

Results, Outcome Predictors, and Complications after Stapled Transanal Rectal Resection for Obstructed Defecation

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PURPOSE: Obstructed defecation may be treated by stapled transanal rectal resection, but different complications and recurrence rates have been reported. The present study was designed to evaluate stapled transanal rectal resection results, outcome predictive factors, and nature of complications.

METHODS: Clinical and functional data of 123 patients were retrospectively analyzed. All patients had symptoms of obstructed defecation before surgery and had rectocele and/or intussusception. Of them, 85 were operated on by the authors and 38 were referred after stapled transanal rectal resection had been performed elsewhere.

RESULTS: At a median follow-up of 17 (range, 3–44) months, 65 percent of the patients operated on by the authors had subjective improvement. Recurrent rectocele was present in 29 percent and recurrent intussusception was present in 28 percent of patients. At univariate analysis, results were worse in those with preoperative digitation ($P<0.01$), puborectalis dyssynergia ($P<0.05$), enterocele ($P<0.05$), larger size rectocele ($P<0.05$), lower bowel frequency ($P<0.05$), and sense of incomplete evacuation ($P<0.05$). Bleeding was the most common

perioperative complication occurring in 12 percent of cases. Reoperations were needed in 16 patients (19 percent): 9 for recurrent disease. In the 38 patients referred after stapled transanal rectal resection, the most common problems were perineal pain (53 percent), constipation with recurrent rectocele and/or intussusception (50 percent), and incontinence (28 percent). Of these patients, 14 (37 percent) underwent reoperations: 7 for recurrence. Three patients presented with a rectovaginal fistula. One other patient died for necrotizing pelvic fasciitis.

CONCLUSIONS: Stapled transanal rectal resection achieved acceptable results at the cost of a high reoperation rate. Patients with puborectalis dyssynergia and lower bowel frequency may do worse because surgery does not address the causes of their constipation. Patients with large rectoceles, enteroceles, digitation, and a sense of incomplete evacuation may have more advanced pelvic floor disease for which stapled transanal rectal resection, which simply removes redundant tissue, may not be adequate. This, together with the complications observed in patients referred after stapled transanal rectal resection, suggests that this procedure should be performed by colorectal surgeons and in carefully selected patients.

KEY WORDS: Transanal surgery; Outlet obstruction; Intussusception; Rectocele; Pelvic floor disease; Stapled transanal rectal resection; STARR.

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Obstructed defecation syndrome is relatively common and mainly characterized by difficult and often painful evacuation, a sense of incomplete evacuation, perineal support or finger insertion into the vagina or anus to defecate, frequent enemas, and laxative abuse. The two most common anatomic findings are rectocele and intussusception, including rectorectal and rectoanal prolapse. Association with anterior compartment and vaginal vault urogenital prolapse, enterocele, and sigmoidocele also are common. The pathophysiology and cause of this syndrome is poorly understood. One of the theories is that, at least in a subset of patients, intussusception develops because of multiple and/or difficult labors and is the cause of obstruction; as a consequence rectocele develops, causing an inability to generate adequate rectal pressures for defecation.¹

Defecography shows a rectocele in 81 percent of asymptomatic females² and intussusception in 35 percent of asymptomatic individuals.³ Therefore, the presence of rectocele and intussusception *per se* is not an indication for surgery. Surgical correction of rectocele and intussusception should only be considered in patients with symptoms of obstructed defecation who fail conservative treatment, such as dietary modifications and biofeedback training.^{4,5}

Correction of both intussusception and rectocele may restore normal anatomy and reverse symptoms, but this is a matter of debate.⁶ Simultaneous correction of intussusception and rectocele has been achieved by combined abdominovaginal approach, as proposed by Zacharin and Hamilton,⁷ or by combined transanal and transvaginal approach, which provides good results but a high incidence of complications. The Delorme operation may correct both defects but is difficult to perform and has a discrete complication rate,⁸ whereas abdominal rectopexy for intussusception is ineffective at relieving constipation.⁹

Recently, stapled transanal rectal resection (STARR) with removal of an anterior and posterior portion of the rectal wall has been introduced.¹ The rationale of the operation is to restore normal anatomy and function by excising redundant tissue.¹⁰ Only three series, two of which were from the same institution, have been fully published, reporting improvement in 90 percent of patients and a very low complication rate.^{1,11,12} After these results, several surgeons, including the authors, had enthusiastically adopted this procedure, but preliminary reports indicated a high complication rate and poor patient satisfaction.¹³⁻¹⁶ Moreover, we noticed an increase in the number of patients referred for complications or persistent symptoms after STARR.

This study was designed to audit our own results, to identify preoperative factors predicting a poor outcome, and to review the management of postoperative complications and recurrences. We retrospectively analyzed the outcome of STARR both in patients operated on by the authors and in patients referred after STARR was performed elsewhere.

