was similar between the two groups. Six patients in each group (23,1%) underwent open surgery and the others (20 patients in each group) had a minimally invasive approach (laporoscopy or robotic approach). The

Fig. 1 Patients' Flow Chart

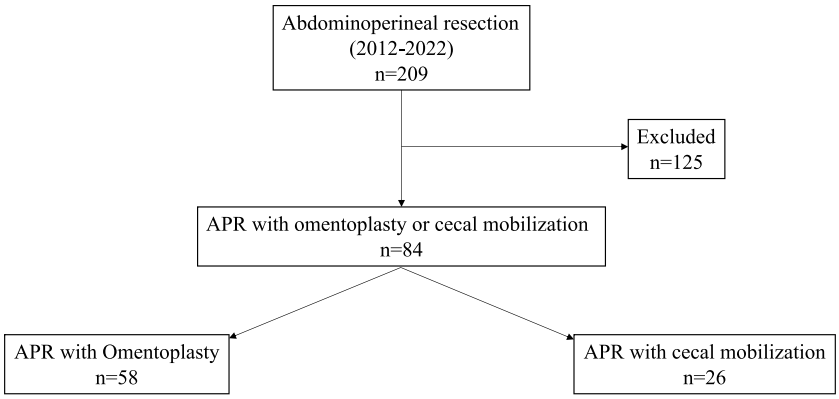

Table 1 Patient's characteristics

	Omentoplasty (n = 58)	Cecal mobilization (n = 26)	*p*
Age	74	68	**0,02**
BMI	24	24	0,79
Diabetes	21	2	**0,007**
History of abdominal surgery	4	4	0,24
ASA Score > 2	34	10	0,10
Tumor type			
Adenocarcinoma	28	22	**0,001**
Epidermoid carcinoma	2	4	0,07
Treatment			
Chemotherapy	22	16	0,06
Radiotherapy	6	8	0,02
Pelvic recurrence	22	18	**0,009**
Distal metastasis	2	1	1

Table 2 Patient's characteristics after propensity score

	Omentoplasty (n = 26)	Cecal mobilization (n = 26)	*p*
Age	67	66	0,59
BMI	24	24	0,83
Diabetes	3	2	1
History of abdominal surgery	4	4	1
ASA Score > 2	9	10	1
Tumor Type			
Adenocarcinoma	24	22	0,67
Epidermoid carcinoma	2	4	0,67
Treatment			
Chemotherapy	22	18	0,49
Radiotherapy	6	8	0,67
Pelvic recurrence	22	18	0,49
Distal metastasis	2	1	1

Table 3 Surgical and post operative outcomes

	Omentoplasty (n = 26)	Cecal mobilization (n = 26)	*p*
Laparoscopy	12	10	0,78
Robotic	8	10	0,78
Laparotomy	6	6	1
Surgery duration	170 (90–280)	155 (80–300)	0,35
Pelvic prothesis	2	2	1
Dindo-Clavien > 2	2	9	**0,04**
Length of stay	7 (5–34)	9 (5–22)	**0,02**
T4	10	7	0,55
Pelvectomy	6	4	0,74
Post operative complications	3	14	**0,01**
Pelvis abscess	0	9	**0,001**
Occlusion	2	2	1
Urinary complication	1	1	1
Others	0	2	0,22
Medical	2	10	**0,02**
Surgical	1	4	0,35
Wound infection	2	1	1
Readmision at 90 days	0	4	**0,04**

mean time of surgery was not significantly different between the two groups (170 min in the group omentoplasty vs 155 min in the group cecal mobilization, p = 0,38). The length of stay was significantly different between the two group (respectively 7 days (5–34) versus 9 days (5–22), p = 0,02).

Post operative morbidity

The post operative morbidity outcomes are show in Table 3.

There is significant difference in term of rate of post operative complication, and pelvis abscess between the two groups (respectively 3 patients (5.2%) versus 14 patients (53.8%), p = 0,01 and 0 patient (0%) versus 9 patients

(34.6%), p = 0,001). There is no difference between the two groups for the other complications. Patients' complication in the omentoplasty group was treated by medical approach for 2 patients and by surgical approach for 1 patient versus 10 patients and 4 patients in the cecal mobilization group (respectively p = 0,02 and p = 0,35).

The readmission rate at 90 days in the cecal mobilization group is higher than the omentoplasty group (4 patients versus 0 patient, p = 0,04).

Figure 2

Relationship between surgical procedure and quality of life

At 3 months, the EQ-5D-5L questionnaire were completed by patients. The descriptive system comprised five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Detailed results were showed in Table 4.

There is significant difference between the omentoplasty group and cecal mobilization group for the item mobility (25 patients vs 19 patients, p = 0,049), usual activities (22 patients versus 14 patients, p = 0,03), no pain or discomfort (21 patients versus 12 patients, p = 0,02) and the median of EQ-VAS (85 (50–95) versus 70 (20–85), p = 0,01).

Discussion

This is the first comparative study comparing omentoplasty and cecal mobilization for pelvic recovering after APR. We are able to demonstrate better results of omentoplasty comparing to cecal mobilization in term of post operative complication especially pelvic abscess, length of stay, readmission rate and quality of life 90 days after surgery.

