Coloplasty for Neorectum Construction after Low Anterior Resection

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Abstract

Background: Low anterior resection is now considered the gold standard procedure for low and ultra low rectal cancer especially from oncological point of view. However straight colo-anal anastomosis is functionally cumbersome to the patients. The idea of colonic pouch hence was raised and proven to be effective in alleviating frequency and urgency associated with straight colo-anal anastomosis.

Aim of Work: In this study our aim was to assess feasibility of coloplasty as a colonic pouch to replace the rectum.

Patients and Method: Fifteen patients who had low anterior resection done were included in this study, transverse coloplasty pouch was done and functional outcomes were assessed by both clinical and manometric means.

Results: Nine female and 6 males were included in this study, the mean operative time was 131min., and leakage rate was 6.66%. The mean number of motions per day was 3.17 and 1.67 at three and twelve months respectively. The grade of continence was 3.5 and 1.25 at three and twelve months. Manometric measures were 50.5mmHg for resting pressure, 126.993mmHg for squeeze pressure and 108.17ml for threshold volume.

Conclusion: Coloplasty is a safe, feasible procedure and improves the functional outcomes of patients after low anterior resection.

Key Words: Low anterior resection – Colonic pouch – Coloplasty – Manometric assessment.

Introduction

AFTER introduction of the Abdominoperineal Resection (APR) by Miles, it was considered the “gold standard” in the surgical treatment of rectosigmoid and rectal cancers and remained so for several decades [1]. To avoid a permanent stoma and based on the knowledge that distal intramural spread was most often limited, dixon described the Low Anterior Resection (LAR) aimed principally at some favorable tumors of the of rectum [2,3]. However, enthusiasm for restorative surgery in rectal cancer was tempered by concerns over incontinence and high stool frequency, especially when ultra-low colorectal anastomoses are required [4,5]. Lazorthes et al., introduced the concept of incorporating a colonic J-pouch to improve the functional outcomes [6,7] however, long-term outcome showed difficulty of evacuation, fragmented stool, and/or constipation in about 10-30 percent of CJP patients [8,9]. Coloplasty has been described to avoid drawbacks of J-pouch [10,11].

The aim of our work was to assess the outcome of transverse coloplasty after low anterior resection of the rectum.

Patients and Methods

This prospective study was conducted at the Colorectal Surgery Unit at Kasr Al-Ainy Hospital, Cairo University in the period from February 2013 to February 2015. Fifteen patients who were candidates for low anterior resection had transverse coloplasty done. Inoperable cases, patients with T4 malignancy and those with an indication for an emergency colectomy were excluded from this study. All patients who were treated for a malignancy underwent a colonoscopy with biopsy of the suspected lesion. When the pathology report confirmed the malignancy, a CT scan of the abdomen and chest was done for pre-operative staging. All patients with cancer rectum received neoadjuvant chemotherapy.

Each patient signed an informed consent in which all operative details and all possible complications were explained, including failure to perform the transverse coloplasty. Diverting ileostomy was routinely employed and was closed 6-8 weeks post operatively. Safety and feasibility of transverse coloplasty were to be assessed as regards operative time, postoperative complications including; leakage, urgency, incontinence, number of daily motions and difficulty in evacuation. Mano-
metric study was done 6 months after closure of the diverting stoma for assessment of the “neorectum” functions.

**Surgical technique:**

Midline exploratory incision was ensued. Formal exploration of the abdomen to rule out metastasis was carried on. A standard rectal dissection was performed; this included a total mesorectal excision, high ligation of the inferior mesenteric vessels and preservation of the autonomic nervous plexus and mobilization of the splenic flexure. If a double-stapled technique was used for anastomosis, contour stapler was used for the LAR. It was applied at or just proximal to the level of the anorectal junction. Then a circular GI stapler was used for anastomosis. If GIA were not available or not feasible such as the need for mucosectomy or inter-sphincteric resection, hand-sewn technique anastomosis was adapted instead. The pouches were constructed with descending colon and it was fashioned starting 4cm from the distal cut end.

**Technique of transverse coloplasty Fig. (1):**

After completion of LAR, the colon was incised 4cm proximal to its distal cut end. The incision was fashioned in a longitudinal manner, 6-8cm in length between the tenia coli on the anti-mesenteric border. This incision was then closed transversely with a continuous single layer of seromuscular absorbable suture usually polyglactin 910 2/0 on a rounded tip needle. The coloplasty pouch was then anastomosed to the anorectal stump by circular stapler or hand sewing technique using 3/0 polyglactin 910, with the coloplasty facing anteriorly. Integrity of the anastomosis and the neorectum was checked by injecting methylene blue dye through the anal canal. Covering ileostomy was done in all cases routinely; it was closed after 6-8 weeks.