MATERIALS AND METHODS

A retrospective analysis was conducted among seven coloproctology units within the Italian Society of Colorectal Surgery that had performed STARR according to the society's annual reports. Ethics approval was obtained by the society's ethics committee. Among patients operated on by the authors, only patients with available follow-up and patients operated on before June 2005 were included. All patients referred by that date after STARR was performed elsewhere were included. Information was gathered from inpatient and outpatient records through a questionnaire filled by a physician. Missing information was obtained by a physician contacting patients. The questionnaire included preoperative signs and symptoms, preoperative anorectal physiology, imaging tests, and associated pathology. Specifically, perioperative complications, postoperative symptoms, recurrence of disease, overall improvement perceived by the patient, long-term sequelae, reinterventions, and outcome of reinterventions were required. The symptoms of obstructed defecation studied were the following: straining at stool more than 25 percent of the time, self-digitations, sense of incomplete evacuation, use of enemas to evacuate more than once per week, and laxative abuse (Table 1). Preoperative and postoperative symptoms of obstructed defecation were not graded and were classified as present or absent. Subjective improvement was defined as the patient's impression of having ameliorated after surgery and was classified as present (improved) or absent (unchanged or worsened).

The STARR procedure was performed as previously described.¹³ Briefly, the operation was performed with general or spinal anesthesia after bowel cleansing and antibiotic prophylaxis with the patient in lithotomy position. Two PPH01 circular staplers were used (Ethicon Endo-Surgery, Inc., Pratica di Mare, Italy). A partial excision of the rectal wall, consisting of two to three anterior and two posterior pursestring sutures, was performed at least 5 cm above the dentate line. A thin, malleable retractor was inserted through the hole of the dilator to avoid circumferential stapling. The stapled lines were reinforced by using 2-6 Vicryl™ 3-0 sutures (Ethicon) and inspected for bleeding. All surgeons who performed STARR were experienced in colorectal surgery and stapled hemorrhoidopexy. All authors who per-

Table 1. Symptoms of obstructed defecation

Straining at stool more than 25 percent of time
Self-digitation
Sense of incomplete evacuation
Use of enemas to evacuate more than once per week
Laxative abuse

formed STARR are accredited in colorectal surgery by the Board of the Italian Society of Colo-Rectal Surgery.

Intussusception was usually diagnosed at defecography. Size of the rectocele was assessed at defecography by measuring maximum depth of the bulge beyond the projected line on the anterior rectal wall, as reported by Mellgren *et al.*¹⁷ A variety of defecography techniques were used preoperatively and postoperatively. These included simple defecography, colpodefecography, colpocystodefecography, colpoenterodefecography, and magnetic resonance imaging defecography. Perineal descent was measured at defecography between the anorectal junction and the pubococcygeal line and was considered present when the difference between straining and rest was >3.5 cm. Enteroceles were detected by defecography with vaginal contrast and were all confined to the upper third of the vagina, because a lower enterocele is a contraindication to a transanal approach. Puborectalis dyssynergia, defined as failure to relax or paradoxical contraction of puborectalis muscle, was considered present when detected by digital examination, manometry, anal ultrasonography, or defecography. Recurrent rectocele was defined as a bulge of ≥ 2 cm in diameter.

P values were calculated by using the two-sided Fisher's exact test and double-tail Wilcoxon's matched-pairs test for categorical variables, and paired or unpaired double tail *t*-test for continuous variables. Results are expressed as odds ratios (OR) and 95 percent confidence intervals (CI), where possible, for categorical variables and means \pm standard deviations (SD) for continuous variables.

RESULTS

Between October 2002 and June 2005, 94 patients underwent STARR by the authors. Of these, 9 (10 percent) patients had incomplete records, so the remaining 85 patients were studied. During the same time frame, an additional 38 patients were referred after STARR was performed elsewhere. These 123 patients formed our study population.

Patients Operated on by the Authors

This group consisted of 85 patients, all of them females. The mean age was 53 (range, 30–77) years. The mean follow-up was 20 (median, 17; range, 3–44) months. The indication for surgery was symptoms of obstructed defecation (Table 1) not responding to conservative treatment, which consisted of dietary modifications and laxatives in all patients and biofeedback training in 24 of 85 (28 percent). Preoperatively, 3 patients (4 percent) had only 1 symptom, 6 patients (7 percent) had 2 symptoms, 28 patients (33 percent) had 3 symptoms, 26 patients (31 percent) had 4, and 22 patients (26 percent) had all 5 symptoms. Of the 85 patients, 62 (73 percent) had a combination of rectocele and intussusception, 17 (20 percent) had intussusception alone, and 6 (7 percent) had rectocele alone. Eighty patients under-

went preoperative defecography with different techniques (colpoenterodefecography = 33, colpodefecography = 19, simple defecography = 18, colpocystodefecography = 8). Intussusception was diagnosed by defecography in 74 of 79 patients. Diagnosis was made by proctoscopy only in five patients with rectoanal intussusception: four of whom had associated rectocele. Of the 68 patients with rectocele, 64 underwent preoperative defecography. Mean rectocele size, measured in 58 of 64 patients, was 41 (± 13 SD; range, 25–79) mm. At preoperative defecography, 19 of 80 patients had perineal descent. Of the 60 patients who received vaginal contrast at defecography, 8 patients had an enterocele descending to the upper third of the vagina. Eight patients (9 percent) had puborectalis dyssynergia, 6 of whom underwent preoperative biofeedback treatment. Thirty patients (35 percent) had anxiety (*n*=13), depression (*n*=8), or both (*n*=9); 23 of whom were taking medications.

