Feasibility study of transanal total mesorectal excision

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ABSTRACT

Introduction
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Methods
From June till August 2012, five consecutive and unselected patients with rectal carcinoma were approached by means of transanal TME.

Results
Transanal endoscopic dissection of the complete rectum was determined feasible in all patients. Pathology reports showed clear surgical margins and an intact mesorectal fascia for all patients. One patient developed a presacral abscess. Mean operative time was 178 minutes.

Conclusions
Transanal TME with the down-to-up principle is feasible. Whether the oncological and clinical results are comparable to standard laparoscopic or open TME has yet to be proven.
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INTRODUCTION

In recent years, much research and development has aimed to further reduce the impact of surgical trauma. The next logical step for laparoscopic surgery may be natural orifice translumenal endoscopic surgery (NOTES). However, due to technical problems in performing these procedures safely, its progress is slow.\(^1\)\(^2\)

In theory, by avoiding transabdominal incisions and their related complications, NOTES procedures have a number of advantages over normal laparoscopy.

The laparoscopic approach for colorectal carcinoma is a safe alternative to open surgery.\(^3\) In complex cases, (such as bulky tumours, distal rectal tumours and narrow male pelvis), conversion remains necessary, such possibly resulting in increased morbidity.\(^4\)

Rectal cancer is nearly always approached transabdominally, beginning at the proximal rectum (top-to-bottom TME). Recently, we used the new transanal TME approach to mobilise the rectum transanally by using a single port and regular endoscopic instruments. Beginning distally from the tumour and working upward (down-to-up principle), this approach for rectal cancer gives new options in difficult patients and may reduce the necessity to convert.\(^5\)

This article describes the feasibility of applying this new transanal TME technique for an unselected group of patients.

METHODS

The feasibility study started in June 2012 after the Vrije Universiteit medical centre (VUmc) ethics committee approved the study protocol. The data monitoring committee included an independent pathologist and a gastroenterologist. The specimens were assessed according to protocol.

Patient selection

Included in the study were five consecutive unselected patients with midrectum T2-T3 tumours, being pathology proven adenocarcinomas. Patients having a previous history of abdominal surgery were excluded.
Preoperative workup
The preoperative workup included a MRI for local staging and a CT-scan of the thorax and abdomen for distant metastasis. Minimum distance of the tumour to the anal verge was 5-cm.

Neoadjuvant therapy
All patients were treated according to the Dutch guideline for the treatment of rectal cancer. Patients with T2-T3 NO-N1 tumours underwent preoperative radiotherapy in a total dose of 25Gy, with a daily dose of 5Gy. Surgery was performed in the week after radiotherapy was finished. T2-T3 N2 tumours underwent chemoradiotherapy in a total dose of 50Gy, with a daily dose of 2Gy combined with 5FU. In this case, surgery was performed six weeks after the end of the neoadjuvant treatment.

Surgical technique
Preoperatively, patients received mechanical bowel preparation with Moviprep (Norgine, The Netherlands). Patients received an epidural catheter for postoperative pain control and prophylactic antibiotics according to protocol. Patients were treated according to ERAS guidelines. The patients were placed in lithotomy position in with both arms parallel to the body. In all patients the procedure started with the transanal phase. A Scott retractor (Lone star Medical Products, Houston, USA) facilitated the full thickness circumferential resection. Variation of the distance to the dentate line depended on the distance of the tumour to the anal verge. A minimum margin of 2-cm distally of the tumour was used. After the full thickness resection, the rectal stump was closed with a purse string suture to prevent spill of tumour cells and bacteria. After closure of the rectal stump, the lumen was rinsed with a povidone-iodine solution.
A SILS port (Covidien, Mansfield, MA, USA) was introduced in the rectum without prior dilatation. It was not necessary to suture the port to the perineal skin. A pneumorectum was created with CO2 with a pressure of 15-mmHg.
A 30-degree 5-mm endoscope was used and positioned on the right side. An atraumatic grasper and the Ligasure device (Covidien, Mansfield, MA, USA) (above and beneath each other) were introduced on the left side (figure 1).
By gently pushing against the tissue starting at the dorsal side, the avascular presacral plane developed (figure 2). According to the TME principles, the plane of dissection was first extended posteriorly, then anteriorly and then laterally.

