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ORIGINAL ARTICLE

Ostomy function after abdominoperineal resection—a clinical and patient evaluation

E. Angenete · A. Correa-Marinez · J. Heath · E. González · A. Wedin · M. Prytz · D. Asplund · E. Haglind

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Abstract
Purpose Abdominoperineal resection (APR) for rectal cancer results in a permanent colostomy. As a consequence of a recent change in operative technique from standard (S-APR) to extralevator resection (E-APR), the perineal part of the procedure is now performed with the patient in a prone jackknife position. The impact of this change on stoma function is unknown. The aim was to determine stoma-related complications and the individual patient experience of a stoma.
Methods Consecutive patients with rectal cancer operated on with APR in one institution in 2004 to 2009 were included. Recurrent cancer, palliative procedures, pre-existing stoma and patients not alive at the start of the study were excluded. Data were collected from hospital records and the national colorectal cancer registry. A questionnaire was sent out to patients. The median follow-up was 44 months (13–84) after primary surgery.
Results Ninety-six patients were alive in February 2011. Seventy seven agreed to participate. Sixty-nine patients (90 %) returned the questionnaire. Stoma necrosis was more common for E-APR, 34 % vs. 10 %, but bandaging problems and low stoma height were more common for S-APR. There were no differences in the patients' experience of stoma function. In all, 35 % of the patients felt dirty and unclean, but 90 % felt that they had a full life and could engage in leisure activities of their choice.
Conclusions This exploratory study indicates no difference in stoma function after 1 year between S-APR and E-APR. Over 90 % of the patients accept their stoma, but our study indicates that more information and support for patients are warranted.

Keywords Ostomy · Rectal cancer · Abdominoperineal excision · Quality of life

E. Angenete (✉) · A. Correa-Marinez · J. Heath · E. González · A. Wedin · D. Asplund · E. Haglind
Department of Surgery, Sahlgrenska Academy at University of Gothenburg, Sahlgrenska University Hospital/Östra campus, 416 85 Gothenburg, Sweden
e-mail: eva.angenete@vgregion.se

E. Angenete · A. Correa-Marinez · J. Heath · E. González · A. Wedin · M. Prytz · D. Asplund · E. Haglind
SSORG–Scandinavian Surgical Outcomes Research Group, Gothenburg, Sweden

M. Prytz
Norra Älvsborgs Länssjukhus, Trollhättan, Sweden

Introduction

Curative treatment for rectal cancer always involves surgery, often in a combination with radiotherapy and/or chemotherapy. In the last decades, advances in surgical technique [1] and a multidisciplinary approach [2] have led to improved 5-year cancer-specific survival exceeding 62 % in Sweden according to recent figures [3]. The local recurrence rate has also been improved, both through surgical technique and the addition of pre-operative radiotherapy [4]. The surgical approach is dependent on the location of the tumour, where low tumours often are subject to an abdominoperineal resection (APR) with a permanent stoma. However, low tumours have been known to be associated with poorer oncological outcome [5, 6]. With the aim of further improving results in these low rectal cancers, a new surgical technique, the extralevator abdominoperineal resection (E-APR), has been introduced [7]. In the standard APR (S-APR), the patient has been placed in a lithotomy position during the perineal phase of the procedure. With the new extralevator technique (E-APR), the patient is

placed in a prone jackknife position for the perineal part of the surgical procedure [7–9]. The stoma is created prior to the shift in patient position from supine to prone and will be under bodily pressure for the remainder of the operation. The impact of this procedure on stoma outcome is not known.

Stoma-related complications are very common [10, 11], and studies have shown that the technical aspects of stoma formation, such as adequate height and suitable abdominal wall placement of the stoma, are of importance [12–16]. Whether or not the stoma itself affects the quality of life (QoL) after curative treatment for rectal cancer is debated. Some studies indicate a lower QoL after curative resection with a permanent stoma [17–22], but there are contradictory results from other studies [23], and a Cochrane review has indicated that there is a lack of high-level evidence [24]. A fairly recent study from Bloemen et al. suggested that the absence of gastrointestinal dysfunction may actually render patients with a permanent stoma with equal or better QoL scores compared to their counterparts without a stoma [25], a view supported by other studies [26, 27].

The aims of this explorative study were to determine the stoma-related complications and individual experiences of a stoma in patients operated on with APR and to evaluate possible differences between patients operated on in the lithotomy position (S-APR) versus patients placed in the prone jackknife position (E-APR) during the perineal part of the surgical procedure.

