DISEASES OF THE COLON & RECTUM

Clinical and Morphologic Correlation after Stapled Transanal Rectal Resection for Obstructed Defecation Syndrome

ORIGINAL CONTRIBUTION

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PURPOSE: The clinical and morphologic outcome of patients with obstructed defecation syndrome after stapled transanal rectal resection was prospectively evaluated.

METHODS: Twenty-four consecutive patients (22 women; median age, 61 (range, 36–74) years) who suffered from obstructed defecation syndrome and with rectal redundancy on magnetic resonance defecography were enrolled in the study. Constipation was assessed by using the Cleveland Constipation Score. Morphologic changes were determined by using closed-configuration magnetic resonance defecography before and after stapled transanal rectal resection.

RESULTS: After a median follow-up of 18 (range, 6–36) months, Cleveland Constipation Score significantly decreased from 11 (range, 1–23) preoperatively to 5 (range, 1–15) postoperatively ($P=0.02$). In 15 of 20 patients, preexisting intussusception was no longer visible in the magnetic resonance defecography. Anterior rectoceles were significantly reduced in depth, from 30 mm to 23 mm ($P=0.01$), whereas the number of detectable rectoceles did not significantly change. Complications occurred in 6 of the 24 patients; however, only two were severe (1 bleeding and 1 persisting pain requiring reintervention).

CONCLUSIONS: Clinical improvement of obstructed defecation syndrome after stapled transanal rectal resection correlates well with morphologic correction of the rectal redundancy, whereas correction of intussusception seems to be of particular importance in patients with obstructed defecation syndrome.

KEY WORDS: Stapled transanal rectal resection; Obstructed defecation syndrome; Outcome.

Obstructed defecation syndrome (ODS) is defined as the normal desire to defecate, but there is an impaired ability to satisfactorily evacuate the rectum. The symptoms of ODS are unspecific, *e.g.*, incomplete evacuation, need of digital support, or excessive straining during defecation. The underlining disorder is complex and often multifactorial. Dyssynergia of the pelvic muscles may contribute to the functional form of ODS, whereas a low rectal redundancy, such as an anterior rectocele and/or an intussusception, depict morphologic alterations causing ODS.

A plethora of surgical strategies have been developed for the treatment of rectoceles. Vaginal,[1] perineal,[2,3] and transrectal[4,5] approaches have been described with mainly discouraging results.[3] Although these techniques often are combined with rectal intussusceptions,[6,7] they primarily target the removal of the rectoceles. The stapled transanal rectal resection (STARR) addresses both rectocele and intussusception as the two major structural abnormalities in ODS. Consequently, STARR has emerged as a promising strategy for the treatment of ODS. Unfortunately, data on the clinical and morphologic outcome after STARR are scarce, thus hampering a more comprehensive analysis of this novel treatment. Therefore, this prospective study was designed to assess the clinical outcome and the morphologic changes assessed by magnetic resonance (MR) defecography before and after STARR.

PATIENTS AND METHODS

From January 2004 to November 2006, STARR was performed on 24 consecutive patients with ODS. Diagnosis of ODS was made by clinical assessment and all patients were evaluated by using MR defecography. In all patients, conservative treatment with diet, laxatives, enemas, and/or physiotherapy had not satisfactorily improved the evacuation disorder. Implications for

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STARR were recurring ODS for more than six months, rectal redundancy on the MR defecography, and failure of conservative treatment. Exclusion criteria for a STARR procedure were concurrent severe anorectal pathology, proctitis, low and fixed enteroceles at rest, external rectal prolapses, severe fecal incontinence (Wexner's incontinence score >12), and paradoxical contractions of the puborectalis and sphincter muscles (anismus) diagnosed by MR defecography and manometry, respectively.

Preoperative and postoperative clinical assessment was done by one of the three surgeons performing STARR procedures. The assessment consisted of a thorough evaluation of the patient's history, evaluation of the patient's symptoms, and clinical examination. By the latter, the depth of the rectoceles and the function of the anal sphincters were estimated (resting pressure, squeeze pressure). The presence of concurrent anorectal pathology was excluded by proctoscopy. All patients were prospectively assessed before and after surgery by using the Cleveland Constipation Score[8] and MR defecography. After STARR, patients were asked about the relief of the main symptoms and their overall satisfaction regarding the procedure (taking into account the improvement of defecation, postoperative pain, and complications). Dyspareunia also was specifically asked by the surgeons, although not specifically mentioned in the questionnaire. Median follow-up was 18 (range, 6–36) months. The protocol was approved by the local ethics committee and written consent was obtained from all patients. The study was registered at *http://www.clinicaltrials.gov* (NCT00521872). Complications were graded by using a validated five-scale classification system.[9]