After circumferential mobilisation of the rectum, the peritoneal reflection was exposed and opened, hereby entering the peritoneal cavity (figure 3).
A second SILS port was introduced at the previously marked future ileostomy site at the right lower abdomen. Pneumoperitoneum was established with pressure of 14-mmHg. The descending colon and sigmoid were mobilised using the SILS technique described previously from medial to lateral. The inferior mesenteric vessels were transected using the Ligasure device after identification of the left ureter. To avoid rotation of the colon, the rectosigmoid was exteriorised transanally under direct visualisation by using the camera in the abdominal port. Anal retrieval of the specimen was performed under protection of an Alexis wound protector (Applied Medical, USA) to avoid any wound contamination of bacteria or tumour’s cells. After dividing the sigmoid, a transverse coloplasty was made. A hand-sutured coloanal anastomosis was created for the first two patients. A stapled anastomosis was created for the last three patients, thereby using an EEA Haemorrhoid stapler with 4.8-mm sized staples (Covidien, Mansfield, MA, USA). Finally, a loop ileostomy was created after removing the SILS port.
RESULTS

From June 2012 until August 2012 five consecutive unselected patients were included and treated with the transanal TME technique. The demographic characteristics of the patients are depicted in table 1.

Table 1. Patient’s characteristics with regard to tumour pathology and perioperative outcomes

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age (yrs)</th>
<th>Gender</th>
<th>Distance to anal verge (cm)*</th>
<th>MRI stage</th>
<th>Neoadjuvant therapy</th>
<th>Operative time (min)</th>
<th>Complications</th>
<th>Histology</th>
<th>Ln¥</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70</td>
<td>F</td>
<td>5</td>
<td>T3N0</td>
<td>5x5 Gy</td>
<td>170</td>
<td>-</td>
<td>ypT3N0</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>66</td>
<td>M</td>
<td>5</td>
<td>T3N2</td>
<td>25x2 Gy + 5FU</td>
<td>160</td>
<td>-</td>
<td>ypT0N0</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>79</td>
<td>M</td>
<td>8</td>
<td>T3N0</td>
<td>5x5 Gy</td>
<td>175</td>
<td>Pneumonia</td>
<td>ypT2N0</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>63</td>
<td>F</td>
<td>5</td>
<td>T3N0</td>
<td>5x5 Gy</td>
<td>192</td>
<td>Presacral abscess</td>
<td>ypT3N1</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>69</td>
<td>M</td>
<td>7</td>
<td>T2N0</td>
<td>5x5 Gy</td>
<td>194</td>
<td>-</td>
<td>ypT2N0</td>
<td>15</td>
</tr>
</tbody>
</table>

*Yrs years, Gy Gray, derived unit of absorbed dose in radiation therapy. 5-FU 5-Fluorouracil, chemotherapy, Yp, histology after radiation therapy
¥Measured on preoperative MRI.
*Number of harvested lymph nodes.

Transanal endoscopic dissection of the complete rectum was determined feasible in all patients. In all patients, the peritoneal reflection was opened thereby entering the abdominal cavity. Complete mobilisation of the sigmoid was possible with the use of the SILS port at the ileostomy site in four patients. In one patient the mesentery of the sigmoid was much too bulky and 2 extra - 5-mm trocars were used for complete mobilisation. Pathology reports showed clear surgical margins (circumferential and distal) in all patients. The mesorectal fascia was intact in all patients. The average number of lymph nodes was 13. During the operation, one patient developed an extreme pneumatosis of the retroperitoneum and mesentery of the small bowel, making laparoscopic mobilisation of the sigmoid difficult. In the
other four patients no complications were observed around the operation. Postoperatively, the above-mentioned patient developed a small bowel ileus on the fifth postoperative day that resolved with conservative measures. This patient with severe COPD also developed a pneumonia treated with antibiotics. Undetermined is whether the pneumatosis incurred during surgery caused the postoperative small bowel ileus. A second patient developed a presacral abscess that was treated by redo laparoscopic drainage. A CT-scan did not reveal an anastomotic leakage. The mean operative time was 178 min.