Preoperative symptoms of obstructed defecation were all significantly improved with the exception of laxative use (Fig. 1). Mean bowel frequency per week was 3.6 ± 3.9 SD preoperatively and 4.3 ± 3.9 SD postoperatively (*P*=0.34). Overall, 76 (89 percent) of patients had three or more symptoms of obstructed defecation preoperatively and 44 (52 percent) postoperatively (*P*<0.001). Subjective improvement was noted in 55 of 85 (65 percent) patients.

Sixty-four patients (75 percent) underwent postoperative defecography 6 to 55 weeks after surgery as part of a protocol or because of recurrent symptoms. Of 68 patients with preoperative rectocele, 20 (29 percent) had recurrent rectocele; and of 79 patients with preoperative intussusception, 22 (28 percent) had recurrent intussusception. Recurrent rectocele and/or intussusception were always confirmed by defecography.

Preoperative variables were correlated with outcome using univariate analysis. Lack of improvement (Table 2) was more frequent in patients with preoperative digitations (OR, 4.14; 95 percent CI, 1.46–11.72; *P*=0.006), puborectalis dyssynergia (OR, 16.43; 95 percent CI, 1.91–141.28; *P*=0.002), and enterocele (OR, 6.18; 95 percent CI, 1.13–33.83; *P*=0.04). Rectocele recurrence (Table 3) was more likely in patients with larger rectocele size (48.42 ± 19.86 mm for those with recurrence *vs.* 38.78 ± 13.77 mm for those without; *P*=0.03). Rectocele recurrence also was higher in patients with enterocele (OR, 8.33; 95 percent CI, 1.38–50.47; *P*=0.02) and puborectalis dyssynergia (OR, 15; 95 percent CI, 1.62–138.82; *P*=0.008). Recurrence of intussusception (Table 4) was more likely in patients with lower bowel frequency (2.95 ± 1.7 bowel movements per week for those with recurrence *vs.* 4.78 ± 3.8 for those without; *P*=0.03). Recurrent intussusception also was higher in patients with a preoperative sense of incomplete evacuation (*P*=0.03).

Preoperatively, 15 patients (18 percent) suffered from incontinence, which was infrequent (less than once per month) to gas or liquid stool in 12 patients, and frequent

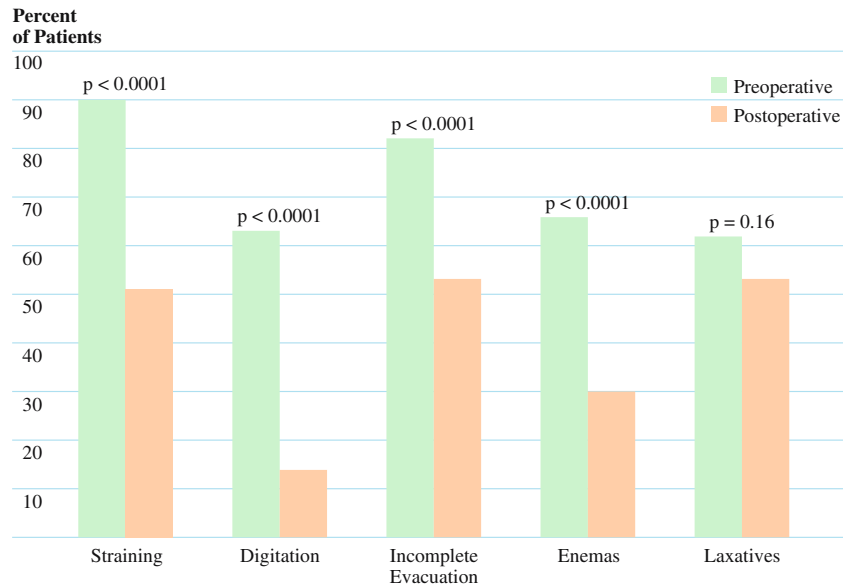


FIGURE 1. Preoperative and postoperative symptoms of obstructed defecation in patients who underwent stapled transanal rectal resection by the authors.

(at least once per week) to liquid stool in 2 patients. Incontinence resolved postoperatively in 8 of 15 patients (53 percent) was unchanged in 4 patients and worsened in 3 patients. New onset anal incontinence developed in five patients (6 percent), was infrequent to gas or liquid

stool in four patients, and complete in one patient. One case of new onset anal incontinence spontaneously resolved after six months. In the other four, incontinence persisted at a mean follow-up of 17 (median, 10; range, 4–36) months.

