What to do with the rectal stump during sphincter preserving rectal cancer resection with end colostomy: a collaborative snapshot study

E. Westerduin*, T. S. Aukema†, A. A. W. van Geloven†, W. A. Bemelman* and P. J. Tanis* on behalf of the Dutch Snapshot Research Group

*Department of Surgery, Academic Medical Centre, University of Amsterdam, Amsterdam, The Netherlands, †Department of Surgery, Tergooi Hospital, Hilversum, The Netherlands, and ‡Department of Surgery, Spaarne Gasthuis, Haarlem, The Netherlands

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Abstract

Aim Low Hartmann’s resection (LHR) and intersphincteric abdominoperineal excision (iAPR) are both feasible options in the treatment of rectal cancer when restoration of bowel continuity is not desired. The aim of this study was to compare the incidence of pelvic abscess and associated need for re-intervention and readmission after LHR and iAPR.

Method From a snapshot research project in which all rectal cancer resections from 71 Dutch hospitals in 2011 were evaluated, patients who underwent LHR or iAPR were selected.

Results A total of 185 patients were included: 139 LHR and 46 iAPR. No differences in baseline characteristics were found except for more multivisceral resections in the iAPR group (22% vs 10%; \( P = 0.041 \)). Pelvic abscesses were diagnosed in 17% of the LHR group after a median of 21 days (interquartile range 10–151 days), compared to 11% in the iAPR group (\( P = 0.352 \)) after a median of 90 days (interquartile range 44–269 days; \( P = 0.102 \)). All 28 patients with a pelvic abscess underwent at least one re-intervention. Four patients (9%) in the iAPR group and nine (7%) after LHR were readmitted because of a pelvic abscess over a median 39 months of follow-up.

Conclusion This cross-sectional multicentre study suggests that cross-stapling and intersphincteric resection of the rectal stump, during non-restorative rectal cancer resection, are associated with an equal risk of pelvic abscess formation and have a similar need for re-intervention and readmission.

Keywords rectal cancer, surgery, hartmann’s resection, intersphincteric abdominoperineal resection, pelvic abscess

Introduction

Substantial comorbidity, old age and poor sphincter function are valid reasons to abort sphincter saving surgery in patients with rectal cancer. Restoring continuity in such patients might be fatal in case of an anastomotic leak. When it is not necessary to resect the anus and the pelvic floor for oncological reasons, these patients can be treated with sphincter preserving but non-restorative resection of the rectum. Options are either to cross-staple the distal rectum or to perform an intersphincteric excision of the rectal stump. The former is often referred to as a low Hartmann’s resection (LHR) and the latter as an intersphincteric abdominoperineal excision (iAPR).

Some studies have reported high pelvic abscess rates after LHR, with a short rectal stump (≤ 2 cm) being a risk factor, suggesting that it is better to excise the remaining short rectal stump [1]. However, APR is also associated with a risk of pelvic abscess and perineal wound complications in up to 50% of patients [2,3].
Preserving the pelvic floor and external sphincter, using iAPR, has been suggested as an alternative technique to both LHR and conventional APR. Such a procedure will leave a less significant perineal wound and no rectal stump [1,2,4]. There are only a few studies regarding iAPR as primary treatment for rectal cancer and, to our knowledge, only one small study comparing iAPR with LHR [5,6]. Therefore, the aim of this study was to compare LHR and iAPR with respect to abscess formation and the associated need for re-intervention and readmission using a dataset from a collaborative research project involving 71 Dutch hospitals.

**Methods**

**Snapshot design**

A resident-led, retrospective cross-sectional snapshot study was performed, a method first described by Pinckney and colleagues [7,8]. A total of 71 hospitals in the Netherlands participated, including all consecutive patients who underwent surgery for rectal cancer from January to December 2011. It was executed as collaborative research under the name of the Dutch Snapshot Research Group (DSRG), in collaboration with the Dutch Colorectal Audit (DCRA).

The Medical Ethical Committee of the Academic Medical Centre in Amsterdam, the Netherlands, reviewed and approved the study design and judged that no informed consent from the included patients was necessary considering the observational study design with no additional burden for the patient.

