Optimisation of surgical care for rectal cancer
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Chapter 7
Diagnosis and treatment of complications after ileal pouch and rectal surgery

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Abstract

Despite numerous innovations being performed in the last decades, rectal surgery still is associated with a high rate of postoperative morbidity. The aim of this chapter is to provide a structured overview of the different surgical procedures being performed for both benign and malignant rectal disease and their associated complications. Parallel to surgery of the colon, a shift has been made towards less invasive treatment options for postoperative surgical complications. Early diagnosis plays an important role in order to increase the success of these minimally invasive techniques. Therefore in this chapter special attention will be paid to the minimally invasive, and so called step-up approach of one of the most dreaded complications following rectal surgery, anastomotic leak.
Introduction

Rectal surgery can be complicated by general problems that follow any major abdominal operation e.g. haemorrhage, paralytic ileus, wound infection, herniation, respiratory insufficiency, deep venous thrombosis or pulmonary embolism. This chapter will focus on the complications which are specific to rectal surgery. The spectrum of complications differs widely due to the different surgical procedures currently performed for both benign and malignant rectal disease. The technical armamentarium of the surgeon is still expanding and so are the varieties of complications that can occur. To a much greater extent than in colonic surgery, the decision to restore continuity in rectal surgery is based on many factors. Comorbidity of the patient, age, preoperative sphincter function, tumour distance from the anal verge, resection margin in relation to the sphincter complex and patients’ preference all play an important role in this, preferably shared, decision making. As a substantial part of the complications are closely related to the decision whether or not to perform a low anastomosis, this chapter differentiates between the complications following “anastomotic surgery” and “non-anastomotic surgery”. The dysfunctional neorectum is seen as a separate long term complication in this chapter.

Surgery for malignant disease

Early in the nineteen eighties, surgical resection of the rectum for cancer underwent a major development with the introduction of complete resection of the visceral mesentery en-bloc with the rectum, the total mesorectal excision (TME). The original paper of Heald published in 1986, showed that with the addition of TME, local recurrence rates less than 4% could be achieved.¹ Previously recurrence rates of up to 30-40% were common. For this reason TME and clear resection margins became the basic principles of a proper resection for rectal carcinoma. The favourable early stage rectal carcinomas e.g. T1, SM1, good differentiation, no lymphatic and no vascular invasion, <3cm in size, can be treated with local endoluminal excision. Transanal Endoscopic Microsurgery (TEM) or the newer transanal minimal invasive surgery (TAMIS) should be the preferred approach compared to the traditional local excision as the former procedures are associated with lower recurrences due to higher rates of clear resection margins.²
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**Low Anterior Resection**

Low anterior resection (LAR) is the most commonly performed procedure for the resection of rectal carcinoma. Up to 70% of the patients with rectal carcinoma who undergo surgery will receive an LAR.\(^3\) Anterior resection is indicated for proximal rectal carcinoma. The technique involves a partial mesorectal excision where the mesorectum is transected 5 cm below the tumour. LAR is indicated for carcinomas located in the mid- or distal rectum (up to 10cm from the dentate line). In these patients the whole mesorectum is excised and the colon is anastomosed to the very distal rectum or even the upper part of the anal canal. This sphincter saving procedure enables the formation of an anastomosis between the descending colon and the distal part of the remaining rectum. The anastomosis can be performed either in a side-to-end, end-to-end, or colon pouch fashion. Either a handsewn or a stapled anastomosis can be done, with no difference in the incidence of anastomotic leaks.\(^4\) Local recurrence rate following LAR is around 5 %.\(^5\) The formation of a defunctioning ileo- or colostomy does not prevent anastomotic leaks, but does decrease the impact of the sepsis subsequent to the leak.