Table 2. Univariate analysis of preoperative factors correlated with improvement

	Improved	Did not improve	OR (95% CI)	P value
Mean age (yr)	54.1 (11.99)	53.4 (12.44)		0.79
Straining	no 5 (71) yes 50 (64)	2 (29) 28 (36)	1.4 (0.25–7.69)	1
Digitation	no 28 (82) yes 27 (53)	6 (18) 24 (47)	4.14 (1.47–11.72)	0.006
Incomplete evacuation	no 9 (75) yes 46 (63)	3 (25) 27 (37)	1.76 (0.44–7.07)	0.53
Enemas	no 25 (76) yes 30 (58)	8 (24) 22 (42)	2.29 (0.87–6.03)	0.11
Laxatives	no 24 (65) yes 31 (65)	13 (35) 17 (35)	1.01 (0.41–2.48)	1
Puborectalis dyssynergia	no 54 (70) yes 1 (12)	23 (30) 7 (88)	16.43 (1.91–141.28)	0.002
Barium trapping	no 11 (73) yes 24 (55)	4 (27) 20 (45)	2.29 (0.63–8.32)	0.24
Hemorrhoids	no 41 (62) yes 14 (74)	25 (38) 5 (26)	0.58 (0.19–1.82)	0.42
Enterocoele*	no 35 (67) yes 2 (25)	17 (33) 6 (75)	6.18 (1.13–33.88)	0.04
Incontinence	no 46 (66) yes 9 (60)	24 (34) 6 (40)	1.28 (0.41–4.01)	0.77
Perineal descent	no 42 (69) yes 9 (47)	19 (31) 10 (53)	2.45 (0.86–7.02)	0.11
Psychopathology	no 39 (71) yes 16 (53)	16 (29) 14 (47)	2.13 (0.85–5.37)	0.15
Mean bm/week	4.1 (1.97)	4.1 (4.93)		0.97
Mean rectocele size (mm)	39.59 (14.92)	45.43 (18.33)		0.18

CI = confidence interval; bm = bowel movements; OR = odds ratio. • Data are numbers with percentages or \pm standard deviations in parentheses unless otherwise indicated. • *Only patients who underwent defecography with vaginal contrast.

Table 3. Univariate analysis of preoperative factors correlated with recurrent rectocele

	<i>Did not recur</i>	<i>Recurred</i>	<i>OR (95% CI)</i>	<i>P value</i>
Mean age (yr)	56.6 (10.32)	56 (11.29)		0.82
Straining	no 3 (75)	1 (25)	1.33 (0.13–13.58)	1
	yes 43 (69)	19 (31)		
Digitation	no 16 (80)	4 (20)	2.13 (0.61–7.46)	0.26
	yes 30 (65)	16 (35)		
Incomplete evacuation	no 8 (89)	1 (11)	4 (0.47–34.36)	0.26
	yes 38 (67)	19 (33)		
Enemas	no 17 (77)	5 (23)	1.76 (0.54–5.7)	0.4
	yes 29 (66)	15 (34)		
Laxatives	no 22 (71)	9 (29)	1.12 (0.39–3.21)	1
	yes 24 (69)	11 (31)		
Puborectalis dyssynergia	no 45 (75)	15 (25)	15 (1.62–138.82)	0.008
	yes 1 (17)	5 (83)		
Barium trapping	no 13 (87)	2 (13)	4.5 (0.9–22.41)	0.06
	yes 26 (59)	18 (41)		
Hemorrhoids	no 37 (70)	16 (30)	1.02 (0.28–3.83)	1
	yes 9 (69)	4 (31)		
Enterocoele*	no 30 (77)	9 (23)	8.33 (1.38–50.47)	0.02
	yes 2 (29)	5 (71)		
Incontinence	no 37 (68)	17 (31)	0.72 (0.17–3.02)	0.74
	yes 9 (75)	3 (25)		
Perineal descent	no 30 (65)	16 (35)	0.62 (0.17–2.25)	0.55
	yes 12 (75)	4 (25)		
Psychopathology	no 30 (73)	11 (27)	1.53 (0.53–4.47)	0.58
	yes 16 (64)	9 (36)		
Mean bm/week	4.45 (4.09)	3.75 (1.04)		0.46
Mean rectocele size (mm)	38.78 (13.77)	48.42 (19.86)		0.03

CI = confidence interval; bm = bowel movements; OR = odds ratio. • Data are numbers with percentages or \pm standard deviations in parentheses unless otherwise indicated. • *Only nts who underwent defecography with vaginal contrast.

A sense of urgency developed postoperatively in 9 patients (11 percent). In two patients, this symptom disappeared after 12 months, and in the other seven, it was still present at a mean follow-up of 12 (median, 12; range, 3–24) months.

Postoperative tenesmus was noted in five patients (6 percent) at a mean follow-up of ten (median, 12; range, 2–24) months. Postoperative pain was present in nine patients (11 percent) at a mean follow-up of 16 (median, 14; range, 2–32) months and was referred to the perineum (n=7) or to the sacrum (n=2). This was never debilitating nor requiring continuous analgesics. Postoperative dyspareunia occurred in one patient (1 percent).