**Data extraction**

The methodology of this snapshot study has been described elaborately in the first publication of the DSRG [9]. Briefly, from the DCRA, all patients who had a resection for rectal cancer in 2011 were identified. Existing data from the DCRA was completed by the snapshot study, including additional data on diagnostic and treatment characteristics and long-term surgical and oncological outcomes. Every participating hospital had one or two surgical residents who were supervised by a surgeon and were responsible for collection of the additional data in a web-based tool which was specifically developed and controlled for privacy regulations.

**Patients**

All patients from the snapshot database who underwent an elective LHR or iAPR as primary treatment for rectal cancer with curative intent were selected. For the LHR group, only patients with a distance of \( \leq 6 \) cm between the lower border of the tumour and the anorectal junction on preoperative sagittal MRI were included to ensure that all Hartmann’s resections could be considered low. Patients in whom no preoperative MRI was performed or in whom the height was not calculated were excluded. All patients who underwent iAPR were included, irrespective of the height of the tumour, since this would not influence the height of the resection. Patients were excluded if the indication for surgery was local recurrence, additional resection following previous (recto)sigmoid resection, or salvage surgery after the occurrence of persistent anastomotic leakage or pelvic abscess.

**End-points and definitions**

Primary end-points were the incidence of pelvic abscess and abscess related need for re-intervention and readmission during long-term follow-up. Secondary end-points were intra-operative complications, overall complications requiring surgical re-interventions, overall readmissions and postoperative mortality. Event rates were separately determined for the periods within 30 days of primary surgery and beyond. A pelvic abscess was defined as either an abscess on the rectal stump or a presacral abscess.

**Statistical analysis**

Descriptive data were reported as median with interquartile range (IQR) or mean with standard deviation (SD) where appropriate. Categorical variables were presented as number and percentage. Comparison between groups for discrete variables was made by the chi-squared test, the chi-squared test for trend or the Fischer exact test when appropriate. The independent \( t \) test was used to compare normally distributed continuous variables and the Mann–Whitney \( U \) test was used to compare continuous variables not normally distributed. \( P < 0.05 \) was considered statistically significant. For the primary end-point, time-to-event analysis was performed, censoring for death or loss to follow-up, using the Kaplan–Meier method. Comparison between groups was made using the log-rank test. Analyses were performed using IBM SPSS Statistics for Windows (Version 24.0: IBM Corp., Armonk, New York, USA).

**Results**

**Patients**

From the total dataset of 2095 patients who underwent resection for rectal cancer, a total of 185 patients were
selected, of whom 139 (75%) underwent LHR and 46 (25%) underwent an iAPR. Patients in the LHR group were non-significantly older than those in the iAPR group (mean 72 vs 68 years; $P = 0.055$). In both groups, 93.5% of the patients (130 and 43 patients respectively) received some form of preoperative treatment. An overview of baseline characteristics is shown in Table 1.

### Intra-operative outcome

In the LHR group, 59 patients (42.4%) had their procedure performed laparoscopically compared to 25 patients (54.3%) in the iAPR group ($P = 0.156$). Fewer patients in the LHR group underwent a multivisceral resection [14 (10.1%) vs 10 (21.7%); $P = 0.041$]. Simultaneous resection of metastases was performed in four and two patients, respectively. An intra-operative complication occurred in four patients (2.8%) in the LHR group and in five patients (10.9%) in the iAPR group ($P = 0.049$). Intra-operative characteristics are described in Table 2. There were no significant differences in stage distribution and completeness of resection (Table 3).

### Pelvic abscess

Overall, a pelvic abscess occurred in 23 patients (16.5%) following LHR and in five patients (10.9%) after iAPR ($P = 0.352$). In the LHR group, 11 of the 23 abscesses

