Enterocoele Reduction in the Prone Position: New Horizons for Safer Stapled Transanal Rectal Resections

SANDRA MARIA MOREIRA PAIM, MD, FBSCP
RESEARCHER, COLON AND RECTAL SURGEON
DEPARTMENT OF COLON AND RECTAL SURGERY
ST. MARK’S HOSPITAL
SALT LAKE CITY, UT

MARYELLYN GILEFEATHER, MD, FACR
RADIOLOGIST
IMAGING CENTER
ST. MARK’S HOSPITAL
SALT LAKE CITY, UT

MELINDA HAWKINS, MD
RESIDENT OF THE ST. MARK’S COLON AND RECTAL SURGERY RESIDENCY PROGRAM
DEPARTMENT OF COLON AND RECTAL SURGERY
ST. MARK’S HOSPITAL
SALT LAKE CITY, UT

JOHN GRIFFIN, MD, FACS, FASCRS
PROGRAM DIRECTOR OF THE ST. MARK’S COLON AND RECTAL SURGERY RESIDENCY PROGRAM
DEPARTMENT OF COLON AND RECTAL SURGERY
ST. MARK’S HOSPITAL
SALT LAKE CITY, UT

ABSTRACT

Aim: The presence of enterocoele may interfere with the surgical approach for obstructed defecation syndrome (ODS) as it may represent a contraindication to stapled transanal rectal resection (STARR), and tactics to overcome this problem have been debated. A change in the patient’s position during surgery may be a means to overcome an enterocoele. We sought to determine whether an enterocoele could be completely reduced when the patient is placed in the prone position during fluoroscopic defecography (FD).

Methods: Patients of a Colon and Rectal Surgery Residency Program undergoing FD for any condition from August 2012 to May 2016 were enrolled. For participants with an enterocoele documented during FD, projections in the prone position were also obtained. Data regarding sex, age, pelvic floor laxity, rectocele, intussusception, sigmoidocele, enterocoele and its reduction in the prone position were recorded for all participants. Enterocoele reduction was analyzed by Fisher’s exact test.

Results: A total of 101 patients were enrolled and an enterocoele was found in 63 (62.3%). Among the patients with an enterocoele, in 48 (76.2%) it was completely reduced when the patient was placed in the prone position (p-value = 0.000195; 95% CI 63.79 - 86.02).
Introduction

Obstructed defecation syndrome (ODS) is multifactorial and the underlying anatomical and physiological disturbances are not completely understood. Surgical procedures for the correction of defecation abnormalities, such as rectoceles, enteroceles, sigmoidoceles and prolapses, are currently being innovated. Stapled transanal rectal resection (STARR) has become a well-discussed surgical procedure for the treatment of ODS. Post-operative results reported in the literature reflect variable outcomes. The extent to which the results of these and other innovations vary according to factors related to the surgeon’s experience, the device used, the technique itself or the patient’s comorbidities and structural abnormalities is unclear, and therefore, thoughtful patient selection is advised.

Such selection can best be achieved by a thorough pelvic and coloproctological physical examination along with clinical scoring systems. In addition, defecography is the most important diagnostic study. When planning the surgical approach in a patient with ODS, the surgeon must be aware of specific conditions for which STARR may be contraindicated. These include psychiatric conditions, pelvic floor dysynergia, slow transit constipation and during maximal straining. Normal descent is diagnosed when the anus is observed to be at least 2.5 cm below this imaginary line at rest, with or without additional downward movement during straining. Perineal descent is diagnosed when the anus is observed to be at least 2.5 cm below this imaginary line at rest, with or without additional downward movement during straining. Perineal descent is measured on FD as the difference between the position of the anorectal junction at rest and during maximal straining. Normally, the anal verge lies just below an imaginary line drawn between the coccyx and the pubic symphysis. Perineal descent is diagnosed when the anus is observed to be at least 2.5 cm below this imaginary line at rest, with or without additional downward movement during straining. Perineal descent is measured on FD as the difference between the position of the anorectal junction at rest and during maximal straining in relationship to the pubococcygeal line.

Design: Observation and analysis of consecutively collected patients from a Colon and Rectal Surgery Residency Program undergoing FD from August 2012 to May 2016 was conducted. Ethics approval was obtained from the Institutional Review Board of St. Mark’s Hospital, Salt Lake City, UT, USA.