Nineteen perioperative complications occurred in 15 patients (18 percent) and are listed in Table 5. A case of postoperative sepsis presented with fever, hypotension, and retroperitoneal air on postoperative Day 1 and resolved with intravenous antibiotics. Both abscesses were at the level of the anastomosis and were surgically drained through a transanal approach. One case of stenosis resolved with anal dilatation; the other required removal of an anastomotic pocket at the level of the anterior staple line. Bleeding was massive and required immediate intervention in one case. In another case, a large perianastomotic hematoma formed, which was drained transanally. The other cases were chronic, originating from granulomatous staples, and resolved after staple removal in an ambulatory setting.

Excluding 9 patients who underwent minor procedures in an ambulatory setting, 16 (19 percent) patients underwent 17 operative procedures after STARR (Table 6). Nine additional procedures were performed in nine patients because of persistent symptoms of obstructed defecation. Seven of these procedures were performed for recurrent or persistent rectocele: four transvaginally (mesh repair of rectovaginal septum and perineorrhaphy) and three transanally (STARR and Sarles). An abdominal rectopexy was performed for recurrent intussusception and an abdominal mesh obliteration of the Douglas pouch was performed for worsening enterocoele after STARR with symptoms of pelvic pain. All patients had a symptomatic improvement after additional procedures, but follow-up was too short for complete assessment.

Patients Referred after STARR Performed Elsewhere

Thirty-eight patients (37 females) were referred after STARR was performed elsewhere (mean age, 51 (range, 31–72) years). Reasons for referral are listed in Table 7. The mean follow-up after STARR was 11 (median, 11; range, 0–36) months. Recurrent rectocele was present in 11 of 38 patients (29 percent), and recurrent intussusception was present in 14 of 38 patients (37 percent). One case of recurrent intussusception revealed rectal procidentia in the squatting position. Postoperative constipation, defined as the presence of at least three symptoms of

Table 4. Univariate analysis of preoperative factors correlated with recurrent intussusception

	<i>Did not recur</i>	<i>Recurred</i>	<i>OR (95% CI)</i>	<i>P value</i>
Mean age (yr)	54.5 (11.86)	54.4 (13.65)		0.98
Straining	no 7 (100)	0 (0)	†	0.18
	yes 48 (69)	22 (31)		
Digitation	no 23 (79)	6 (21)	1.92 (0.65–5.65)	0.24
	yes 32 (67)	16 (33)		
Incomplete evacuation	no 11 (100)	0 (0)	†	0.03
	yes 44 (67)	22 (33)		
Enemas	no 26 (84)	5 (16)	3.04 (0.99–9.43)	0.07
	yes 29 (63)	17 (37)		
Laxatives	no 28 (78)	8 (22)	1.81 (0.65–5.01)	0.31
	yes 27 (66)	14 (34)		
Puborectalis dyssynergia	no 51 (72)	20 (28)	1.27 (0.22–7.52)	1
	yes 4 (67)	2 (33)		
Barium trapping	no 9 (75)	3 (25)	1.61 (0.37–6.95)	0.73
	yes 26 (65)	14 (35)		
Hemorrhoids	no 39 (67)	19 (33)	0.38 (0.1–1.48)	0.24
	yes 16 (84)	3 (16)		
Enterocoele*	no 32 (68)	15 (32)	5.33 (0.93–30.72)	0.09
	yes 2 (29)	5 (71)		
Incontinence	no 45 (70)	19 (30)	0.71 (0.18–2.87)	0.75
	yes 10 (77)	3 (23)		
Perineal descent	no 40 (75)	13 (24)	2.77 (0.92–8.29)	0.08
	yes 10 (53)	9 (47)		
Psychopathology	no 39 (78)	11 (22)	2.44 (0.88–6.75)	0.11
	yes 16 (59)	11 (41)		
Mean bm/week	4.78 (3.76)	2.95 (1.73)		0.03

CI = confidence intervals; bm = bowel movements; OR = odds ratio. • Data are numbers with percentages or \pm standard deviations in parentheses unless otherwise indicated. • *Only patients who underwent defecography with vaginal contrast. • †Odds not estimated.

obstructed defecation, was present in 23 of 38 patients (61 percent). Among the 38 patients, postoperative tenesmus was present in 5 patients (13 percent), urgency in 5 patients (13 percent), and dyspareunia in 1 patient (3 percent).

One patient had septic shock the night of the operation. A CT scan showed retroperitoneal air, and she was taken to the operating room where necrosis of rectum and uterus were found. A hysterectomy and Hartmann's procedure were performed. This patient died of septic shock the day after reintervention. The specialist opinion of one of the authors (Mario Pescatori) was requested as part of a medicolegal dispute and was based on a review of the patient's records. Postmortem revealed necrotizing pelvic fasciitis. All other patients were seen as outpatient consultations.