### Table 1 Baseline characteristics.

|                      | LHR ($n = 139$) | iAPR ($n = 46$) | $P$ value |
|----------------------|-----------------|-----------------|-----------|
| Sex ($n$, %)         |                 |                 |           |
| Male                 | 76 (54.7%)      | 27 (58.7%)      | 0.634     |
| Female               | 63 (45.3%)      | 19 (41.3%)      |           |
| Age at surgery (years), mean (± SD) | 72 (± 10.2)     | 68 (± 11.5)     | 0.055     |
| BMI, median (IQR)    | 25 (22–29)      | 24 (23–29)      | 0.435     |
| ASA classification ($n$, %) |             |                 | 0.683     |
| 1                    | 26 (18.7%)      | 7 (15.2%)       |           |
| 2                    | 85 (61.2%)      | 30 (65.2%)      |           |
| 3                    | 24 (17.3%)      | 7 (15.2%)       |           |
| 4                    | 1 (0.7%)        | 1 (2.2%)        |           |
| Unknown              | 3 (2.2%)        | 1 (2.2%)        |           |
| Height of tumour on MRI |             |                 | 0.619     |
| 0 cm                 | 6 (4.3%)        | 2 (4.3%)        |           |
| 1 cm                 | 9 (6.5%)        | 7 (15.2%)       |           |
| 2 cm                 | 13 (9.4%)       | 5 (10.9%)       |           |
| 3 cm                 | 19 (13.7%)      | 4 (8.7%)        |           |
| 4 cm                 | 29 (20.9%)      | 5 (10.9%)       |           |
| 5 cm                 | 34 (24.5%)      | 7 (15.2%)       |           |
| 6 cm                 | 29 (20.9%)      | 1 (2.2%)        |           |
| ≥ 7 cm               | –               | 10 (21.7%)      |           |
| Unknown              | –               | 5 (10.9%)       |           |
| cTNM tumour stage    |                 |                 | 0.736     |
| Stage 1              | 17 (12.2%)      | 3 (6.5%)        |           |
| Stage 2              | 29 (20.9%)      | 11 (23.9%)      |           |
| Stage 3              | 56 (40.3%)      | 20 (43.5%)      |           |
| Stage 4              | 12 (8.6%)       | 4 (8.7%)        |           |
| Unknown              | 25 (18.0%)      | 8 (17.4%)       |           |
| Preoperative treatment ($n$, %) |             |                 | 1.000     |
| Type of preoperative treatment ($n$, %) |           |                 | 0.427     |
| Short course radiotherapy | 68 (48.9%) | 15 (32.6%) |           |
| Long course radiotherapy | 4 (2.9%) | 2 (4.3%) |           |
| Chemoradiotherapy     | 50 (36.0%)      | 24 (52.2%)      |           |
| Chemotherapy          | 1 (0.7%)        | –               |           |
| Radiotherapy unspecified | 7 (5.0%) | 2 (4.3%) |           |

ASA, American Society of Anesthesiology; BMI, body mass index.
were diagnosed within 30 days, whereas all abscesses in the iAPR group were diagnosed beyond 30 days ($P = 0.041$). When censored for mortality or loss to follow-up, there was still no difference in the overall incidence of pelvic abscess between LHR and iAPR (Fig. 1).

After LHR, the median time from surgery to diagnosis of the pelvic abscess was 21 days (IQR 10–151 days), compared to a median of 90 days (IQR 44–269 days) in the iAPR group ($P = 0.102$). The length of the rectal stump could not be determined; however, subgroup analysis was performed in the LHR group depending on tumour location. Sixteen patients (11.5%) with a tumour located 3 cm or less from the anorectal junction on MRI developed a pelvic abscess, compared to seven patients (5.0%) with a tumour above 3 cm ($P = 0.812$).

All patients with pelvic abscess underwent one or more re-interventions. An overview of the type of treatment for all pelvic abscesses is displayed in Table 4. In two patients, who initially underwent LHR (1.4%), an intersphincteric resection of the rectal stump was performed because of persistent pelvic abscess at 9 and 11 months postoperatively. In the LHR group, nine