Methods

Study design

Patients

All patients operated at our institution with an abdominoperineal resection between 2004 and 2009 were identified from the hospital records and the Swedish Rectal Cancer Registry. Patients operated on for rectal cancer recurrence, palliative procedures and cases with other diagnoses than adenocarcinoma were excluded. This patient cohort has previously been described in depth by Asplund et al. [28]. For this study, patients lost to follow-up, patients with a pre-existing stoma created prior to the curative resection and patients no longer alive at the start of this study were excluded. To evaluate potential selection bias, a comparison between the primary patient cohort and the study population was made. All patients included in the study (n=69) were compared regarding age, gender, type of surgery (standard or extralevator APR), tumour stage, American Society of Anaesthesiology (ASA) classification, BMI and pre-operative radiotherapy to patients not able or willing to participate in the study, patients with pre-operative stoma, patients lost to follow-up and patients dead during follow-up. The patients in the study population (n=69) had lower tumour stage and less severe co-morbidity (indicated by ASA classification) compared to patients not possible to be included (n=89); otherwise, the groups were comparable.

Clinical data from charts and the Swedish Rectal Cancer Registry

Patient charts and the Swedish Rectal Cancer Registry were reviewed for gender, age, BMI, pre-operative adjuvant treatment, laparoscopic or open procedure, type of surgery (standard or extralevator APR), mobilization of the splenic flexure, perioperative blood loss, operating time (including, when applicable, turning of the patient), perioperative bowel perforation and ASA classification as a surrogate marker for pre-operative morbidity, tumour height, tumour stage (Union for International Cancer Control, UICC), length of hospital stay, local recurrence, stoma height and diameter measured 3–7 days post-operatively, at 6 and 12 months. The follow-up regarding stoma height and diameter is missing in two patients at 6 months due to a re-operation (one) and a patient-missed follow-up visit (one). At 1 year, three patients had been re-operated on due to stoma complications, and their data are thus missing. The number of patients included in each calculation is stated in the tables. All problems with bandaging of the stoma as reported by the stoma care nurse were registered. Any hospital admission or surgery due to stoma complications during the follow-up period was registered. Stoma-related complications defined as bleeding, necrosis, stenosis, hernia, skin irritation, fistula, dehiscence, retraction, prolapse and inflammation registered at any time during the first year by a stoma care nurse were included in the study.

Quality-of-life questionnaire

A questionnaire with detailed questions on overall quality of life as well as stoma function was constructed using in-depth qualitative interviews as a base together with previously validated questions, and content validation was then performed by an expert panel consisting of colorectal surgeons, gynaecologists, oncologists and specialized nurses. The questionnaire was face validated by rectal cancer patients operated on with abdominoperineal resection using the same validation methods previously described for prostate cancer [29]. It comprised a total of 249 questions; not all questions have been analysed for this report. The patients were asked to describe symptoms occurring within the last month in order to achieve as true answers as possible. When appropriate, we questioned the patients about the quality, frequency and intensity of a symptom as well as the corresponding distress to the symptoms [29].

After an introductory letter and a telephone call, all patients alive in the spring of 2011 who agreed to participate in the study were mailed a questionnaire. All patients received a reminder and thank you note after 2 weeks, and if the questionnaire was not returned, a second phone call was made as a reminder.

Surgical procedure

During 2004–2006, at our institution, the perineal part of the APR was performed with the patient in the lithotomy position. The standard technique (S-APR) was then replaced by the extralevator APR that differs from the standard procedure as described elsewhere [7]. Briefly, the abdominal dissection is stopped above the levator muscle plane in extralevator APR, and the patient is turned into the prone jackknife position for the perineal phase. The major surgical difference between the two groups was the more lateral perineal dissection with the extended technique, resulting in a wide resection of the levator muscles and a cylindrical specimen.

The timing of the stoma construction is different between the techniques. The stoma is created in the end of the procedure in S-APR and prior to the turning of the patient in E-APR. The stoma was created through the rectus abdominis muscle according to local standards, and the technique did not change during the study period. A stoma care nurse sited all patients preoperatively. The extralevator APR was introduced at our hospital in the end of 2006 and was then generally employed in 2007–2009, regardless of tumour stage, during the remainder of the study period.

Follow-up

All patients were contacted in the spring of 2011 rendering a median follow-up time after surgery of 44 months (13–84).