Operative Technique

Preoperatively, a cleansing enema was given and all patients received a routine antibiotic prophylaxis (single shot of cefuroxime 1.5 g and metronidazole 0.5 g intravenously) 30 minutes before surgery. STARR was performed, as described previously,[10] under general anesthesia with the patient in the lithotomy position. Two PPH-01™ kits (Ethicon EndoSurgery, Spreitenbach, Switzerland) were used. After introduction of the circular anal dilatator (CAD33), the posterior rectal wall was protected by a retractor. The anoscope (PSA 33) was introduced into the CAD 33. Three full-thickness stitches with Prolene™ 2–0 (Ethicon, Somerville, NJ) were done with three semicircular sutures above the dentate line. The 33 mm circular stapler was opened and the head was placed above the sutured anterior rectal wall that was pulled caudally and dorsally. For female patients, the posterior vaginal wall was checked digitally before firing the stapler. A minimal mucosal bridge connecting the two edges of the anterior anastomosis was sometimes found and cut with scissors. Hemostatic stitches were occasionally required. The procedure was repeated in the posterior rectal wall. A histologic examination was performed on all resected specimens. All STARR procedures were conducted by three surgeons (DD, FH, and DH).

MR Defecography

MR defecography was performed by using a closed-configuration 1.5 T MR imaging system (Signa SP™; GE Medical Systems Europe, Buc, France) in the supine position. A preoperative and postoperative MR defecography was performed for all patients in the exact same manner.

Before the MR imaging session, patients' rectums were filled with 300 ml of a synthetic stool consisting of potato starch mixed with 1.5 ml of gadopentate dimeglumine (377 mg/ml; Magnevist®; Schering AG, Berlin, Germany); this produced a gadolinium concentration of 2.5 mmol/l. A convenience food potato starch was used for the study (Stocki, Knorr, Switzerland). For the purpose of the study, 125 g of the powder were mixed with 200 ml of water. All enemas were administered via a rectal tube. A phased array coil was used for signal transmission and reception.

On the basis of the localizing images in the axial, coronal, and sagittal planes, a multiphase fast T1-weighted spoiled gradient-recalled echo (SPGR) sequence was planned in the midsagittal plane of the anal canal with an image update every two seconds. The imaging parameters of this sequence were as follows: repetition time (TR) ms, 7.4; echo time (TE) ms, 1.7; flip angle, 80°; section thickness, 10 mm with no interslice gap; bandwidth, 15.6 kHz; field-of-view (FOV) 31 cm; image matrix, 256×160, and two signals acquired.

Using this sequence, images of the pelvis were obtained with the patient at rest, at maximal voluntary sphincter and pelvic floor muscle contraction (squeezing), at straining, and during evacuation.

To obtain images of the various pelvic, rest-like positions, maximal voluntary sphincter, and pelvic floor muscles contraction (squeezing), at straining and at evacuation, the patients were coached by the technician performing the examination through a microphone and a headset. All acquired images were formatted into a cine loop presentation to enable assessment of the dynamics of rectal emptying and pelvic floor movement.

Image Analysis

All analyses were made by one experienced radiologist (DW) and were performed in a standardized manner using a workstation (Advantage Windowing Workstation; GE Medical Systems Europe, Buc, France). MR images were analyzed with regard to structural abnormalities of the pelvic floor including anterior rectoceles, enteroceles, intussusception (rectorectal, rectoanal), descent of the anterior compartment (cystoceles), middle compartment (vaginal vault or any part of the remaining cervix in case of hysterectomy), and posterior compartment and descents (descents of rectum or enteroceles). All measure-

ments were taken at rest, at sphincter contraction (squeezing), as well as at the end of defecation. The largest measured distance (usually at the end of defecation) was used for further analysis. A rectocele was defined as a rectal protrusion beyond the expected margin of the rectal wall (an imaginary line extended upward through the anal canal). Rectoceles were classified as complete or incomplete evacuating depending on the remaining contrast dye after defecation. The pubococcygeal line (PCL), joining the inferior border of the symphysis with the last coccygeal joint in the midline sagittal MR image, served as a reference line for measuring the position of any of the three compartments of the pelvic floor as well as to measure the depth of any enterocele. Abnormalities of the anterior (cystocele), middle (vaginal vault), and posterior compartment (rectal descent) were estimated as a descent at 90° to the PCL. An enterocele was defined as descent of the peritoneum containing small bowel or the sigmoid below the PCL. Anorectal angles were measured between the longitudinal axis of the anal canal and the posterior rectal wall. Intussusception was divided into rectorectal and rectoanal depending on whether the apex of the internal prolapse reached the anal canal.