### Table 2 Intra-operative characteristics.

|                        | LHR ($n = 139$) | iAPR ($n = 46$) | $P$ value |
|------------------------|-----------------|----------------|-----------|
| Technique ($n, %$)     |                 |                | 0.156     |
| Open       | 77 (55.4%)      | 20 (43.5%)     |
| Laparoscopic | 59 (42.4%)      | 25 (54.3%)     |
| Unknown   | 3 (2.2%)        | 1 (2.2%)       |
| Conversion ($n, %$)   | 13 (9.4%)       | 3 (6.5%)       | 0.764     |
| Accessibility        | 10              | 2              |
| Intra-operative complication | 2 | 1          |
| Extensive tumour     | 1               | –              |
| Multivisceral resection ($n, %$) | 14 (10.1%) | 10 (21.7%) | 0.041     |
| Omentoplasty ($n, %$)* | –              | 19 (41.3%)    |
| Intra-operative complications ($n, %$) | 4 (2.8%) | 5 (10.9%) | 0.049     |
| Intra-operative bleeding | 1              | –              |
| Bowel injury         | 2               | 1              |
| Ureter injury        | 1               | 1              |
| Spleen injury        | –               | 1              |
| Other                | –               | 2              |

iAPR, intersphincteric abdominoperineal excision; LHR, low hartmann’s resection.

*Omentoplasty in LHR was not registered.

### Table 3 Oncological outcome.

|                        | LHR ($n = 139$) | iAPR ($n = 46$) | $P$ value |
|------------------------|-----------------|----------------|-----------|
| ypTNM stage ($n, %$)  |                 |                | 0.724     |
| Stage 0               | 12 (8.6%)       | 3 (6.5%)       |
| Stage 1               | 26 (18.7%)      | 13 (28.3%)     |
| Stage 2               | 41 (29.5%)      | 11 (23.9%)     |
| Stage 3               | 42 (30.2%)      | 14 (30.4%)     |
| Stage 4               | 13 (9.4%)       | 4 (8.7%)       |
| Unknown               | 5 (3.6%)        | 1 (2.2%)       |
| Radical surgical resection ($n, %$) |          |                | 0.128     |
| R0                    | 121 (87.1%)     | 44 (95.7%)     | 0.189     |
| R1                    | 10 (7.2%)       | 1 (2.2%)       | 0.295     |
| R2                    | 2 (1.4%)        | –              | 1.000     |
| Unknown               | 6 (4.3%)        | 1 (2.2%)       | –         |
| Circumferential resection margin < 1 mm ($n, %$) | 7 (5.0%) | 2 (4.3%) | 1.000     |

iAPR, intersphincteric abdominoperineal excision; LHR, low hartmann’s resection.
patients (6.5%) were readmitted because of pelvic abscess, of whom three (2.2%) were admitted within 30 days. Four patients in the iAPR group (8.7%) were readmitted because of a pelvic abscess, all beyond the 30-day postoperative period.

**Overall short-term surgical outcome**

Postoperative complications, requiring surgical re-intervention within 30 days, occurred in eight out of 139 patients (5.8%) in the LHR group. Besides surgical drainage of a pelvic abscess in one patient, six other patients (4.3%) underwent a stoma related re-intervention, and the remaining patient underwent adhesiolysis because of an ileus. In the iAPR group, two out of 46 patients (4.3%) had a surgical re-intervention within 30 days, one stoma related re-intervention and one adhesiolysis.

Following LHR, eight patients (5.8%) were readmitted within 30 days. As mentioned above, three patients were readmitted because of a pelvic abscess, three because of a postoperative ileus, one patient had an infection of the abdominal wound and the last patient was readmitted because of dehydration. Readmission within 30 days was required in two patients (4.3%) following iAPR, both because of an ileus. In the LHR group, four patients (2.9%) died within 30 days, three being related to surgical complications: one patient had an ileus followed by progressive renal failure, one patient had peritonitis after iatrogenic bowel injury and the third patient died of sepsis because of an intra-abdominal abscess.

**Overall long-term surgical outcome**

Median duration of follow-up was 39 months in both groups, with an IQR of 13–45 months after LHR and an IQR of 19–44 months following iAPR \( (P = 0.841) \). In the iAPR group, the perineal wound was healed within 30 days in 65.2% of the patients \( (n = 30) \). An additional 19.6% \( (n = 9) \) of patients had a healed perineal wound within 3 months. No persisting perineal wound problems were reported. A total of five patients (10.9%) in the iAPR group developed a perineal hernia, of whom one patient (2.2%) underwent surgical repair.