**Hartmann’s procedure**

The Hartmann’s procedure for malignant disease is traditionally being reserved for surgery in the acute setting or for patients with extensive comorbidities. Nevertheless, population based data from the Dutch Surgical Colorectal Audit (DSCA) showed that the Hartmann is being performed in up to 27.8% of the patients who opted for a sphincter saving procedure. This proves that in current practice the Hartmann procedure is an important alternative to abdominoperineal resection or colorectal anastomosis. Even though the risk of anastomotic leakage is avoided, the Hartmann procedure is still associated with a substantial pelvic abscess rates of around 13 %.\(^6,7\) The majority of these pelvic abscesses originate from the rectal stump and therefore it is important to acquire enough length (minimally 4 cm) before suturing or stapling the distal rectum, as a short stump increases the risk of a blow-out due to the increased pressure caused by the anal sphincter.

**Intersphincteric resection with coloanal anastomosis**

In 1994 the intersphincteric resection (ISR) with a coloanal anastomosis was introduced by Schiessel et al.\(^8\) During this procedure the internal anal sphincter is partially
or completely removed after separation from the external sphincter. Subsequently, a handsewn colorectal anastomosis is fashioned. An ISR is associated with an increased risk of anastomotic leaks and an increased risk of impaired continence, particularly in patients who have received neoadjuvant chemotherapy. However some patients are willing to accept these risks in order avoid a permanent colostomy.9

**Transanal total mesorectal excision**

For carcinomas located between 4-10 cm from the dentate line recently a new surgical procedure has been developed: the Transanal Total Mesorectal Excision (TaTME). The TaTME consists of an abdominal and transanal phase. Ideally two surgeons operate simultaneously, working towards each other until the rendezvous is made between the abdominal- and transanal plane (Figure 1). The basic principle of the procedure is that a SILS-port (e.g. Gelpoint path) is placed in the anus, thereby creating a pneumopelvis. Especially in obese patients with a small pelvis, the pneumopelvis enables better exposure since no structures need to be moved out of the operation field. During TaTME, approximately 3-4 cm at the distal side of the carcinoma or just above the anal sphincter complex a purse string suture is placed to close off the lumen. Subsequently, after a washout with povidon iodine, a full thickness, circumferential, rectal transection is made up to the avascular presacral TME plane. A bottom up approach is done dissecting the rectum in the TME plane beyond the level of the seminal vesicles. Laparoscopically, the left colon is fully mobilised and the rectum is dissected from above downwards until the rendezvous with the bottom up dissector. The anastomosis can be performed either handsewn or with a double purse string circular stapler. A stapled anastomosis is associated with a superior functional outcome compared to a handsewn one as the remaining rectal cuff tends to be longer. A surgeon should be careful that only the anorectal wall is enclosed in the purse-string as there is a risk of including the vaginal wall. An advantage of the TAMIS-TME is that the stapled anastomosis can be reinforced endoluminally.10 Injury to the urethra should be carefully avoided as the urethra can be difficult to identify during the transanal phase, especially in the case of a hypertrophied prostate. Even though the short term outcomes seem promising, the TaTME has only been in use since 2009, therefore it must be emphasized that the long term oncological and functional results are still awaited and this procedure should only be performed by experienced hands or after extensive proctoring.11
Abdominoperineal resection

For some of the low rectal carcinomas (up to 5 cm from the dentate line), especially with ingrowth into the anal sphincter complex, the maintainance of bowel continuity is not an option. In these cases an abdominoperineal resection (APR) is advised. In about 23% of rectal carcinomas the APR is the procedure of choice.\(^3\) The APR that is being performed today is not very similar to the APR that was the standard operation performed for many years before the introduction of the sphincter saving procedures.\(^12\) During APR, the distal colon, rectum and anal sphincter complex are removed and a permanent colostomy is constructed. Despite the fact that the APR has been applied for a long period of time, the conventional procedure still is associated with substantial rates of margin involvement and perforation of the TME-specimen. Local recurrence rates following APR were around 7-9%.\(^13\) To reduce these rates of local recurrences a modification of the conventional APR has been introduced over the past years: the extralevator-APR(eAPR).\(^14\) As opposed to the conventional approach, during eAPR the lateral limits of the dissection are extended to the base of the levator muscle. By including the levator muscle in the specimen, more tissue remains between the carcinoma and the dissection plane, which theoretically decreases margin involvement and perforation rate.\(^15\) The eAPR is considered to be one of the most complex procedures and is subsequently associated with an increased risk to perineal wound healing because of the larger perineal defect.\(^16\) If the margins are not threatened, and the sphincter cannot be
saved because of ingrowth, an intersphincteric abdominoperineal resection is a good alternative.