Statistical analysis

The statistical analyses were performed with SPSS 19.0 (SPSS Inc., Chicago, IL, USA). Assuming that data were not normally distributed, non-parametric testing was performed. Chi-square test, Fisher's exact test and the Mann–Whitney *U* analysis were used, and the results are presented as median values with minimum and maximum range in parenthesis. Some of the questionnaire data were dichotomized to distinguish presence of symptoms from no symptoms and then related to the surgical technique. Symptoms were also related to the corresponding distress of the symptoms using the chi-square test. Quality-of-life aspects related to the presence of a stoma were analysed for the entire group.

Ethical aspects

The local ethics committee approved the study (#407-10), and the study was registered at ClinicalTrials.gov, NCT01323166.

Results

Out of 213 consecutive cases of APR, a total of 55 were excluded, due to reasons described above. Of the 158 eligible patients, patients with a pre-existing stoma ($n=12$) and those patients lost to follow-up regarding stoma complications due to stoma care at another hospital or unwilling to be

Table 1 Baseline characteristics

	Standard APE	Extralevator APE
Patients	31	38
Male (%)	68 %	58 %
Age (median)	66 (47–81)	66 (35–89)
BMI (median)	24 (20–34)	24 (19–37)
ASA classification		
ASA I	11 (36 %)	7 (18 %)
ASA II	19 (61 %)	24 (63 %)
ASA III	1 (3 %)	6 (16 %)
ASA IV	0 (0 %)	1 (3 %)
UICC stage		
Stage 0	0	1 (3 %)
Stage I	11 (36 %)	11 (29 %)
Stage II	10 (33 %)	11 (29 %)
Stage III	9 (29 %)	15 (40 %)
Stage IV	1 (3 %)	0 (0 %)
Radical surgery (CRM>1 mm)	25 (83 %)	36 (97 %)
Neo-adjuvant treatment		
Radiotherapy	28 (90 %)	28 (76 %)
Radiochemotherapy	0 (0 %)*	9 (24 %)*
Adjuvant treatment	10 (32 %)	13 (34 %)
Operative time (minutes, median)	258 (181–649)*	340 (236–541)*
Intraoperative bowel perforation	3 (10 %)	4 (11 %)
Mobilization of the splenic flexure	2 (6.5 %)	3 (7.9 %)
Bleeding (L)	0.9 (0.001–2.9)	0.75 (0.02–6.0)
Laparoscopic procedure	3 (10 %)	10 (26 %)
Hospital stay (days)	10 (6–47)	11 (7–36)
Local recurrence	1 (3 %)[a]	0 (0 %)
Follow-up time at time of questionnaire send-out	65 (16–84)*	29 (13–48)*

All values are median values with range in parenthesis

*$p<0.05$

[a] Patient curatively treated for local recurrence in March 2005—no signs of recurrent disease since then

Table 2 Stoma-related data registered by stoma care nurses

	Post-operatively (n=69)		6 months (n=67)		1 year (n=66)	
	Standard APE	Extralevator APE	Standard APE	Extralevator APE	Standard APE	Extralevator APE
Stoma height (mm)	10* (0–40)	20* (0–35)	5* (0–20)	10* (0–40)	5 (0–20)	10 (0–30)
Stoma diameter (mm)	32 (23–40)	30 (20–45)	25 (19–33)	28 (18–45)	26 (20–35)	25 (18–40)
All values are median values with range in parenthesis; *p<0.05						
	Standard APE (n=31)			Extralevator APE (n=38)		
Bandaging problems registered by stoma care nurse (n=69)	11 (36 %)			6 (16 %)		
Surgery due to stoma complications (n=69)	5 (16 %)			3 (8 %)		
Patients admitted to hospital due to stoma complications (n=69) *p<0.05	4 (13 %)			4 (11 %)		
Stoma complications (n=69) *p<0.05	Standard APE (n=31)			Extralevator APE (n=38)		
Necrosis	3 (10 %)*			13 (34 %)*		
Bleeding	3 (10 %)			1 (3 %)		
Stenosis	2 (7 %)			4 (11 %)		
Hernia	6 (19 %)			11 (29 %)		
Skin irritation	7 (23 %)*			2 (5 %)*		
Fistula	1 (3 %)			0 (0 %)		
Dehiscence	2 (7 %)			2 (5 %)		
Retraction	1 (3 %)			0 (0 %)		
Prolapse	0 (0 %)			1 (3 %)		
Inflammation	1 (3 %)			4 (11 %)		