Beyond 30 days, 22 patients underwent a total of 30 surgical re-interventions after LHR and 11 patients in the iAPR group underwent 21 surgical re-interventions. An overview of all surgical re-interventions is shown in
Table 4. At any time during follow-up, a total of 26 patients (18.7%) were readmitted in the LHR group vs nine patients (19.6%) in the iAPR group ($P = 0.900$).

| Duration of admittance | LHR ($n = 139$) | iAPR ($n = 46$) | $P$ value |
|------------------------|-----------------|-----------------|-----------|
| Days, median (IQR)     | 9 (7–13)        | 8 (7–12)        | 0.554     |
| Pelvic abscess ($n$, %)* | 23 (16.5%)     | 5 (10.9%)       | 0.352     |
| Within 30 days         | 11 (7.9%)       | 0 (0%)          | 0.041     |
| Time between surgery and diagnosis pelvic abscess |                |                 |           |
| Days, median (IQR)     | 21 (10–151)     | 90 (44–269)     | 0.102     |
| All type of treatment for pelvic abscess |                |                 |           |
| Percutaneous (trans-gluteal) drainage | 2 | 2 | |
| Trans-anal drainage    | 15              | –               |           |
| Surgical drainage      | 8               | 2               |           |
| Surgical trans-perineal drainage | – | 3 | |
| Endo-SPONGE® treatment | 1               | 2               |           |
| Patients with surgical re-interventions ($n$, %) | 28 (20.1%) | 13 (28.8%) | 0.251 |
| Within 30 days         | 8 (5.8%)        | 2 (4.3%)        | 1.000     |
| Total number of surgical re-interventions | 38 | 23 | |
| Surgical treatment of pelvic abscess | 9 | 7 | |
| Stoma related surgical re-intervention | 22 | 10 | |
| Correction perineal hernia | – | 1 | |
| Correction incisional hernia | 1 | – | |
| Adhesiolysis           | 4               | 1               |           |
| Intersphincteric resection of rectal stump | 2 | – | |
| Other                  | –               | 4               |           |
| Patients with one or more readmissions ($n$, %) | 26 (18.7%) | 9 (19.6%) | 0.900 |
| Within 30 days         | 8 (5.8%)        | 2 (4.3%)        | 1.000     |
| Mortality              | 44 (31.7%)      | 8 (17.4%)       | 0.068     |
| Within 30 days         | 4 (2.9%)        | 0 (0%)          | 1.000     |

iAPR, intersphincteric abdominoperineal excision; LHR, low hartmann’s resection.
*Number of patients, at any time during follow-up.

Table 4. At any time during follow-up, a total of 26 patients (18.7%) were readmitted in the LHR group vs nine patients (19.6%) in the iAPR group ($P = 0.900$).

**Discussion**

This cross-sectional multicentre snapshot study revealed no significant differences in the overall incidence of pelvic abscess, the abscess related re-intervention or readmission rates between LHR and iAPR for distal rectal cancer. Pelvic abscesses after iAPR were all diagnosed beyond 30 days, while half of the abscesses were diagnosed in the early postoperative period after LHR ($P = 0.041$). Overall, a substantial percentage of patients underwent surgical re-intervention for any reason (20% after LHR and 28% after iAPR), and only a minority of these re-interventions were performed within 30 days postoperatively. Similarly, high readmission rates were found for both groups (19% after LHR and 20% after iAPR), also mostly occurring beyond 30 days.

Presumably, the formation of a pelvic abscess after LHR is mostly due to leakage or blowout of the staple line of the rectal stump. It has been suggested that the anal sphincter forms a barrier of high resistance for drainage of remaining fluid and mucous in the rectal stump causing the staple line to blow out. Considering this aetiology, pelvic abscesses subsequent to LHR might develop relatively soon following surgery, at a time when the blind ending rectal stump has not yet healed. After iAPR, however, pelvic abscesses probably develop from fluid collections in the presacral cavity following the total mesoectal excision dissection which then becomes secondarily contaminated. The layered closure of the pelvic floor with preserved external sphincter might contribute to formation of such fluid collections. This process might evolve more slowly, probably explaining the more delayed diagnosis of the abscess following iAPR compared with LHR.