Complications related to APR

The wider extent of surgical resection and high rate of neoadjuvant therapy both contribute to a perineal wound complication rates of up to 57% after APR.\textsuperscript{17} Complications such as perineal wound infection, perineal herniation and chronic presacral sinus are associated with a high disease burden, high costs and obviously have a severe impact on the quality of life. Recently the BIOPEX randomized trial investigated the effectiveness of a biological mesh for pelvic floor reconstruction following eAPR in terms of uncomplicated perineal wound healing. This was the first randomized controlled trial on patients undergoing APR specifically focussing on postoperative complications. Patients were randomized either to biological mesh placement or to primary perineal wound closure. Uncomplicated perineal wound healing was reported in 66\% vs. 64\% of the patients respectively at 30-days postoperatively with no significant difference between the groups. At 12 months postoperatively, a healed perineum was reached in 95\% and 98\% respectively. Perineal herniation occurred in 25\% of the patients after primary closure compared to a significantly lower rate of 9\% in the biological mesh group. These rates seem rather high however it was not specified whether these hernias were symptomatic or asymptomatic. In retrospective series these asymptomatic hernias are not reported explaining the discrepancy with the higher rates reported in the prospective randomized trial.

Depending on the degree of herniation, surgical repair is indicated on an individualized basis as the majority of patients are treated conservatively with supportive underwear. Surgical repair is aimed to reconstruct the pelvic floor. The approach may be abdominal or perineal. The defect can be closed using myocutaneous flaps, by primary suture repair or with the use of a mesh. Current evidence on treatment options is based on case reports or small-retrospective series.\textsuperscript{18} A pooled analysis by Mjoli et al. combined all the case reports and showed that the hernia recurrence rate was lowest following mesh-repair (20\%).\textsuperscript{18} Due to the radicality and extension of the operation the sexual outcomes following APR are worse when compared to sphincter saving procedures.\textsuperscript{19} More than half of the patients who underwent
TME (LAR/APR/Hartmann) experience a decrease in sexual function.\textsuperscript{20} Interestingly, reported quality of life does not seem to differ between LAR and APR.\textsuperscript{21}

**Surgery for benign disease**

**Restorative proctocolectomy**

A restorative proctocolectomy (RP) should be considered as the best definitive surgical treatment for refractory ulcerative colitis (UC) or polyposis coli. Eventually, up to a third of the patients with UC will undergo surgery during their disease course.\textsuperscript{22} Total proctocolectomy with ileal pouch-anal anastomosis (IPAA) is a more attractive option than the traditional total proctocolectomy with a permanent end-ileostomy. The RP can be performed as a single or a modified two stage procedure. Polyposis patients can safely have a primary RP with an ileoanal pouch anastomosis. Patients with ulcerative colitis are best treated with a subtotal colectomy first followed by a completion proctectomy and pouch at a later stage which is named a *modified two stage procedure*. In the acute setting of the colitis these patients are often malnourished and immunocompromised which is responsible for an increased risk of a complicated postoperative course. Subtotal colectomy allows the patient to recover after which the completion proctectomy can be scheduled within 3-6 months. The creation of an ileal reservoir with the formation of the IPAA was invented by Sir Alan Parks in 1978.\textsuperscript{23} In his original paper he described a S-shaped pouch comprised of three 8 cm loops of small bowel and a handsewn anastomosis after mucosectomy of the remaining rectal cuff. This S-Pouch has the drawback of an efferent limb that can be the cause of evacuation problems. So Utsunomiya et al. proposed the simpler J-pouch configuration.\textsuperscript{24} Throughout the years several reservoir types have been described (J-, S-, W-, H- and Kock-pouch). Evidence from systematic reviews showed that the double stapled J-pouch is considered to be superior, in terms of evacuation, continence and the J-pouch is easier to construct.\textsuperscript{25} Both the colectomy and the proctocolectomy can be performed via an open or laparoscopic approach (totally or hand-assisted via a Pfannenstiel incision). The pouch itself is most commonly being constructed extracorporally. The bowel can be extracted through the future stoma site, or via a periumbilical incision or Pfannenstiel incision. One of the difficulties of a laparoscopic proctectomy is the formation of the anastomosis with a cross-staple line at the distal rectum. Often multiple staple firings are needed, which is associ-
ated with an increased anastomotic leak rate. Mucosectomy prior to performing the anastomosis is associated with better disease control, but also with a worse functional outcome and therefore should not be considered as the standard in pouch-surgery. Mucosectomy should only be reserved for patients with a high risk of cuff dysplasia or recurrent inflammation in the cuff. In order to prevent ‘cuffitis’ in the postoperative course, it is crucial that the anastomosis should be placed in a way that the rectal cuff is less than 2 cm in length. Laparoscopic ileal pouch surgery is associated with beneficial outcomes in experienced centres compared to open surgery. In terms of hospital stay, wound-infection and pelvic abscess rates laparoscopic colectomy has been shown to be superior, nevertheless it must be stressed that the evidence for laparoscopic surgery results in severe acute ulcerative colitis or with perforated disease is scarce.