Table 5. Perioperative complications in 15 patients who underwent stapled transanal rectal resection by the authors

<i>Perioperative complication</i>	<i>No. of patients</i>	<i>(%)</i>
Bleeding	10	(12)
Perianastomotic abscess	2	(2)
Stenosis	2	(2)
Hemorrhoidal thrombosis	3	(4)
Anal fissure	1	(1)
Sepsis with retroperitoneum	1	(1)
Total	19	

With the exception of the patient who died after STARR, in whom the level of the anastomosis could not be ascertained, staple lines were found in the rectum in all cases. The majority of patients presented with multiple complex problems are listed in Table 7. Fifteen of 38 patients (39 percent) were treated with counseling only. Eleven patients (29 percent) were found to have puborectalis dyssynergia and in nine of them, including two cases with concomitant incontinence, symptoms improved with pelvic rehabilitation and biofeed-

Table 6. Reinterventions in 16 patients who underwent stapled transanal rectal resection by the authors

<i>Reintervention</i>	<i>No. of patients</i>
Mesh repair of rectovaginal septum for rectocele	3
Redo STARR for rectocele and intussusception	2
Hemorrhoidectomy	2
Perianastomotic abscess drainage	2
Internal sphincterotomy	1
Suturing of anastomotic Bleeding	1
Drainage of rectovaginal hematoma	1
Obliteration of Douglas pouch for enterocele	1
Perineorraphy for rectocele	1
Abdominal rectopexy for intussusception	1
Sarles (anterior Delorme) for rectocele	1
Removal of anastomotic pocket	1
Total	17

STARR = stapled transanal rectal resection

back. Fourteen patients (37 percent) underwent 19 operative interventions as listed in Table 8.

New onset perineal pain after surgery was present in 20 of 38 patients (53 percent). This was debilitating and constantly requiring analgesics in 7 of 20 patients. In one case with prostatitis and perianastomotic abscess, pain resolved after complete removal of the anterior staple line and performance of a manual reanastomosis together with a long course of antibiotics. In one case, rectal granulomas from the staple line were removed without benefit. Of the 13 cases with less severe pain, 2 also complained of constipation with recurrence of rectocele in one case and of both rectocele and intussusception in the other. In both cases pain improved after performing Sarles and Delorme procedures, respectively. In another case, pain resolved after removal of staple line granulomas.

Postoperative incontinence was present in 11 of 38 patients (29 percent) and was frequent with liquid or solid stool in 5 patients. Four cases improved with pelvic rehabilitation and biofeedback training and two patients underwent levatorplasty alone or in association with a Sarles procedure. Of the 19 patients with constipation and recurrent rectocele and/or intussusception, 7 underwent surgical procedures (Table 8). After reoperation, at a mean follow-up of six (median, 7; range, 1–24) months, symptoms were unchanged or worse after abdominal rectopexis (n=2 patients) and were improved after colporectosacropexy (n=1), Sarles (n=2), Delorme (n=1), and an Altemeier (n=1). Three patients with a rectovaginal fistula underwent fistula repair with diverting colostomy: one after a failed rectal advancement flap. An enterocele was found at postoperative

Table 7. Reasons for referral after stapled transanal rectal resection performed by other surgeons

<i>Reason for referral</i>	<i>No. of patients</i>	<i>(%)</i>
Pain + constipation + recurrence	8	(21)
Pain alone	5	(13)
Pain + incontinence + constipation + recurrence	4	(11)
Constipation alone	4	(11)
Constipation + recurrence	4	(11)
Incontinence + constipation	2	(5)
Incontinence alone	2	(5)
Rectovaginal fistula	2	(5)
Constipation + incontinence + recurrence	1	(2)
Constipation + incontinence + rectal procidentia	1	(3)
Rectovaginal fistula + constipation + recurrence	1	(3)
Necrotizing pelvic fasciitis	1	(3)
Pain + constipation	1	(3)
Pain + incontinence	1	(3)
Pain + prostatitis + abscess	1	(3)
Total	38	

Recurrence = recurrence of rectocele and/or intussusception.

Table 8. Reinterventions in 14 patients referred after stapled transanal rectal resection

<i>Reintervention</i>	<i>No. of patients</i>
Rectovaginal fistula repair with colostomy	3
Removal of granulomas	3
Abdominal rectopexy for intussusception	2
Anterior levatorplasty for incontinence	2
Sarles (anterior Delorme) for rectocele	2
Hysterectomy and Hartmann for pelvic sepsis	1
Delorme for intussusception	1
Altemeier for rectal procidentia	1
Advancement flap for rectovaginal fistula	1
Reanastomosis and abscess drainage	1
Colporectosacropexy for pelvic prolapse	1
Hemorrhoidectomy	1
Total	19

defecography in 4 of 38 patients (11 percent), but it was unclear whether this was present preoperatively. None of them had symptoms attributable to the enterocele itself. Psychologic features also were difficult to assess in this patient population, but 6 of 38 patients (16 percent) had a clear history of mental illness before STARR.