Literature on pelvic abscess formation after LHR and iAPR for rectal cancer is scarce and there also is substantial variability in reported outcome. Pelvic abscess
rates between 3% and 33% have been reported after LHR and between 6% and 17% after iAPR [1,2,4–6,10]. Transection within 2 cm from the pelvic floor, previously described as an independent risk factor for pelvic abscess formation by Tøttrup et al., could not be statistically confirmed as a risk factor in this study although a tendency towards more pelvic abscesses was observed in patients with more distal tumours (12% vs 5%) [1]. Variability in the use of preoperative radiotherapy might also explain the wide range in reported abscess rates given the reported association with postoperative intra-abdominal abscess formation after Hartmann’s resection [11]. Recently the use of preoperative radiotherapy for rectal cancer in the Netherlands has been reduced following revision of the national guidelines [12].

The low pelvic abscess rate of 3% after LHR in the 30-day postoperative period as observed by Sverrisson et al. illustrates that surgical outcome after rectal cancer surgery requires a sufficiently long follow-up [4]. This study shows that the majority of pelvic abscesses, re-interventions and readmissions after LHR and iAPR occur beyond 30 days postoperatively. Therefore, a 30-day postoperative follow-up of complications is insufficient.

Previous studies have compared LHR with APR and concluded that the high rate of pelvic abscesses following LHR is a more substantial problem than the incidence of perineal wound complications in APR [2,10]. However, a review by Musters et al. shows that a pooled proportion of 38% was found for perineal wound problems in a subgroup of patients undergoing APR with preoperative radiotherapy [3]. This might indicate that the perineal wound problems, after conventional APR or extralevator APR, are more substantial than suggested in the relatively small comparative studies. The present study shows that 85% of the iAPR patients had a healed perineal wound within 3 months, and no persistent wound problems were reported, suggesting a benefit of preserving the pelvic floor if oncologically possible regarding the risk of postoperative infectious complications.

In the iAPR group, significantly more patients underwent a multivisceral resection. This type of extensive surgery might be the reason for the higher rate of intra-operative complications. This baseline difference might be related to the fact that surgeons are more inclined to perform an APR procedure for a locally advanced rectal cancer. In cases of posterior exenteration in females, a colorectal anastomosis or stapled rectal stump runs the risk of formation of a fistula to the transected vagina.

With a growing population of frail, elderly rectal cancer patients, the need for tailored surgery increases [13]. Refraining from creating an anastomosis is a valuable option for these high risk patients, and LHR and iAPR are two such surgical options which can be performed without the need for restoration of bowel continuity. This is one of the first studies evaluating iAPR as a primary treatment for rectal cancer and one of the first to compare iAPR to LHR. Some limitations, however, should be discussed. Since the dataset was not designed to answer the specific question of this study, some potentially relevant variables are missing. For example, missing data do not allow analysis of the reason for not making an anastomosis, the reason for choosing either an LHR or an iAPR, evaluation of specific expertise or training of the operating surgeon, nor the handling of the rectal stump regarding type of closure and postoperative drainage. Furthermore, numbers and events are still small, despite being the largest series in current literature to our knowledge. The small sample size may cause a sparse data bias and statistical type II errors, hence possibly limiting the power to find significant statistical differences between groups, even though numerical differences are observed [14]. These limitations should be borne in mind when interpreting the results of this study. Another limiting factor of this study is its retrospective design, which may have led to incomplete data. Additionally data on quality of life, after both techniques, were not available within the design of the study. This clearly will be of importance in the decision making process for the individual patient. Nevertheless, this snapshot study design provides a cross-sectional analysis of rectal cancer care in the Netherlands with high external validity and allowed us to include a relatively large number of still rarely performed procedures.

Conclusion

This cross-sectional snapshot study suggests that, although iAPR has fewer pelvic abscesses within 30 days, there is no difference in the overall incidence of pelvic abscess and related need for re-intervention or readmission between LHR and iAPR as primary treatment for rectal cancer. Both procedures are associated with substantial surgical events beyond the 30-day postoperative period, underlining the need for extensive follow-up.

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Conflict of interest

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