Statistical Analyses

Data are expressed as median with range. Chi-squared test and Mann-Whitney *U* test were used where appropriate. Level of significance was chosen at a level of 0.05.

RESULTS

Preoperative Findings

Twenty-four patients (22 women; median age, 61 (range, 36–74) years) were included in the study. Sixteen (70 percent) of the 22 women had a history of vaginal delivery and 14 (64 percent) had a hysterectomy. Body mass index was 26.8 (range, 17.2–36.6) kg/m^2.

All patients suffered from at least one of the major ODS defining symptoms (excessive straining, need for digital assistance during defecation, or incomplete evacuation). This was reflected in a Cleveland Constipation Score of 11 (range, 1–23). The main symptoms were excessive straining, incomplete evacuation and pain in 10 (42 percent), 12 (50 percent), and 2 patients (8 percent), respectively.

In the MR defecography, an anterior rectocele was detected in 22 patients (91 percent), measuring 30 (range, 15–50) mm. Nineteen (86 percent) of the patients with rectoceles had an anterior rectocele >2 cm. Incomplete evacuation of the rectocele was observed in 14 patients (64 percent). An enterocele was found in 13 patients (54 percent) with a size of 48 (range, 27–80) mm. Enteroceles were seen more often in patients with former hysterectomy, although not reaching statistical significance (4/8 patients *vs.* 10/14 patients; $P=0.29$). An intussusception was observed in 20 patients (83 percent), and 18 patients (75 percent) had an anterior rectocele combined with an intussusception. Intussuceptions were rectorectal in nine and rectoanal in nine patients. Rectoanal angle measured at rest 116° (range, 90–143) and under defecation 156° (range, 123–180). Under defecation, anterior, middle, and posterior descent measured 10 (range, 0–44) mm, 24 (range, 0–80) mm, and 66 mm (range, 45–100) mm, respectively. Table 1 gives a summary of this data.

Postoperative Findings

The average length of surgery was 60 (range, 40–110) minutes with an average blood loss of 10 (range, 0–50) ml. Median hospital stay was 3 (range, 1–10) days.

Postoperatively, the Cleveland Constipation Score significantly improved from 11 to 5 (1–15; $P=0.02$; Table 1). The main symptoms disappeared in 19 patients (79 percent) with an overall satisfaction rate of 83 percent (20/24). Excessive straining and incomplete evacuation as

Table 1. Radiologic and clinical findings before and after STARR

	Before STARR (n=24)	*After STARR (n=24)*	*P value*
Radiologic findings			
Rectocele (n)	22	18	0.28
Rectocele (mm)	30 (15–50)	23 (10–39)	0.01
Rectocele >2 cm (n)	19	10	0.015
Intussusception (n)	20	5	<0.001
Incomplete evacuation (n)	14/22	7/18	0.11
Enterocele (n)	13	8	0.11
Enterocele (mm)	48 (27–80)	53 (36–127)	0.32
RA angle in rest (°)	116 (90–143)	113 (98–152)	0.83
RA angle during defecation (°)	156 (123–180)	160 (118–180)	0.69
Anterior descent (mm)	10 (0–44)	12 (0–49)	0.82
Middle descent (mm)	24 (0–80)	12 (0–86)	0.42
Posterior descent (mm)	66 (45–100)	67 (47–115)	0.73
Clinical findings			
Main symptoms			<0.001
Excessive straining	10	2*	
Incomplete evacuation	12	3*	
Pain	2	0*	
Cleveland Constipation Score	11 (1–23)	5 (1–15)	0.02

RA = rectoanal angle; STARR = stapled transanal rectal resection. • * Symptoms unchanged.