Patients and Setting: Consecutive patients who presented to the Colon and Rectal Surgery Service with evacuatory disorders for which defecography was required were considered potentially fit for inclusion. All were invited to participate and informed consent was obtained. There were no refusals or exclusions. Since the endpoint of this study was to address the complete reduction of an enterocele upon prone positioning, the final inclusion criterion was the actual presence of an enterocele during FD. Since ODS is a complex and multifactorial condition, all other descriptive FD results found in enrolled patients—pelvic floor descent, sigmoidocele, rectal intussusception, rectal prolapse and rectocele—were also explicated.

The entire study was conducted at a tertiary hospital by a team of board-certified colon and rectal surgeons, the resident of the colon and rectal surgery residency program and a gastroenterology-trained board-certified radiologist.

Definitions and Measurements of Reference: Obstructed defecation syndrome (ODS) is a subset of functional constipation in which patients report symptoms of incomplete rectal emptying with or without an actual reduction in the number of bowel movements per week. Pelvic floor laxity (PFL) with descent — Perineal descent was defined as the abnormal caudal movement of the pelvic floor with straining. It is measured clinically by the position of the anal verge in relationship to the plane of the ischial tuberosities at rest and during maximal straining. Normally, the anal verge lies just below an imaginary line drawn between the coccyx and the pubic symphysis. Perineal descent is diagnosed when the anus is observed to be at least 2.5 cm below this imaginary line at rest, with or without additional downward movement during straining. Perineal descent is measured on FD as the difference between the position of the anorectal junction at rest and during maximal straining in relationship to the pubococcygeal line.

Herniations of the peritoneal sac with contained organs such as small bowel (enterocele) or sigmoid colon (sigmoidocele) were graded as small (<3 cm), moderate (3–6 cm), or large (>6 cm) by measuring the greatest distance between the pubococcygeal line and the most inferior point of the sac.
Enterocele — An enterocele was defined as protrusion of the peritoneum between the rectum and vagina containing the small bowel. On defecography, enterocele is classified as small bowel present between the rectum and vagina, reaching lower than the upper third of the vagina or further during evacuation effort.

Sigmoidocele — A sigmoidocele was defined as a protrusion of the peritoneum between the rectum and vagina that contained the sigmoid colon. On defecography, sigmoidoceles are classified according to the position of the lowest loop of the sigmoid during evacuation effort.

Rectocele — A rectocele was defined as bulging of the rectum into the posterior wall of the vagina. This quantitative clinical description is based on the relationship between the mobile posterior vaginal wall and the anatomically fixed hymen. Radiographically, rectoceles are seen as a blind pouch that fills like a hernial sac during efforts at defecation and are graded as small (<2 cm), moderate (2–4 cm), or large (>4 cm).

Rectal Prolapse — A rectal prolapse was defined as circumferential, full-thickness intussusception of the rectal wall, the degree of which can vary from intussusception (either intrarectal prolapse or intra-anal prolapse) to external rectal prolapse.

Evacative motion recordings and official radiologist’s reports were reviewed by the investigators, who all agreed on the interpretations. Fluoroscopic defecography was obtained by standard fluoroscopy equipment and analyzed by the same gastroenterology-trained board-certified radiologist under the same working conditions. After all standard projections were obtained during FD, patients who had an enterocele were positioned in the prone position and an additional image was obtained to determine whether the enterocele would reduce with the change in position. The procedure was performed by a trained radiology physician assistant; a radiologist was available during the study to answer questions and to evaluate the images before the patient was discharged from the department.

Patient Preparation: The patient drank 500 ml of liquid barium followed by 500 ml of water 2 hours prior to FD to opacify the small bowel for the detection of enterocele. Next, 300 ml of liquid barium and 150 ml of barium paste were administered in the rectum by catheter to fill the rectum and distal sigmoid colon with the patient lying in the left lateral position. A small amount of liquid barium—an average of 50 ml—was administered into the vagina via a catheter to identify the position of the vagina in relation to the bowel by fluoroscopy. We did not use suppositories and the rectum was not emptied beforehand. Contrast opacification of the bladder may have been useful but is increasingly invasive.