**Anastomosis related complications**

Anastomotic surgery of the rectum, is defined as the formation of a connection between the colon or ileum on one hand and the transected rectum or anus on the other. A temporary ileo- or colostomy is often created to divert the bowel contents in order to reduce the sequelae of anastomotic leakage; the leak incidence itself however is not necessarily prevented by this diversion. The definition of an anastomotic leak has been debated through the years due to the wide variety of clinical symptoms with which it is associated. We recommend the definition proposed by the International Study Group of Rectal cancer which is ‘A defect of the intestinal wall at the anastomotic site (including suture and staple lines of neorectal reservoirs) leading to a communication between the intra- and extraluminal compartments’.

The study group also categorized the severity on the leak into three grades:
- **I** Anastomotic leakage requiring no active therapeutic intervention
- **II** Anastomotic leakage requiring active therapeutic intervention but manageable without relaparotomy or re-laparoscopy
- **III** Anastomotic leakage requiring re-laparotomy or re-laparoscopy.

In the current literature, an anastomotic leak is defined as “symptomatic” when either grade II or III is present. This definition of symptomatic leak also applies to
this chapter. The rates of anastomotic leak following rectal surgery are higher than after colonic surgery, respectively 10-14% vs. 2-7%.\textsuperscript{32-35} With an associated mortality of 6-22%, an increased risk of having a permanent ileostomy as well as local recurrence and the need of surgical or radiological interventions leakage is one of the most dreaded complications following rectal surgery.\textsuperscript{36,37}

\textit{Diagnosis of anastomotic leaks}

The early diagnosis of an anastomotic leak is not only crucial to minimize the degree of its sequelae, but also increases the chances of saving the anastomosis.\textsuperscript{38,39} Clinical signs of anastomotic leaks include fever, ileus, abdominal pain, abdominal distention and even pulmonary and cardiac symptoms.\textsuperscript{30} All these symptoms can be absent if a defunctioning ileostomy is present. Clinical evaluation and imaging can be misleading when not conducted complementarily. Therefore adequate timing of diagnostic tests is of great importance. A contrast study performed too early increases the false negative rate of the test.\textsuperscript{40} However delayed diagnosis of the leak is associated with poorer outcomes in the long term. Inflammatory markers as C-reactive protein (CRP) and white blood cell count should be used as screening markers to augment the clinical observations. Irrespective of the signs of sepsis, patients with an elevated CRP (> 150 mg/L) on day 3-5 postoperative should be considered for imaging. The cut-off border of a CRP-level of 150 mg/L reduces the false-negative rate of both computed-tomography (CT) with rectal contrast or contrast radiography.\textsuperscript{41} Both contrast studies and sigmoidoscopy can be used to diagnose an anastomotic leak. However as the specificity of these imaging studies have a wide range, the decision to perform an intervention should be guided by clinical evaluation as a negative test does not rule out an anastomotic leak.\textsuperscript{40}