FIGURE 1. Representative image of a closed-configuration magnetic resonance defecography before the stapled transanal rectal resection (STARR) procedure showing a large anterior rectocele (bar; 40 mm) and a rectoanal intussusception (circle) during defecation.

main symptoms remained unchanged in three and two patients, respectively. In the MR defecography, the depth of the anterior rectocele was significantly reduced to 23 mm (10–39; $P=0.01$) and only ten patients had an anterior rectocele >2 cm ($P=0.015$). However, the number of patients with a detectable rectocele did not significantly change (18/24 patients, 75 percent; $P=0.28$). Incomplete evacuation was less frequently observed but did not reach statistical significance (7/18 patients, 39 percent; $P=0.11$). Intussusceptions were only present in five patients, hence being corrected in 75 percent (15/20; $P<0.0001$). Figures 1 and 2 show the findings of the MR defecography before and after STARR with reduced depth of the anterior rectocele and disappearance of the intussusception. Furthermore, the occurrence and the size of enteroceles was not affected by STARR (8 patients, 33 percent: $P=0.11$ and 53 (range, 36–127) mm: $P=0.32$, respectively). Rectoanal angles were not significantly different after surgery either. The data are summarized in Table 1.

The comparison of the radiologic and the clinical outcomes yielded that patients with successful correction of intussusception had a significantly greater reduction of CCS by a median of 5 points (0–23) compared with patients with persistent intussusception after STARR (0.5 points, 0–1; $P=0.04$).

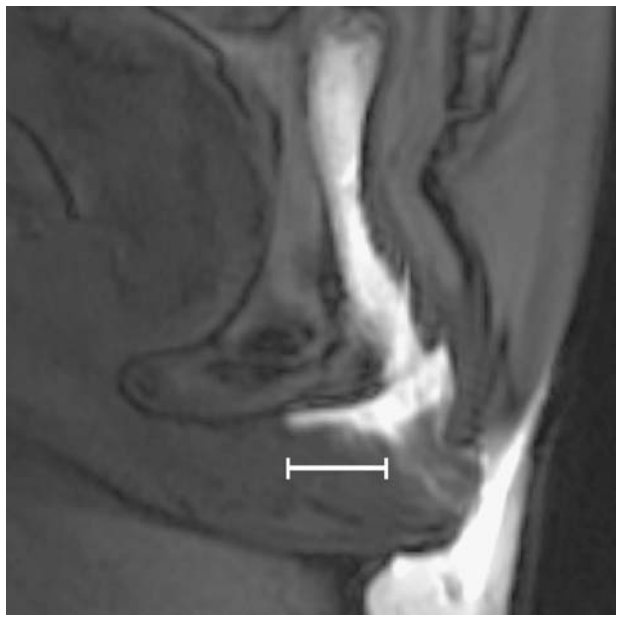
During surgery, no complications occurred. Most postoperative complications were self-limiting and did not require surgical intervention. One patient had urinary retention requiring catheterization (Grade I complication: complication needing no further intervention).[9] One patient complained of a new onset of fecal incontinence after STARR (Wexner's incontinence score postoperatively, 9), and two patients of a worsened incontinence (Wexner's incontinence score from 6 to 11 and from 6 to 15, respectively). In the latter case, incontinence ameliorated with biofeedback training (Wexner's incontinence score, 8 after treatment); in the other two patients incontinence was self-limiting (Grade I). One patient had bleeding postoperatively from the stapler line that had to be oversewn (Grade IIIb: complication requiring surgical intervention under general anesthesia).[9] During the follow-up, one patient had rectal pain that could be relieved by removal of a staple (Grade IIIb). No dyspareunia was reported after STARR.

DISCUSSION

Stapled transanal rectal resection (STARR) has emerged as a promising, novel approach for the treatment of the obstructed defecation syndrome. In the present study, constipation assessed by the Cleveland Constipation Score (CCS) significantly improved after STARR with most patients being satisfied with the outcome. This is in line with other studies that showed alleviation of outlet obstruction after STARR.[10,11] Clinical improvement correlated to a reduction of the depth of anterior rectoceles and to the incidence of intussusceptions as assessed by MR defecography.

Anterior rectoceles, enteroceles, and intussusceptions often are seen in patients with symptoms of ODS.

FIGURE 2. Magnetic resonance defecography after stapled transanal rectal resection (STARR) (same patient as in Fig. 1) with a reduced depth of the anterior rectocele (bar; 26 mm) and complete disappearance of the rectoanal intussusception.