Acquisition of Standard Projections: The patient was then seated on a fluoroscopically compatible chair—similar in height and size to a standard toilet—in the lateral position. The patient was examined by fluoroscopy, with a usual dose of 80 mGy. Images were obtained in the lateral position at rest, with straining, during defecation and following rectal emptying. A cine-loop of the evacuation was obtained until the rectum was emptied or at least three 30-second attempts had been made to empty the rectum. All patients were instructed to empty the rectum completely and without interruption.

Fluoroscopic defecography does not directly visualize herniations of the peritoneal sac that may be filled with omentum rather than with small bowel or sigmoid colon.

Acquisition of Prone Projections: Following rectal emptying, the fluoroscopy table was moved into the horizontal position and the patient was placed prone on the table. A cross-table lateral image of the pelvis was obtained to evaluate the rectum and to identify the presence or reduction of any enterocele or sigmoidocele.

RESULTS

From August 2012 to May 2016, all consecutive patients who presented to the Colon and Rectal Surgery Service with evacuatory disorders for which defecography was required were invited to participate. A total of 101 patients were enrolled (92 females, 9 male) and underwent FD. All participants were symptomatic. The main reason for the exam was constipation in 44 patients (44%), followed by pelvic outlet dysfunction in 30 (30%) and incontinence in 12 (12%). The mean age was 55 years (range 24-84 years).

The mean fluoroscopic time was 1.7 minutes. Fluoroscopic defecography detected a rectocele in 89 patients (88.1%), PFL in 68 (61.8%), rectal intussusception in 49 (48.5%) and sigmoidocele in 30 (29.7%).

An enterocele was found in 63 patients (62.3%), and in 48 (76.2%) of these it completely reduced when the patient was placed in the prone position (p-value = 0.000195, 95% CI 63.79 - 86.02). In all six male patients with an enterocele on FD, it reduced upon prone positioning.

Among the 63 patients with an enterocele, pelvic floor laxity was noted in 43 (68.2%), rectocele in 56 (88.8%), rectal intussusception in 38 (60.3%), and sigmoidocele in 8 (12.7%). All 8 patients with co-existing enterocele and sigmoidocele were females and, although this was not an endpoint of this study, the sigmoidoceles in 7 of these patients (87.5%) were also reduced in the prone position.

A computer-based database was created using Microsoft Excel (Microsoft Corp., Redmond, WA) and the following patient data were recorded: sex, age, presence of PFL, enterocele, sigmoidocele, rectocele, and rectal intussusception during FD, and whether the enterocele was reduced in the prone position. Enteroceles that were only partially reduced in the prone position were considered “not reduced” for the statistical analysis. No follow-up was performed, since it was not relevant for the aim of this study. Fisher’s exact test was performed to evaluate enterocele reduction in the prone position. P values < 0.05 were considered statistically significant with a 95% confidence level (± 5 confidence interval).
Demographic information and the distribution of defecographic findings for all participants and participants with an enterocele are shown in Table I. Figures 1-4 show FD projections for female patients with enteroceles that were/were not reduced in the prone position.

**DISCUSSION**

The present findings demonstrate that enterocele reduction occurred in the prone position in the vast majority of the patients studied. This suggests that placing the patient in the prone position during transanal surgery may help overcome this issue even if the procedure is contraindicated or otherwise cumbersome in the lithotomy position.

Accidental stapling of an enterocele is a concern even in other stapled procedures such as perineal stapled prolapse resection (PSPR) for external rectal prolapse. Enterocele is a contraindication for STARR, especially for patients in the lithotomy position. This is understandable, since gravitational forces will naturally direct the herniation into the pelvis. While some surgeons prefer to perform transanal procedures with the patient in this position, others prefer the prone position for ergonomic reasons.

The distribution of pathological findings on FD in our sample was consistent with the literature, and these results are consistent with the multifactorial nature of ODS.

In our experience, FD is an efficient and thorough evaluation of patients with symptoms of ODS. Magnetic Resonance Imaging (MRI) can also be used to evaluate the pelvic floor, although the patient needs to be lying on their side for the exam, which does not simulate normal defecation. Furthermore, MRI is more cumbersome and more time-consuming, as well as more expensive.

Because ODS is predominantly found in women, defecography is not often performed in men and our results are similar to others reported in the literature. Despite its predominance among women, ODS is not rare in men. Men can also complain of constipation, fecal incontinence and pelvic pain, for example, and these symptoms deserve the same careful evaluation.