\textbf{Treatment of the anastomotic leak}

\textit{Early anastomotic leak}

In the acute phase of a symptomatic anastomotic leak, the primary goal of the treatment is control of the sepsis. Traditionally when continuity is not intended, the leaking anastomosis is dismantled and an end-colostomy is constructed. If continuity is preferred on the long term, the anastomotic leak should be defunctioned, if not done so primarily and subsequently, drainage of the sepsis is the cornerstone the
treatment. The total mesorectal excision, that is being performed for malignancy, creates a large cavity behind the anastomosis which will be stuffed with pus and debris in case of a leak. The anal sphincter thereby functions as a physiologic barrier preventing drainage via the anus. Adequate and timely drainage of the abscess is of major importance. Drainage can be performed transabdominal, percutaneous or transanal. With this type of adequate drainage, the healing rate of the anastomosis is around 50%. However, this could take months before the leak has closed so the patient must be prepared for an intensive treatment period. Therefore new strategies are being investigated.

Endosponge treatment, combined with transanal closure of the defect

Weidenhagen et al. was the first to describe the Endosponge® vacuum assisted drainage. An Endosponge® is placed endoscopically into the abscess cavity, by changing it twice a week and tapering the size of the Endosponge® sequentially, the cavity gradually collapses. (Figure 2) Endosponge® treatment in this early phase shows a healing rate of 75%. However this technique is labour-intensive, expensive and it could take several weeks or even months before healing of the anastomosis is achieved. Therefore recently a modification of this technique was proposed, in which the Endosponge® is used to clean the cavity instead of aiming at a gradual collapse. A clean cavity that is surrounded by granulation tissue can be achieved within one or two weeks. Subsequently the anastomotic defect is closed transanally with the use of a Lone-Star-retractor (Cooper Surgical, Trumbull, United Stated) or a SILS port (GelPOINT® Path Transanal Access Platform, Applied Medical, Rancho Santa Margarita, United States) (Figure 3). In patients with an ileal pouch anal anastomosis (IPAA) for benign disease, this strategy showed high anastomotic healing rates up to 100%, however the results after resections for malignant disease have to be awaited. Leaking coloanal anastomoses might have a lower tendency to heal because of prior neoadjuvant radiotherapy. Technically, this anastomosis is more difficult to repair than the low colorectal anastomosis.

So, in case of an anastomotic leak diagnosed early a step-up approach is advised starting with minimally invasive techniques for drainage and transanal reconstruction leaving resection of the anastomosis and the formation of an end-colostomy as a last resort.
Figure 2: Cavity with debris prior to Endosponge treatment (left). Granulation tissue covering cavity after Endosponge treatment (right).

Figure 3: Anastomotic leak treated successfully with endosponge

Late anastomotic leakage

Late anastomotic leaks can be classified in two categories: an anastomotic defect or presacral abscess that is present for longer than two months after the construction of the anastomosis, including early leaks that have not been treated successfully and secondly the chronic presacral sinus defined as a presacral abscess that is present more than a year after surgery. This distinction is important as we think that both entities need different treatment strategies.

-First category: An anastomotic defect or presacral abscess that is present more than two months after the initial operation