However, conflicting data have been published on the role of these morphologic alterations on constipation.[12] The majority of patients with rectoceles are asymptomatic. Small rectoceles may be found in 80 percent of normal subjects, although in most of these patients rectoceles are small (<2 cm in depth).[13,14] Furthermore, correction of rectoceles did not improve constipation in a number of studies[15] nor was a correlation found between rectoceles and bowel symptoms.[16,17] Other studies have reported an improvement of constipation after surgery, supporting the concept that rectoceles may cause ODS.[1,18,19] This discrepancy may be explained by an underestimation of the posterior compartment and rectal intussusceptions, respectively, which are found in up to 60 percent in combination with anterior rectoceles.[6,7] This figure is even higher in our series (75 percent). A defecography had not been performed before surgery in most of the studies casting doubt on the relevance of rectoceles.[15–17] However, a preoperative defecography is essential because it may impact treatment decisions.[20,21] Additionally, incomplete evacuation may only be detected in the defecography by the trapping of contrast media; this was suggested to be the most important criterion for surgery.[22] In this study, incomplete evacuation was less frequently detected after STARR, although it did not reach statistical significance. However, clinical outcome was significantly improved as assessed by CSS. Moreover, main symptoms, such as straining, incomplete evacuation, or digital assistance during defecation, improved in 80 percent of our patients.

As with rectoceles, intussusceptions may be detected in nearly half of asymptomatic patients.[13,23,24] Moreover, evacuation parameters, such as speed and effectiveness of defecation, did not differ between patients with rectal intussusceptions and healthy volunteers.[24] This further questions the clinical significance of these findings. However, it has been demonstrated that intussusceptions in healthy volunteers and patients with ODS may morphologically differ.[25] Intussusceptions in symptomatic patients are predominantly full-thickness and mucosal in healthy subjects.[24] Of note, pure mucosal and full-thickness intussusceptions often are difficult to distinguish in conventional defecography. In this study, intussusception was diagnosed by MR defecography and was present in 83 percent of the patients with ODS. Given the fact that intussusceptions were corrected in three-fourths of the patients after STARR, whereas rectoceles of abnormal depth (>2 cm) were significantly reduced in only half of the study group, the treatment of intussusceptions might be of paramount importance in the therapy of ODS. The therapy of intussusceptions is still a matter of debate. Although some authors advocate conservative treatment,[26] most authors prefer surgery as treatment strategy. In some studies, rectopexy has been suggested but the results are predominantly discouraging.[27,28] Therefore, the STARR procedure has been introduced as a promising therapeutic alternative.[10]

Most of the studies that investigated outlet obstruction used conventional defecography for the radiologic assessment of the pelvic floor. However, this technique is limited by its projectional nature and its inability to detect soft-tissue structures.[29] Moreover, the radiation and the need for contrast media instillation into the vagina and bladder to visualize the anterior and middle compartment of the pelvic floor are negative aspects. Hence, patients seem to prefer dynamic MR defecographies to conventional defecographies because of greater comfort.[30] Another drawback of conventional defecography is the difficult distinction between mucosal and full-thickness intussusception. Therefore, MR defecography has become the method of choice for the diagnosis of rectal intussusceptions.[31] Furthermore, MR defecography is the method of choice for the evaluation of enteroceles; it is superior to conventional defecographies even when additional opacification of the vagina and bowel is performed.[29]

It is still controversial whether MR defecographies in the supine position are of similar accuracy as defecographies in the sitting position. Most of the reported studies have used closed-configuration MR systems.[31–34] Closed-configuration MR has been shown to have similar accuracy as open-configuration MR systems with the exception of lesser sensitivity in the diagnosis of intussusceptions.[35] However, in the study by Bertschinger *et al.*,[35] MR imaging in the supine position was only done during rest, squeezing, and straining but not during defecation, hampering the interpretation of the results. Because open-configuration MR systems are scarce and conventional defecographies are burdened by the use of radiation and methodologic weaknesses, closed-configuration MR systems are a compelling alternative. Until now, data from closed-configuration MR systems evaluating ODS and the outcome after STARR were not available. In the present study, we demonstrated that STARR reduces the depth of rectoceles and the incidence of intussusceptions. This is in line with several other studies that used conventional techniques.[10,36,37]

CONCLUSIONS

We demonstrated that STARR is an effective procedure for the treatment of ODS in patients with anterior rectoceles and intussusceptions. Clinical improvement correlates well with morphologic correction of the rectal redundancy assessed by closed-configuration MR defecography. This technique allows an accurate assessment of the underlying alterations in patients with ODS and, therefore, is recommended for an appropriate patient selection. The best treatment for ODS is still under

debate. Despite the lack of randomized trials, we might conclude that the STARR procedure is a valuable alternative for the therapy of anterior rectoceles and intussusceptions, whereas the latter might be of greater importance for the treatment of ODS.

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