DISCUSSION

In our hands, at 20 months mean follow-up, STARR was successful at improving 65 percent of patients. Results were worse in patients with preoperative digitation, puborectalis dyssynergia, enterocele, larger size rectocele, lower bowel frequency, and preoperative sense of incomplete evacuation. Overall, surgical reintervention was necessary in 19 percent of cases. Reintervention for recurrent or persistent disease was needed in 11 percent of patients.

We also are reporting that patients who were referred after unsuccessful STARR procedures presented with complex problems requiring highly specialized care. A common complaint in this patient population was perineal pain, often debilitating, for which there was no successful treatment, with the exception of one case of staple line removal and manual reanastomosis. These patients represent a selected population and the denominator of this group of patients is not known, as it is not known what the level of training was for all the surgeons who performed STARR in this group, although none of them was accredited by the Italian Society of Colorectal Surgery. Even if this information is strongly biased, we wanted to include it because it reflects our specialist practice and may be helpful in the management of complications and recurrence after STARR.

Our goal was to evaluate the results of the STARR procedure and we did not include in this study the patients who were treated conservatively or with other operations. Biofeedback training leads to complete resolution of symp-

toms in 12 percent of patients with rectocele and 33 percent of patients with intussusception and has no effect in 28 and 48 percent of patients, respectively.^{4,5} However, biofeedback training was attempted only in a minority of our patients and is therefore possible that a proportion of patients who underwent STARR might have improved with biofeedback.

Overall, the results of STARR were worse than what has been reported by other authors^{1,11,12} and more similar to results of many other surgical procedures for obstructed defecation.^{18–20} This difference may be the result of: different patient populations, such as patients with larger rectoceles and lower bowel frequency in our series; our longer follow-up; different selection criteria, because we did not exclude patients with isolated rectocele or intussusception and patients with puborectalis dyssynergia. Postoperative urgency and incontinence have been reported as being transient after STARR¹ but were still present after 19 months in some of our patients. Incontinence may be caused by sudden decrease of rectal compliance or by stretching of the internal sphincter secondary to the 34-mm dilator.²¹

Puborectalis dyssynergia was present in 9 percent of patients operated on by the authors and in 29 percent of patients referred after STARR; this was despite published data suggesting that puborectalis dyssynergia may be a contraindication to STARR.^{13,22} The role of postoperative fibrosis over puborectalis innervation and dynamics cannot be excluded in the referred patient population. Although van Dam *et al.*²³ demonstrated that surgery for rectocele was not influenced by the presence of puborectalis dyssynergia, we found, in agreement with others,^{13,24} that patients with preoperative puborectalis dyssynergia were less likely to be satisfied with surgery results and had more frequently recurrent rectocele.

Chronic pain after STARR was observed in 10 percent of patients operated on by the authors and in 52 percent of referred patients. Chronic pain has been previously described after STARR¹³ and after stapled hemorrhoidopexy,^{25,26} and the hypothesized mechanisms are a too-low staple line, perianastomotic fibrosis, and high levels of anxiety. Pain after stapled hemorrhoidopexy may respond to oral nifedipine, which was not used in the current study.²⁷

It may be that some of the complications that we observed in patients referred after STARR are operator-dependent, as it is possible for the septic complications. Necrotizing pelvic fasciitis is rarely described in the literature.^{28,29} Sepsis and retroperitoneum are reported after stapled hemorrhoidopexy^{26,30,31} and developed in one of our patients who recovered with intravenous antibiotics. These reports may be considered anecdotal but are one of the main reasons for the expressed caution about the indiscriminate use of stapled hemorrhoidopexy.^{26,32,33}

The correlations between preoperative digitation, lower bowel frequency, and worse results after surgery also have been previously reported.^{22,33,34} Our finding that larger rectoceles are more likely to recur after STARR

is opposite to what has been observed by Thornton *et al.*³⁵ for transanal and laparoscopic rectocele repair. STARR, as opposed to other perineal and abdominal procedures, amputates rectoceles without reinforcing the rectovaginal septum. This difference may explain our results.

A way to interpret some of the results of univariate analysis is that patients with puborectalis dyssynergia and lower bowel frequency, which may be a marker of slow-transit constipation or rectal inertia, may not benefit from surgery because this does not address the underlying cause of their symptoms. Patients with large rectocele size, presence of an enterocele, digitation, and sense of incomplete evacuation may be a subset with more advanced pelvic floor disease. Transanal (as well as vaginal) operations ultimately depend on normal orientation and function of the pelvic diaphragm for long-term support and protection of the repair. Consequently, the presence of abnormal neuromuscular and connective tissue physiologic features may predispose to failure the types of repairs that only close fascial defects. Under these circumstances, a surgical repair that adds exogenous synthetic support, such as abdominal sacral colpopexy with interposition of a synthetic suspensory bridge between the prolapsed vagina and the anterior sacrum, may be indicated.³⁶ High rectoceles may have concomitant urogenital prolapse, including cystocele and enterocele. Low rectoceles are usually an isolated defect in the suprasphincteric portion of the rectovaginal septum and situated immediately above its attachment to the perineal body.³⁷ If STARR is performed in patients with small and low fascial defects, results may be more favorable. In light of our observations, recent attempts to perform STARR in patients with enterocele under laparoscopic surveillance³⁸ may result in poor functional outcome, even if it may prevent entrapment of enterocele in the staple line as recently described for stapled hemorrhoidopexy.³⁹