DISCUSSION

Conversions during laparoscopic TME are sometimes unavoidable due to technical limitations. These limitations include bulky tumours and having a narrow male pelvis, which can make dissection distally of the tumour impossible. Another limitation of the laparoscopic approach in distal rectal tumours is the surgical margin. It is often difficult to determine the margin after placement of endoscopic staplers and this may result in insufficient surgical margin and conversion. It may therefore be necessary to change the surgical strategy to further reduce the number of inadequate resections and conversions. Using current laparoscopic technique, the rectum is always mobilised transabdominally. In theory, rectal carcinomas could also be approached from beneath through the anal canal (down-to-up). This combination of both abdominal and transanal approaches is not new and had already been described in the starting period of laparoscopic colorectal surgery. Both Ramos and Watanabe et al. described a laparoscopic ultralow anterior resection combining transanal dissection with transabdominal mobilisation of the rectosigmoid for lower rectal cancer. However, the transanal part was limited to an intersphincteric dissection or a coloanal pull-through with hand-sewn anastomosis. An important advantage of this technique was that a sufficient distal margin could be obtained under direct vision.

In 2009, Zorron et al. described a new approach, the perirectal NOTES access: the down-to-up total mesorectal excision. They described their initial experience with a transanal mobilisation of the whole rectum. Two different techniques were described. The first entailed an operation by flexible colonoscopy. The second using a transanally placed SILS port and standard endoscopic
instruments. Their preliminary data showed that it could be possible to perform an oncologic resection for a select group of patients.

Additional researchers described comparable techniques. Sylla et al. depicted the transanal dissection using a TEM proctoscope.\(^9\) After closure of the rectum with a purse string suture, the rectal mucosa was dissected circumferentially. The rectal dissection was done with TEM instruments and the harmonic scalpel. After complete mobilisation of the rectum, the peritoneal reflection was opened. The abdominal part was performed with 2-mm needle ports and mini-instruments. The vascular pedicle was transected with the use of an endostapler as introduced transanally. After creation of a transverse coloplasty, a hand-sewn anastomosis was formed. Tuech et al. described a case report using a comparable technique. However, they applied two single port trocars.\(^{10}\) The first was introduced transanally; the second at the future ileostomy site. Their procedure is comparable to the technique we used in the five patients of our feasibility study.

We applied this new approach to an unselected group of patients, with midrectum cancer (previously treated by neoadjuvant therapy) with the following results. In all patients, the whole rectum could be dissected free without per-operative complications. The surgical/TME plane was clearly visible and developed without any problems, even in case of more bulky tumours. One patient developed pneumatosis of the mesentery of the small bowel and sigmoid, which complicated the laparoscopic mobilisation of the sigmoid loop. The transanal route for NOTES procedures had always been considered the least likely because of the high bacterial load in the rectum and the fear of infectious complications. In our feasibility study, one patient developed a presacral abscess, without proven anastomotic leakage on the CT-scan, which was treated by renewed drain placement. All surgical margins were clear and all specimens had an intact mesorectal fascia. Finally, the number of lymph nodes harvested was considered acceptable.
CONCLUSION

Transanal TME involving the down-to-up principle is feasible. Whether the oncologic and postoperative results of this new technique are comparable to standard laparoscopic or open TME has yet to be proven. In our estimate, this new approach could form an important technique for increasing the safe distal resection margin and reducing the number of conversions.
REFERENCES