![Fig. (1): Technique of coloplasty; A: About 8cm incision in the antimesentric border of left colon about 4cm from the cut edge, B: The colon is opened in full thickness manner, C: Closure of the incision in transverse manner forming the pouch.](image)

Proper hemostasis was ensured. Nelaton tube drain 18 Fr. was inserted in the pelvis and connected to a bag without suction. Mass closure of the abdomen was done using polypropylene suture 1 with rounded needle. Skin was closed using interrupted polyglycolic acid sutures 3/0.

**Results**

Fifteen patients were included in this study. Transverse coloplasty was done after LAR for these patients. Age of patients ranged from 22 to 63 years old with mean of 51.33. This study included 9 males and 6 females. Demographic data are summarized in (Table 1).

<table>
<thead>
<tr>
<th>Total number of cases</th>
<th>Female patients</th>
<th>Male patients</th>
<th>Range of age</th>
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<tr>
<td>15</td>
<td>9 (60%)</td>
<td>6 (40%)</td>
<td>22-63 years</td>
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</table>

**Operative and post operative outcomes:**

Operative time ranged from 90 up to 180 minutes, with mean of 131.67. There was no mortality in this series. There was a single case of leakage that was diagnosed on the 4th postoperative day with tachycardia, fever and leucocytosis. CT scan revealed localized pelvic collection. Reoperation revealed a small opening in the anterior wall of the anastomotic line not the transverse line for coloplasty. Peritoneal lavage was done with wide pored drains inserted after closure of the leaking point. The patient had a smooth post operative recovery, the ileostomy loop was restored 6 weeks later and the patient completed the follow-up.

**Functional outcomes:**

Functional outcomes were assessed both clinically and by means of manometry. The motions per day, degree of continence and difficulty in evacuation in 3 and 12 months after restoration of
continuity were recorded. Urge incontinence (inability to defer defecation for 15 minutes) was also assessed. The mean number of motions per day was 3.17 (1-6) in the first three months. This number decreased to be 1.67 (1-3) after one year. Degree of continence at 3 and 12 months was assessed using Wexner scoring system, where 0 is perfect continence and 20 is complete incontinence. It ranged from 0 to 8 with mean of 3.5 in the first 3 months, and decreased to range from 0 to 5 with mean of 1.25. One patient complained of urge incontinence for the first three months then improved gradually to disappear within one year without any medications. There was no difficulty in evacuation. All patients did not report the need of enemas or laxative for pouch evacuation. This was confirmed by complete evacuation on defecography. The functional outcomes are summarized in (Table 3).

Table (2): Operative and post operative outcomes.

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<table>
<thead>
<tr>
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<tr>
<td>Mean operative time in minutes</td>
<td>131.67</td>
<td></td>
</tr>
<tr>
<td>Post operative leakage</td>
<td>1 (15) = 6.66%</td>
<td></td>
</tr>
<tr>
<td>Post operative mortality</td>
<td>0</td>
<td></td>
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Table (3): Functional outcomes.

<table>
<thead>
<tr>
<th></th>
<th>3 months</th>
<th>12 months</th>
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<tbody>
<tr>
<td>Mean motions per day</td>
<td>3.17</td>
<td>1.67</td>
</tr>
<tr>
<td>Mean grade of continence</td>
<td>3.5</td>
<td>1.25</td>
</tr>
<tr>
<td>Urgency</td>
<td>1/15 (6.66%)</td>
<td>Zero</td>
</tr>
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Manometric assessment:

Resting and squeeze pressures as well as threshold volume were recorded at 6 months post restoration of continuity using manometry. Results are summarized in (Table 4).

Table (4): Manometric findings after 6 months.

<table>
<thead>
<tr>
<th>Manometric assessment</th>
<th>Resting pressure (mmHg)</th>
<th>Squeeze pressure (mmHg)</th>
<th>Threshold volume (ml)</th>
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<tbody>
<tr>
<td>Min</td>
<td>40</td>
<td>90.0</td>
<td>65</td>
</tr>
<tr>
<td>Max</td>
<td>65.1</td>
<td>152.4</td>
<td>143</td>
</tr>
<tr>
<td>Mean</td>
<td>50.5</td>
<td>126.993</td>
<td>108.17</td>
</tr>
<tr>
<td>SD</td>
<td>8.79</td>
<td>18.805</td>
<td>22.152</td>
</tr>
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Normal value: Resting pressure 59-75mmHg, squeeze pressure 90-160mmHg, threshold volume 90-150ml.