The first category includes patients that present with an asymptomatic leak which is diagnosed on imaging, classically during anastomotic assessment, prior to (or after) stoma reversal. Approximately 40-50% of the anastomotic leaks are diagnosed after the patient is discharged from the hospital. The increased rates of neoadjuvant radiotherapy are probably responsible for reducing secondary healing following an anastomotic leak. These late anastomotic leaks or presacral abscesses can present
with a variety of symptoms such as sacral pain, anal discharge, low anterior resection syndrome, fatigue, chronic anaemia or even late evacuation of pus transanally or transvaginally. Due to the chronic infection the wall of the abscess including the neorectum becomes fibrotic and stiff. The abscess cavity cannot be filled anymore by the neorectum due to the stiffness of the wall. Drainage alone is therefore not enough to close the defect particularly in longstanding leaks.\textsuperscript{38,44} Redo-surgery with resection of the leaking coloanal or ileoanal anastomosis followed by pull-through of a new colon loop or pouch and a new anastomosis is a possibility in selected and motivated patients. However this must be seen as the last option to avoid a permanent stoma. The decision to perform reconstructive surgery should be considered on individual basis. Small retrospective series have shown that redo surgery is associated with substantial complication rates and poor functional outcomes.\textsuperscript{48,49} Therefore it is important that the patient is closely involved in the decision making process and this type of surgery should only be performed in centres with extensive experience in reconstructive surgery. We would like to discuss three types of redo-procedures – the Conventional pull-through, the Turnbull-Cutait and the TAMIS-redo procedures.

**Conventional pull-through**

During all operations in which the anastomosis is reconstructed, it is important to fully mobilise the left colon ligating the inferior mesenteric pedicle to acquire enough length for a tension free apposition.\textsuperscript{48} If the left colon is not available the transverse colon should be brought down transmesenterically (Toupet procedure).\textsuperscript{50} The reported success rate following the conventional procedure is 78.8%, with overall morbidity and reintervention rates of 32.2% and 15.6% respectively.\textsuperscript{48} The anastomosis itself is most commonly constructed in a hand-sewn fashion.

**Turnbull-Cutait abdominoperineal pull-through procedure**

The Turnbull-Cutait abdominoperineal pull-through procedure consists of rectal resection (including the leaking anastomosis) and exteriorization of the afferent colon, followed by delayed handsewn colo-anal anastomosis several days later.\textsuperscript{51,52} The largest retrospective study showed an functioning anastomosis in 75% of the patients following this procedure.\textsuperscript{53} A Turnbull-Cutait procedure is preferred above the conventional pull through procedure by a small group of highly specialized
surgeons. They apply it in highly selected patients who have an increased risk for a complicated course or for patients who present with a recto-vaginal fistula that tracks down to the designated place of the new anastomosis. A known risk of the Turnbull-Cutait is that the exteriorized colon becomes ischaemic and therefore the exteriorized colon should be checked carefully in the first post-operative days.

**Redo TAMIS**

Following the recent developments with the TaTME, the bottom up-approach is also applied in redo-surgery. The insufflation of the pelvis during TAMIS improves visualisation and surgical access and as such has the potential to revolutionise the approach to redo low anastomotic surgery and extensive sleeve advancement of the pouch. Furthermore, the advantage of TAMIS redo surgery is that the neorectum can be used to guide the dissection, thereby potentially minimising the chance of nerve and vascular injury deep in the pelvis. However the application of this technique should be further investigated before deciding on its value in redo surgery.

- **Second category: Chronic presacral sinus**

A chronic presacral sinus is defined as a presacral abscess that has been present more than a year after initial surgery and is confirmed on imaging. The sinus can be caused by an insufficiently treated anastomotic leak following a LAR or IPAA. However it can also occur at the top of the rectal stump following a Hartmann’s procedure or in the presacral cavity following an APR. Unpublished data provided by a nationwide Snapshot audit in the Netherlands showed a presacral sinus incidence in approximately 9% of the patients following a LAR. A surprising 42% of the patients with anastomotic leaks will eventually develop a presacral sinus. As mentioned earlier a chronic sinus can cause serious long term complications. The number of patients with asymptomatic chronic sinuses is unknown, however we believe that at long-term the sinus will become symptomatic. Patients with a chronic sinus can present with a variety of symptoms such as a purulent anal discharge, sacral pain, difficulty in sitting or walking and urine or faecal discharge from the fistula tracts. However emergency presentation with osteomyelitis, hydronephrosis and necrotizing fasciitis have also been described.
Salvage surgery of the sinus is the only option for cure. In most patients, restoration of continuity is no longer advisable or achievable. Completion abdominoperineal intersphincteric proctectomy with an end-colostomy with omentoplasty in the presacral cavity, is advised.\textsuperscript{45,54} Due the longstanding chronic pelvic sepsis and prior irradiation in some, the cavity must be filled with healthy tissue to avoid recurrent abscesses. The omentum must be mobilised in order to obtain sufficient length. This can be done by pediculising the omentum on the left or right gastroepiploic artery (Figure 4). Alternatively the presacral cavity can be filled using a muscle transposition flap (VRAM or Gracilis). Due to the risk of donor site complications e.g. painful thigh wounds, sensory loss or even necrosis, the omentoplasty is often preferred to the muscle flap.