Table 3 Bowel function and stoma-related symptoms

	Standard APE	Extended APE	*p* value
1. Have you been constipated the last month?	5/30 (17 %)	9/37 (24 %)	n.s.
2. Have you had diarrhoea the last month?	10/29 (35 %)	8/37 (22 %)	n.s.
3. Have you had a feeling of stomach bloating the last month?	9/29 (31 %)	11/37 (30 %)	n.s.
4. Have you had loud farts from your stoma the last month?	25/31 (81 %)	30/37 (81 %)	n.s.
5. Have you had smelly farts from your stoma the last month?	15/30 (50 %)	21/38 (55 %)	n.s.
6. Have you had leakage of faeces from your stoma the last month?	14/30 (47 %)	17/38 (45 %)	n.s.
7. Has the skin been irritated around your stoma the last month?	14/31 (45 %)	9/38 (24 %)	n.s.
8. Have you had problems managing your stoma the last month?	3/31 (10 %)	6/38 (16 %)	n.s.

n.s. = non significant

followed by a stoma care nurse ($n=16$) were excluded. Thus, 130 patients were possible to be included at the start of the study. Thirty-four patients were dead, leaving 96 patients possible to include, but ten patients declined to participate in the study, two patients had emigrated and seven patients were either too sick or not able to answer due to language difficulties. Of the 77 patients who agreed to participate in the study, 69 patients (90 %) returned the questionnaire.

The study population was divided into standard APR (S-APR) and extralevator APR (E-APR) for analysis regarding the stoma-related complication rate. The baseline characteristics of the population are displayed in Table 1. No patients in the S-APR group had pre-operative radiochemotherapy compared to 24 % in the E-APR group ($p<0.03$). The E-APR group had longer operating time (340 vs. 257 min, $p<0.0001$). Otherwise, the groups were comparable regarding age, gender, BMI, morbidity, UICC stage, radical surgery, pre-operative radiotherapy, adjuvant treatment, bowel perforation, bleeding, laparoscopic vs. open procedures and hospital stay. The follow-up time after surgery differed between the two groups.

The stoma height was significantly shorter in the standard APR (S-APR) group both post-operatively and at 6 months (Table 2). The stoma diameter did not differ significantly between the two surgical groups. There was a trend towards more bandaging problems registered by the stoma care nurse in the S-APR-group compared to the E-APR group (11 of 31 vs. 6 of 38, $p<0.059$), and more patients in the S-APR group had skin problems (7 of 31 vs. 2 of 38, $p<0.05$). The number of patients with a necrosis of the stoma was significantly higher in the E-APR group (13 of 38 vs. 3 of 32, $p<0.05$). The other complications registered did not differ between the two groups. The proportion of patients requiring surgery or hospital admissions due to stoma complications did not differ between the two groups.

The patients' experiences regarding symptoms of the stoma and bowel function are displayed in Table 3. The

Table 4 Patients' feelings about bowel function and stoma-related symptoms

	No symptoms with answer: "It would affect me negatively"	Symptom present with answer: "It would affect me negatively"
1. How would you feel if you would be constipated for the rest of your life the way it has been the last month?	0/52 (0 %)	10/14 (71 %)
2. How would you feel if you would have diarrhoea for the rest of your life the way it has been the last month?	3/47 (6 %)	16/18 (89 %)
3. How would you feel if you would have this feeling of bloating for the rest of your life the way it has been the last month?	0/46 (0 %)	17/20 (85 %)
4. How would you feel if you would have loud farts for the rest of your life the way it has been the last month?	1/12 (8 %)	34/55 (62 %)
5. How would you feel if you would have smelly farts for the rest of your life the way it has been the last month?	4/32 (13 %)	27/36 (75 %)
6. How would you feel if you would leak faeces for the rest of your life the way it has been the last month?	5/37 (14 %)	23/30 (77 %)

Table 5 How often have you worried that your stoma will leak during the last month?

	No symptoms of leakage	Leakage within the last month
1. Not applicable, I have not been worried about leakage the last month.	23 (62 %)	5 (17 %)
2. I have been worried at least once this last month.	9 (24 %)	10 (33 %)
3. I have been worried at least once a week.	2 (5 %)	9 (30 %)
4. I have been worried at least three times the last week.	1 (3 %)	1 (3 %)
5. I am worried at least once a day.	2 (5 %)	5 (17 %)

frequency of symptoms did not differ between the two surgical groups.

The patients' distress was related to the presence of symptoms. Patients were asked if they would feel distressed if a symptom was to persist for the rest of their life; most symptoms were associated with a distress. Some patients without a specific symptom also displayed a distress about the symptoms in some cases (Table 4). When asked how frequently they worried about their stoma leaking, more than 30 % of the patients without any leakage reported worries about leakage. Leakage did, however, seem to increase the intensity of worries, as 30 % with leakage worried at least once a week compared to 5 % among patients without leakage (Table 5).