Discussion

Traditionally, straight Coloanal Anastomosis (CAA) was the standard procedure follow Total Mesorectal Excision (TME) [12], however, it jeopardized patient's functional outcome owing to loss of the rectal reservoir. Early functional outcomes after TME and straight coloanal anastomosis showed urgency, stool incontinence, and frequent bowel movements. Creation of a reservoir improved defecatory functions. In 1986, Parc et al., [6] and Lazorthes et al., [7] demonstrated a better functional outcome for restorative Colon J-Pouch procedure (CJP) when compared with CAA. TCP was developed to avoid drawbacks of CJP; mainly difficulty of pouch evacuation.

In this study, TCP was constructed after LAR, functional results were assessed. In the concurrent study the mean operative time was 131.67 minutes. In a study done by Yik-Hong and his colleagues, the mean operative time was 110 minutes [13]. In a study done by Yang et al., the mean operative time was 145 minutes [14]. This is much less than the early results of Ulrich and his colleagues when operative time was with a mean of 240 minutes [15].

Leakage percentage in this study was 6.66%. In this goes with the study held by Pimentel leakage rate was 6% [16]. Z’graggen and Buechler reported in a study, which included 41 patients with TCP after low anterior resection, an anastomotic leakage rate of 7.3% (3/41 patients) [17]. These results are comparable to a published study from Heidelberg, looking at the early postoperative results after 82 TCPs (8.5%) [18]. In another study held by Ulrich et al., later in 2008 leakage rate was 8% [15]. On the contrary to a study published by Ho et al., in which leakage rate was significantly higher with 15.9% [19]. Leakage in the concurrent study was higher than that of Yang in 2006, in that study leakage was 2.7% [14].

In the current study there were no mortalities, this is probably because of small sample size. This goes with what Pimentel stated in his study on 30 patients in 2003 with no mortalities [16]. Also in a study conducted by Furst, there were no mortalities [20]. On the other hand, in Yik Hong study there was 7% mortality in TCP [13]. In a study conducted by Ulrich in 2005, mortality was 3% [14]. In HO study mortality rate was 2.27% [19].

Number of motions per day was assessed in this study at 3 months and 12 months after restoration of bowel. The mean number of motions in three months was 3.17 and after twelve months the mean was 1.67. This goes with Pimentel results where mean number of motions was 3.12 at three months and 2.12 after twelve months [16]. On the contrary, number of bowel motions in a study held by HO et al., was higher, with 4.6 and 3.4 in six and twelve months respectively [19]. In a study...
conducted by Fazl, the mean number of motions was 5 in the first three months and decreased to 2 after six months [21]. In Yang’s study, motions per day were with mean of 4.3 and 2.4 after six and twelve months respectively [14]. In a study conducted by Fazio in patients included, mean number of motions was 4 and 3 after six and twelve months respectively [22].

The grade of continence in this study was evaluated by Wexner scoring system, the mean grade of continence was 3.5 after 3 months and 1.25 after 12 months. Pimentel used Wexner scoring system in his study in 2003, the continence grade was 3.2, 2.9 and 2.7 at three, six and twelve months post-operatively [16]. Z’graggen and his colleagues used Park’s incontinence score; in which Grade I is full continence, while Grade IV is complete incontinence. In Z’graggen’s study which included 41 patients to whom TCP was done, post operative follow-up showed the patients to be in Grade I and II of continence, with gradual improvement over time, except for two patients who remained in Grade II without improvement [17]. The results in the concurrent study were better when compared to Ho where continence grade was 3.2 when assessed at 4 months and remained unchanged with 3.2 at 12 months follow-up [19].

In the concurrent study, one patient (6.66%) had urgency early in the follow-up that improved markedly after one year. This is comparable to Pimentel who had 10% urgency in his study [16].

This also goes with Z’graggen who reported urgency of 16% of cases after 6 months, to drop to 6% after 12 months [17]. On the contrary, Fazio et al., reported persistence of urgency in 23.3% of patients with coloplasty [22].

Manometric findings of TCP in our study were also comparable to similar studies with mean resting and squeeze pressures 50.57mmHg and 126.99 mmHg respectively, and threshold volume 108.17 ml. These results are consistent with a study by Z’graggen in which median resting pressure after TCP was 49mmHg, with mean tolerable volume 123ml [17].

Pimentel et al., reported resting pressure after TCP 43.6mmHg, squeeze pressure 116.3 mmHg and threshold volume 126.1ml [16]. In another study done by Hong [19], similar results were concluded. In this study resting pressure 47.4 mmHg, squeeze pressure 140.9mmHg and threshold volume 123.1 mL. In a study done by Könünger et al., similar results, with resting pressure 52mmHg, threshold volume 110mL was obtained. Squeeze pressure was not measured in that study [23].

Conclusion:
Transverse coloplasty is a feasible and safe procedure for neorectum construction after low anterior resection to alleviate functional drawbacks of straight colo-anal anastomosis.

References