In 2013, Agarwal et al. presented a case series of 67 patients with ODS who underwent STARR, 46 of whom were male with a mean age of 57 years. There have been few studies on pelvic floor dysfunction in males. Piloni and co-workers studied 36 male patients with ODS undergoing dynamic magnetic resonance (DMR) defecography and found that the boundaries of the levator hiatus in men are potentially subjected to the same overload deformities as in women, despite the absence of pelvic floor trauma related to vaginal delivery. They concluded that the two most relevant variants of ODS in men can be linked to a spectrum of unbalanced forces acting at the level of the rectal outlet. On one side of this spectrum, an increase in binding forces (i.e., muscle contraction and angulation) creates an obstacle to the free

### TABLE I

Defecographic findings in all participants and in participants with an enterocele

<table>
<thead>
<tr>
<th>Characteristics of the sample</th>
<th>All enrolled participants</th>
<th>Participants with an enterocele</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants (n)</td>
<td>101 (100%)</td>
<td>63 (100%)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>92 (91.1%)</td>
<td>57 (90.4%)</td>
</tr>
<tr>
<td>Male</td>
<td>9 (8.9%)</td>
<td>6 (9.6%)</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>24-84</td>
<td>24-77</td>
</tr>
<tr>
<td>Median</td>
<td>55</td>
<td>54</td>
</tr>
<tr>
<td>Mean</td>
<td>55</td>
<td>52</td>
</tr>
<tr>
<td>Mode</td>
<td>69</td>
<td>69</td>
</tr>
<tr>
<td>Pelvic Floor Laxity (descent ≥ 2.5cm)</td>
<td>68 (61.8%)</td>
<td>43 (68.2%)</td>
</tr>
<tr>
<td>Rectocele (≥ 2.5cm)</td>
<td>89 (88.1%)</td>
<td>56 (88.8%)</td>
</tr>
<tr>
<td>Rectal Intussusception</td>
<td>49 (48.5%)</td>
<td>38 (60.3%)</td>
</tr>
<tr>
<td>Enterocele (≥3 cm)</td>
<td>63 (62.4%)*</td>
<td>48 (76.2%)*</td>
</tr>
<tr>
<td>Reduced in prone position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completely reduced = 48 (76.2%)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partially reduced = 3 (4.8%)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not reduced = 12 (19%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sigmoidocele (≥3cm)</td>
<td>30 (29.7%)</td>
<td>8 (12.7%)</td>
</tr>
<tr>
<td>Reduced in prone position = 7</td>
<td></td>
<td>(87.5%)</td>
</tr>
</tbody>
</table>

*p-value = 0.000195 (95% CI 63.79 - 86.02)

**Considered “not reduced” for the statistical analysis.
Figure 1. FD results in a female patient. No enterocele on standard projection.

Figure 2. FD results in a female patient. A large enterocele on standard projection.

Figure 3. FD results in a female patient. An enterocele that was not reduced in the prone position.

Figure 4. FD results in a female patient. An enterocele that was reduced in the prone position.
movement of the rectum and the outflow of rectal content (dyskinesia), and on the other side there is a decrease in the binding forces that normally ensure stability and maintain proper attachment of the anorectal junction during emptying (prolapse).21

This observation is corroborated by Andrade et al., who concluded that, in men, the most frequent pathology was dyskinetic puborectal syndrome (37.5%). This syndrome is more likely in men than in women (p = 0.01; OR 5.78), whereas descending perineum syndrome (p = 0.027; OR 2.8) is more likely to occur in women.17

An interesting report by Savoye-Collet et al. discussed the value of defecography as a potential adjunct to clinical evaluation in men, particularly in cases of constipation, fecal incontinence or pelvic pain. Among 66 male patients with these symptoms, an intussusception was found in 57.6% of patients, enterocele in 10.6% and rectoceles in 4.5%.19

Although STARR is not the mainstay or a first-line treatment option, it is still part of the armamentarium for ODS surgery, and this choice will depend on individualized patient selection in light of inclusion and exclusion criteria.7,22 Stapled transanal resection (STARR) was originally described by Longo8 in 2004 for ODS. This procedure entails a full-thickness resection of part of the rectum and aims to remove redundant rectum in the case of either rectocoele or an internal rectal intussusception and to restore the normal rectal anatomy.18 This novel technique can restore anatomical abnormalities using two firings of a PPH01 stapler (Ethicon Endo-Surgery, Inc., Cincinnati, OH) to achieve separate anterior and posterior resections of the distal rectum.20 Later, the first series of a stapled procedure for rectal mucosal prolapse causing ODS was reported by Pescatori and Gagliardi in 2008 using a circular stapler in a small series with good short-term results and no relevant complications.