Most of the patients (93 %) felt that their stoma did not limit their ability to live their lives (Table 6). Still, over 40 % of the patients with symptoms from their stoma or bowel feel that this would negatively affect their life if the symptoms would persist. Also, 22 % were afraid of embarrassing episodes during sexual activity, and 35 % felt dirty and unclean because of their stoma.

Discussion

This study shows that stoma function after 1 year did not differ between the two groups. However, regarding early complications, this exploratory study revealed differences; stoma necrosis after APR was more common in patients operated on in the prone jackknife position. The reported incidence of stoma necrosis in the literature is about 20 % or less [12, 13, 30, 31], while the incidence was 35 % in our patients operated on in the prone jackknife position. A possible explanation for our finding may be pressure of bodily weight on the newly constructed stoma during the prone jackknife position. However, there were no differences in surgery due to stoma complications between two groups indicating that stoma necrosis did not pose a severe clinical problem.

Patients operated on in the lithotomy position had a shorter height of their stoma and a trend towards more stoma bandaging problems. The correlation between stoma height and post-operative bandaging problems has been demonstrated previously [12, 13] and stresses the importance of adequate height of the stoma. We considered whether inadequate mobilization of the splenic flexure could explain our results, but there were only a few patients that had their flexure mobilized, and it did not differ between the two groups. Whether the difference in time when the stoma is constructed during the surgical procedure has any impact on the short-term outcome is not possible to determine from our data.

We found no differences in stoma or bowel function between the two groups when at least 13 months had passed after surgery. This is corroborated by other studies [12], indicating that the short-term differences in stoma complications have little impact on the long-term results.

In all, we had a low rate of re-operation due to stoma problems, although we had a hernia rate of 19–29 % and a stoma necrosis rate of 10–34 %. This is probably in part explained by the fact that our stoma care nurses are skilled at helping patients with bandaging problems resulting from complications. Many of our patients are old, and as long

Table 6 Patient-assessed quality of life related to stoma function

	Yes	No
1. I feel that I can live a full life with my stoma.	64/69 (93 %)	5/69 (7 %)
2. I feel at ease with my stoma.	64/69 (93 %)	5/69 (7 %)
3. I am worried that something awkward may occur during sexual activity, due to my stoma.	15/67 (22 %)	52/67 (78 %)
4. I feel dirty and unclean due to my stoma.	24/67 (36 %)	43/67 (64 %)
5. I have the leisure activities and the social life I want.	60/67 (90 %)	7/67 (10 %)
6. It would affect me negatively if I had the same stoma/bowel problems I have today for the rest my life.	27/65 (41 %)	38/65 (59 %)

as their bandaging does not pose a problem, we generally do not recommend surgery for these patients. Consequently, we suggest that the low re-operation rate is explained by a low impact on function by the short-term complications for most of our patients.

The follow-up time differs between the two groups, due to the retrospective study design. However, it is plausible to believe that the long-term stoma complications remain constant, and studies have shown that after 1 year, the quality-of-life measurements indicate stabilized scores [20, 32].

The QoL measurements in this study differ from other studies in that not only symptoms but also the distress caused by these symptoms have been evaluated, as described previously [29, 33]. Whether or not a stoma has a negative impact on quality of life has been extensively debated [17–27]. This study cannot fully answer this question, both due to limited sample size and lack of comparison to other groups. It is of course possible that some patients misunderstand some questions, but we have performed thorough face validation of our questionnaire and believe this risk to be very small.

Over 40 % of the patients in our study with symptoms from their stoma or bowel felt that this would negatively affect their life if the symptoms would remain the same. The fear of leakage of faecal content was present even if the patient had little or no symptoms, and a majority of patients who have had leakage of stool worried about this at least once a month. Many patients felt dirty and unclean due to their stoma, and 22 % were worried of adverse events during sexual activity. We suggest that improved information from the surgeon as well as stoma care nurses could reduce this distress. A study addressing this issue would be of great interest as it might reduce the stress caused by a permanent colostomy.

On the other hand, over 90 % of the patients indicated that their stoma did not have a negative impact on their life or leisure activities. In total, this indicated that in general, surviving patients with a colostomy after abdominoperineal resection experience a full life.

In conclusion, we found short-term differences in stoma outcome between patients placed in a prone jackknife position compared to lithotomy position, but for patients surviving more than 1 year after surgery, this did not appear to affect their ostomy or bowel function. Our study is retrospective, and due to the explorative nature of the analysis, the data must be interpreted with caution. We plan to conduct further studies with a larger patient population to enlighten this issue further.

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