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Abstract The tendency towards sphincter-preserving resection for distal rectal cancers has led to the technique of straight coloanal anastomosis (CAA) and colonic J-pouch anal anastomosis (CPA) after low anterior resection. The aim of the present study was to compare complication rate, anorectal physiology and functional results after both types of reconstruction after ultra-low intersphincteric resection. A total of 31 patients who had undergone CPA were followed up prospectively using anorectal manometry and a standardised questionnaire and were compared with 63 patients who had undergone CAA and were followed up in the same way. The complication rate after CPA did not differ significantly from that after CAA. One year postoperatively, the median stool frequency and urgency were reduced after CPA (1.7±2.2/day; 7% vs. 2.4±3.6/day; 14%; \( P<0.05 \)). Three months after colostomy/ileostomy closure, the maximum tolerable volume, threshold volume and compliance were decreased after CAA when compared with CPA (55±12, 34±12, and 3.9±0.3 ml/mmHg vs. 85±21, 53±11 and 6.2 ml/mmHg, respectively; \( P<0.05 \)). Anal manometry revealed no significant differences in the anal resting and squeeze pressure. One year postoperatively, continence also did not differ significantly between CPA and CAA. Colonic J-pouch reconstruction seems to be superior to the straight coloanal anastomosis, especially during the first postoperative year. In view of the often poor prognosis of the patients, it is the reconstruction of choice after ultra-low resections of the rectum.

Keywords Rectal cancer · Pouch · Coloanal anastomosis · Manometry · Anorectal physiology

Introduction

Intersphincteric resection of the rectum with direct coloanal anastomosis at the level of the dentate line is the most extreme form of sphincter-preserving surgery for rectal carcinomas. Complete resection of the rectum down to the dentate line, including the proximal part of the internal anal sphincter, ensures sufficient lateral and distal safety margins, even in many tumours of the lower third of the rectum [1], and has therefore become the method of choice in our department [2, 3]. In many patients, the price for avoiding a permanent colostomy was an increase in stool frequency, urgency and often incontinence. The trend towards less mutilating surgery and sphincter preservation has been pursued by the increasing application of colonic J-pouch anal anastomosis in carcinomas of the mid- and lower third of the rectum. Based on experience with the ileal J-pouch, it was described in 1986 by Lazorthes et al. [4] and Parc et al. [5] in order to improve the functional results after very low rectal resections by increasing the neorectal volume. Due to good functional results, the colonic J-pouch anal anastomosis has gained general acceptance and is becoming the operation of choice for carcinomas of the lower third...
of the rectum. In 1997, we adopted this reconstruction technique and modified it by intersphincteric resection and direct J-pouch anal anastomosis (Fig. 1). However, there are still misconceptions about the pouch [6]. This study was designed to analyse the functional and clinical outcomes of our patients with colonic J-pouch reconstruction compared with straight coloanal anastomosis performed after ultra-low anterior resection.

**Patients and methods**

The following results are based on an analysis of patients at the Aachen Technical University’s Department of Surgery who were operated on for low rectal carcinoma between January 1978 and July 1999. Intersphincteric resection of the rectum with straight coloanal anastomosis (CAA) was the standard procedure for carcinomas of the mid- and lower third of the rectum until 1997 and was then superseded by colonic J-pouch anal anastomosis (CPA). Patients with tumour recurrence, palliative resections, infiltration of adjacent organs or preoperative incontinence were excluded from the study. The indication was based on clinical staging and endoscopic ultrasonography. Perirectal tumour infiltration or fixation of the tumour led to abdominoperineal extirpation in the lower third of the rectum. A distal resection margin of at least 1.5 cm was considered oncologically adequate.

Follow-up and data acquisition was prospective in 31 patients with CPA. Data on patients with CAA (n=128) constitute a case control investigation, although 63 of them were followed up prospectively in the same way for at least 1 year. By excluding all other patients, the present study design can be regarded as prospective and consecutive.

Total mesorectal excision and complete intersphincteric resection was performed in all patients as described elsewhere [2]. The colonic pouch was fashioned using a linear stapling device and was 6–6.5 cm long. Straight coloanal anastomoses were completed by hand suture in 20 patients and by using circular staplers in 43 patients. Protective ileostomies or colostomies were performed in all patients with a hand-sutured anastomosis and in 30 patients with a stapled anastomosis. Pouch anal anastomoses were stapled in all patients (using a 32-mm CEEA circular stapling device) with protective ileostomies or colostomies in 26 patients. Protective stomata were closed 10 weeks (range, 5–28 weeks) postoperatively. None of the patients had preoperative radiochemotherapy. Additional intraoperative radiotherapy was performed in four patients with CPA. All patients with Dukes stage B or C received adjuvant chemotherapy postoperatively (Table 1).

All patients were followed up systematically for at least 1 year. Functional results were assessed either by a personal interview during routine controls or by a standardised questionnaire 1 year postoperatively. Continence was classified by the Kirwan-Parks classification:

- I Continence for gas, liquid and solid stools
- II Continence for liquid and solid stools, uncontrolled flatus
- III Incontinence for gas and liquid stools, continence for solid stools, occasional soiling
- IV Incontinence for gas, liquid and solid stools, regular soiling

For comparison with data from the literature, continence grades I and II were considered to be good, III imperfect and IV bad.

A station pull-through vector manometry was performed 3 months after stoma closure in 29 patients with CPA and in 38 patients with CAA. The manometry probe was a nine-lumen open-ended polyvinyl catheter with an outer diameter of 5.5 mm and a perfusion rate of 0.5 ml H₂O/min per capillary. The eight 0.8 mm diameter side holes were circularly arranged at 45° intervals (MUI Scientific, Mississauga, Ontario, Canada). During continuous pull-out at a speed of 10 mm/s, eight pressure vectors were registered.

**Table 1 Patient characteristics**

<table>
<thead>
<tr>
<th>Operative technique</th>
<th>Patients (n)</th>
<th>Age (years)</th>
<th>Sex (n)</th>
<th>Stage (n)a</th>
<th>Distal clearance margins (cm)</th>
<th>Protective colostomy/ileostomy (n) (%)</th>
<th>Intraoperative radiotherapy (n) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPA</td>
<td>31</td>
<td>52</td>
<td>29–85</td>
<td>14 9 8</td>
<td>2.3±1.0</td>
<td>24 77</td>
<td>4 13</td>
</tr>
<tr>
<td>CAA</td>
<td>63</td>
<td>59</td>
<td>22–86</td>
<td>26 18 19</td>
<td>3.3±1.3</td>
<td>50 79</td>
<td>– –</td>
</tr>
</tbody>
</table>

CAA, straight coloanal anastomosis; CPA, colonic J-pouch anal anastomosis.

*a* Dukes classification.