\textbf{Figure 4:} Mobilised omentum from left or right gastroepiploic artery

\textbf{Non-anastomotic related complications}

\textit{Ureter and urethra lesions}

Surgery deep in the pelvis puts structures like the ureter, urethra and pelvic autonomic nerves which are responsible for urogenital function at risk. One of the most feared complications during rectal surgery is direct injury to the ureter, therefore the ureter should always be identified proactively. When recognised directly, an ureter lesion can be treated with good functional outcomes. Nevertheless failure to detect
it could lead to hydronephrosis, renal function disorders and even fistula from urine collection in the retroperitoneum or pelvis to the colon, abdominal wound, drain site or vagina. During the transanal phase of the TAMIS-TME it is not so much the ureter but the urethra that should be safeguarded, as the urethra may be difficult to identify. Urethral injury is a hidden complication of this novel approach.

**Urogenital complications**

Almost half of the patients that undergo rectal surgery experience a form of sexual dysfunction. These mainly consist of ejaculatory and erectile dysfunction in men (reported in 65-80%) and dyspareunia (in 53-60%) and dryness (72%) in women. Almost a third of the patients experience incontinence or retention of urine. The sympathetic nerves that supply the bladder, prostate and seminal vesicles follow the branches of the internal iliac artery. These nerves are mainly involved in the ejaculatory function. During presacral and ventrolateral dissection of the mesorectum, the sympathetic nerves are at risk. The parasympathetic nerves, that are located behind the endopelvic fascia and follow the ischiococcygeus and iliococcygeus muscles to the anterior genital tract, are mainly responsible for the erectile function, sensation of bladder fullness and bladder emptying. The parasympathetic nerves are at risk during the deep dissection of the lateral planes. Results from the Dutch-TME trial showed that difficulty in bladder emptying was significantly increased if there was a reported damage to the parasympathetic sacral splanchnic nerves and parasympathetic inferior hypogastric plexus. Especially in the case of a narrow pelvis, or severe obesity, these autonomic nerves are at risk of being damaged due to the decreased visibility. As urogenital dysfunction is a common postoperative complication, patients should be made well aware of the risk of a deterioration in urinary and sexual function in the preoperative course.

**Dysfunctional neorectum**

Urgency, constipation, incontinence of flatus and/or faeces, fragmentation, frequent bowel movements, sexual and urinary dysfunction all are symptoms that can be brought under the umbrella of a “dysfunctional neorectum”. Up to 60% of the patients undergoing rectal surgery experience disturbance in function. The height of the anastomosis directly correlates with function. In general, the lower the anastomosis the worse the functional outcome. A recent Cochrane review showed
that seven different scales can be used to assess functionality and quality of life (QoL) in surgically treated rectal cancer patients. The huge negative impact on the QoL, costs related to work-absence and potential social-isolation have led to the consensus that there was a need for a simple, quick and quantitative tool for the assessment of postoperative functionality and quality of life. For this reason Laurberg and coworkers developed the LARS-Score, which is currently being validated internationally and is being broadly supported by colorectal surgeons on an international scale. It is a short 5-item questionnaire that is easy to use. Hopefully the international implementation of this questionnaire will provide the needed homogeneity in the assessment of postoperative functionality and Quality of life.

Conclusions

Rectal surgery is subject to a continuous development in surgical techniques and multimodulary treatment strategies. The spectrum of its complications is therefore expanding simultaneously. Early diagnosis and treatment are crucial in order to achieve curation minimal invasively. Patients should be closely involved in the decision making process when striving for continuity due to the high morbidity associated with redo anastomotic surgery.
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