STARR performed with a stapler designed for hemorrhoidopexy has limited capacity for housing the redundant tissue and creates a challenge for the surgeon. The surgeon should also be able to control the positioning of the rectal walls under direct vision. Since STARR is performed "blind," there are concerns about serious complications, especially in the presence of a concomitant enterocele.22 After issues were raised regarding the safety of the PPH-01 device for STARR, more dedicated devices were launched, such as the Contour® Transtar™ (Ethicon Endo-Surgery, Inc., Cincinnati, OH) and Tissue Selective Therapy Plus - TST Plus24 (Touchstone, Suzhou, China).

The Contour® Transtar™ is a curved multi-fire stapler that was specifically designed for STARR. It enables better modulation of the rectal wall and a greater extent of prolapsed tissue to be resected as a single specimen,24 but still does not overcome the potential risk of operating on a patient with enterocele.

Although there have not been reports of severe complications in patients with enterocele after STARR procedures,13 maneuvers during surgery are often needed to avoid small bowel injury in these patients. The presence of a coexisting fixed enterocele, low and stable, has been classically considered to be an absolute contraindication for the STARR procedure based on the recommendations of the 2006 STARR consensus meeting,2 which were endorsed in 2008 by the STARR Pioneer Group.34

In contrast to a fixed enterocele, a dynamic enterocele that only appears on straining is not considered to be an absolute contraindication, but is a reason for extra caution by the surgeon to avoid damage to the small bowel.14 Different tactics have been proposed to achieve this: a bimanual digital examination of the rectum and vagina to assess the presence of an enterocele, positioning the patient in a sufficient Trendelenburg tilt position, use of retractors to lift the uterus, and/or laparoscopic assistance to retract the small bowel out of the pouch of Douglas. The safety of these techniques for STARR for ODS in the presence of an enterocele has been further debated. For instance, Reibetanz et al. studied a series of 170 patients, 32% of whom had an enterocele. These patients were operated on with either a PPH01-STARR or TRANSTAR™ and followed-up for 18 months. There were no complications or re-operations related to the presence of an enterocele.15 On the other hand, Jayne and Stuto14 reported that STARR is contraindicated when internal rectal prolapse coexists with a fixed enterocele. Ren et al.13 published a series of cases using a TST-STAR Plus device, and again enterocele was an exclusion criterion during patient selection.

In a recent review about transanal surgeries for ODS, Liu et al.22 highlighted that no procedure has yet been proven to be superior to others and few standards are available for selection criteria for such procedures. They offered several possible reasons for this, including the fact that reported clinical outcomes of current techniques are controversial and the patient selection criteria for different surgical approaches are usually not adequately described in the literature.

The choice of appropriate surgical procedures for the treatment of ODS remains a challenge for colon and rectal surgeons, especially if contraindications are present. Placing the patient in a prone position during a transanal approach to reduce an enterocele may be an excellent alternative.

CONCLUSION

This study showed highly significant enterocele reduction with the patient in the prone position. We conclude that complete enterocele reduction observed during defecography in the prone position may safely eliminate enterocele as a contraindication to STARR, and suggest that additional image-acquisition in the prone position should be done for patients who may be eligible for a transanal surgical approach. The preoperative diagnosis of enterocele reduction in the prone position and its projected impact on the surgery planned for STARR is consistent with the call for individualized selection criteria. Validation studies are needed to assess whether the prone position leads to lower enterocele-related complications in transanal rectal resections.

ACKNOWLEDGEMENTS

We thank Dr. Kimberlee Everson (Western Kentucky University, KY, USA) for her kind assistance with the statistical analysis and Melinda M. Turpin, BS, CCRC (St. Mark’s Hospital, Salt Lake City, UT, USA) for her valuable advice during the course of this study.
REFERENCES