One of the major limitations of our study is its retrospective nature, with information gathered from the patients' charts through a questionnaire. Another limitation of our study is that defecography was not performed with vaginal contrast in all patients, which may have underestimated the incidence of enterocele. In addition, a few patients with intussusception did not undergo preoperative defecography. Despite that most of the authors believe that defecography is essential to diagnose intussusception, circumferential mucosal prolapse, protruding into the anal canal and possibly representing the initial phase of rectoanal intussusception, may be detected at proctoscopy on straining.⁴⁰

CONCLUSIONS

We conclude that STARR for obstructed defecation has an appealing rationale and may be of some benefit in carefully selected patients. In our experience, patients

with more advanced pelvic floor disease and patients with other possible causes of their symptoms, such as puborectalis dyssynergia and motility disorders, benefit less from this operation. Nevertheless, transanal procedures for rectocele and intussusception, such as STARR, could be offered to patients who do not respond to conservative treatment, providing that morbidity is acceptable and that the patient is correctly informed about the functional outcome. The severity and complexity of problems that we encountered in patients referred after unsuccessful STARR suggests that this operation should be considered only by surgeons with extensive experience in endoanal suturing and skilled in the evaluation of pelvic floor disorders. Finally, the high cost of this procedure may be a financial burden in many countries until an improvement in the quality of care can be clearly demonstrated.

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INVITED COMMENTARY

To the Editor—The operation of stapled transanal rectal resection or STARR procedure is becoming increasingly popular to treat patients with obstructed defecation syndrome (ODS). The operation involves partial excision of the rectal walls approximately 5 cm above the dentate line using circular stapling instruments. Initial reports have suggested that patients make a rapid and uneventful recovery and have excellent symptomatic results.

It has been postulated that the STARR procedure is efficacious because the operation restores the normal anatomy and function of the anorectum by excising redundant rectal tissue that would otherwise cause an obstruction at the anorectal junction. It may be expected, therefore, that patients who are

likely to benefit from this operation should have unequivocal evidence of a rectal intussusception or internal prolapse rather than symptoms of ODS, which is an ill-defined clinical entity with a multifactorial etiology, including psychologic causes. It would be helpful to have clear guidance with regard to which patients with ODS will benefit from the STARR procedure.

The article by Gagliardi *et al*. reporting the outcome of the STARR operation in seven coloproctology units affiliated to the Italian Society of Colorectal Surgeons may help in this regard. The goal of the study was to identify preoperative factors that would predict a poor outcome after STARR. All the patients had a rectocele or intussusception (or both) identified before surgery predominantly by defecography. Although the study is limited by the fact that it is retrospective and is dependent on the patient's nonobjective assessment of symptomatic improvement, several factors were associated with a poor outcome. These included preoperative digitation, puborectalis paradox, enterocele, the presence of a large rectocele, and low bowel frequency. Overall 65 percent of patients were improved, but almost one in five required further surgery.

The article also highlights the fact that the STARR procedure is neither as simple, nor as safe, as has been previously portrayed. There was one death and several serious complications, such as rectovaginal fistula. The authors are correct to emphasise that STARR, like any other procedure, requires appropriate training and skilled surgery.

Despite these limitations, it is evident that the STARR operation benefits a selected group of patients with ODS. The challenge is to identify which patients. Evidence is accumulating, including from this Italian study, that it is those patients with an unequivocal intussusception in the absence of other features, such as a large rectocele and puborectalis paradox, who are most likely to benefit. This is logical (if the postulated mode of action of the operation is correct) and the key to success, therefore, lies in having a method that reliably diagnoses symptomatic intussusception.

To date, much emphasis has been placed by authors reporting the outcome after STARR on the role of defecography for this purpose. It is recognized, however, that defecography has a high false-positive rate identifying “intussusception” in 20 to 30 percent of asymptomatic healthy control subjects. Furthermore, abdominal surgery using various techniques has not been successful in treating patients with intussusception diagnosed by defecography. In contrast, it has been reported that abdominal surgery based on the diagnosis of internal or “occult” prolapse by examination under anesthesia (EUA) is equally effective as abdominal surgery performed for overt rectal prolapse. In that study the internal or “occult” prolapse was diagnosed by drawing the rectum out of the anal canal with sponge forceps at EUA. In effect a true rectal prolapse was diagnosed that was not evident on office examination. It is of note that Dr. Longo, in Vienna, who has the largest experience with this operation also reported that a high percentage of his patients had an EUA in addition to defecography. Could this be a mechanism for reducing the false-positive rate for defecography by ensuring that only those patients with clinically important internal prolapses are offered surgery?

In conclusion, there is increasing evidence that the STARR procedure gives symptomatic relief to selected patients with ODS. The challenge remains to reliably identify which patients with ODS will benefit.

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