Perineal complications after APR are often multifactorial, and several pre-operative risk factors have already been identified [10–13]. Age, obesity, diabetes, smoking and neoadjuvant treatments are all recognized as risk factors. In comparison with our study, the omentoplasty group included older patients (p = 0.02) with more diabetes (p = 0.007) than the cecal mobilization group. In theory, these differences should have been in favor of the cecal mobilization group, but this was not observed in our study. In our study, we decided to include only patients who had undergone APR for cancer, thus avoiding the potential bias of inflammatory bowel disease. There was no difference between the two groups with regard to neoadjuvant treatment.

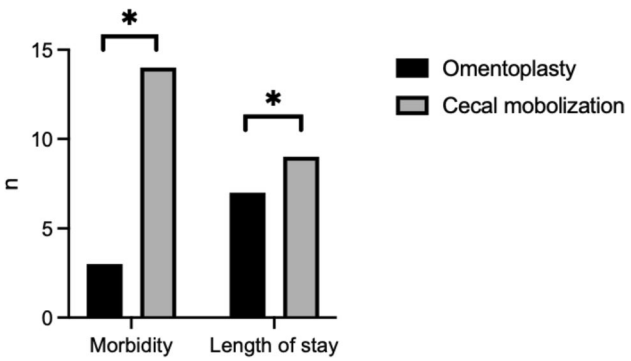

Fig. 2 Surgical outcomes (*: p < 0.05)

Table 4 Relationship between surgical procedure and quality of life

	Omentoplasty (n = 26)	Cecal mobilization (n = 26)	*p*
Mobility[a]	25	19	**0,049**
Self-care[a]	25	20	0,09
Usual activities[a]	22	14	**0,03**
Pain/discomfort[a]	21	12	**0,02**
Anxiety/depression[a]	22	17	0,2
EQ-VAS[b]	85 (50–95)	70 (20–85)	**0,01**
EQ-5D VAS > 80	20	14	0,14

[a]No problem

[b]Median (interquartile range)

There are conflicting results in the literature on the benefits of omentoplasty [14–16] and data on cecal mobilization are lacking.

Indeed, a recent meta-analysis [16] analyzed 894 patients who had undergone omentoplasty during APR. It found no benefit of omentoplasty in reducing 30-day complication rate (RR = 1.30 95%IC 0.92–1.82), perineal abscesses (RR = 1.11 95%IC 0.79–1.56), perineal healing disorders (RR = 1.21 IC95% 0.96–1.53) or ileus (RR 0.90 IC95% 0.62–1.31), compared with no pelvic complement. However, the lack of standardization of the omentoplasty technique, the lack of comparison with another uniform group, and the possibility of combining different perineal closure techniques in the various studies could be a source of potential bias.

Another 2013 meta-analysis [8] including 14 studies and 894 patients highlights the benefits of omentoplasty. The mean rate of primary wound healing was 66.8%, time to wound healing 24 days and weighted mean wound infection rate 14.4% with omentoplasty compared with 50.1%, 79 days and 18.5% in patients having no omentoplasty. In a Japanese retrospective series, Oida et al. reported a higher rate of perineal infection (32% vs 5%) and longer hospital stay (21 ± 9d vs 17 ± 4d) in the non-omentoplasty group than in the omentoplasty group.

Quality and standardization of omentoplasty is essential to avoid adding the risk of omentum necrosis and infection into the pelvis, thus worsening the morbidity of APR.

To our knowledge, there are no other studies evaluating the quality of life of different pelvic filling techniques after APR. In

our study, quality of life was significantly improved for patients who had omentoplasty compared with those with cecal mobilization. These results may be explained by the lower rate of complications and scarring disorders in the omentoplasty group.

In a recent multicentric study from 2020 [17], APR had similar quality-of-life scores at 3 years to sphincter-sparing techniques, with satisfactory results. These results show that in patients without pelvic wound healing disorders and medium- to long-term complications, quality of life is assessed as satisfying after APR by patients.

This study has certain limitations, such as its retrospective and non-randomized nature, which limits the conclusions of this study. Difference in size between the two groups was compensated for by a propensity score to balance the two groups. However, to our knowledge, this study is the first to compare two common techniques for pelvic filling after APR. Thanks to patient follow-up, it has been possible to obtain exhaustive data on surgical techniques, complications and quality of life. The surgical technique for omentoplasty is standardized in our center and has always been performed in the same way to ensure group homogeneity.

To conclude, we observed a higher risk of surgical complications and of altered quality of life in cecal mobilization group than in omentoplasty group. This is the first comparative study of these two techniques after APR. Standardized omentoplasty, when feasible, therefore appears to be the best surgical technique to fill pelvic void after APR.

Author contributions MB; BF and ER designed the study. MB BF and LB made data acquisition. MB and BF analyzed data and made statistical analysis. MB and BF wrote the manuscript and prepared figures and tables. AE LB BC AM SA and ER reviewed and corrected the manuscript

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Data availability No datasets were generated or analysed during the current study.

Declarations

Conflicts of interest The authors declare no competing interests.

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