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Laparoscopic-assisted anorectal pull-through

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Posterior sagittal anorectoplasty (PSARP) is the procedure most commonly employed to repair high and intermediate anorectal malformations. Many patients repaired by PSARP subsequently require bowel management to avoid the physiologic and social problems associated with fecal incontinence. Laparoscopic assisted anorectal pull-through (LAARP) is a recently developed technique which positions the neorectum accurately inside the sphincter complex without dividing any of these muscles. Some physiologic measurements after LAARP indicate that outcomes are at least equivalent to PSARP. Long-term outcomes have not been reported after LAARP.

The current standard of surgical care for high anorectal malformations is posterior sagittal anorectoplasty.[1] This operation provides excellent exposure of the anatomy and the precise placement of the distal rectum within the muscle complex. Despite this excellent anatomic exposure, most patients need bowel management after posterior sagittal anorectoplasty.[2-4] Certainly, no one would claim excellent results for any operation repairing high anorectal malformations. The goals of laparoscopic-assisted pull-through for high anorectal malformations include precise placement of the rectum inside the sphincter complex without dividing and weakening the muscles, diminished soft tissue scarring around the rectum leading to improved rectal compliance, and the potential ability to perform the operation primarily avoiding the morbidity of a colostomy.

Preoperative workup

A standard proximal sigmoid colostomy is usually performed in the newborn with a high anorectal malformation. This colostomy should be divided with the proximal end colostomy brought out with a Brooke stomal technique. The distal colon mucous fistula should be placed more medially. This medial placement will allow the laparoscopic pull-through to be performed without tethering the rectum and sigmoid colon by the mucous fistula's attachment to the anterior abdominal wall. Even with the mucous fistula placed fairly medially, the view into the pelvis is adequate during the laparoscopic dissection of the rectum down to the rectourethral fistula. A colostogram should be obtained before the laparoscopic pull-through procedure to help identify the presence or absence of a rectourethral fistula and its level and shape. This information is very helpful in performing the laparoscopic procedure.

Operative technique

The pull-through procedure is usually performed 3 to 6 months after birth. A circumferential prep is performed. The patient is positioned transversely at the end of the operating table. A transurethral catheter is passed into the bladder in all cases. If the catheter cannot be passed easily, cystoscopy can be used to aid in placing the transurethral bladder catheter. A catheter must be in the urethra to help identify the rectourethral junction and to avoid compromising the lumen of the urethra during ligation of the rectourethral fistula.

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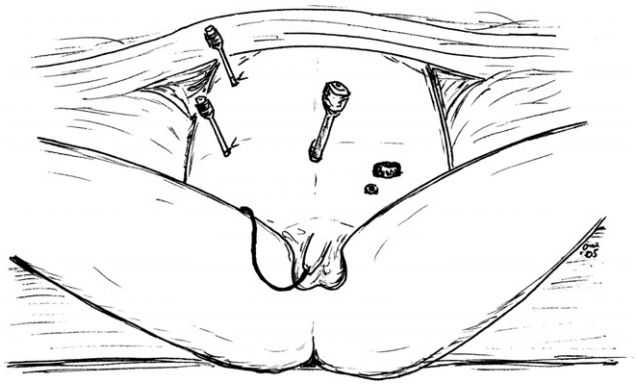

Figure 1 The patient is positioned transversely on the operating table, a bladder catheter is placed, and the trocars are positioned in the illustrated sites (umbilical, 5 mm; right upper and lower quadrant, 4 mm).

A pneumoperitoneum utilizing pressures of 10 to 12 cm of water is established. A 5-mm port is passed through the umbilicus, which is also used for developing the pneumoperitoneum. Two 4-mm trocars are placed in the anterior axillary line just below the liver and in the right lower quadrant in the anterior axillary line at least 4 or 5 cm away from the upper canula (Figure 1). The laparoscopic intraabdominal dissection is initiated near the peritoneal reflection. This dissection is best performed with a hook cautery dividing the mesorectum and all tissues attached to the extraperitoneal rectum. Care must be taken to avoid injury to the left ureter during this portion of the dissection. The dissection is continued circumferentially directly adjacent to the longitudinal rectal muscle. Wandering away from this plane can lead to injury to important pelvic structures such as the vas deferens. Traction is placed on the rectum during the perirectal dissection using the left hand for the traction and using the hook cautery in the right hand. A fourth trocar is sometimes added on the left side of the abdomen to help with traction. Usually, however, the dissection can be performed with only three trocars. Visualization into the pelvis is improved significantly with the use of a U-stitch through the abdominal wall and through the back wall of the bladder with the stitch then brought back out through the anterior abdominal wall again. This U-stitch is tied over a rolled 4 × 4 gauze, which pulls the bladder out of the pelvis and gives a magnificent view of the rectum for dissection down to the rectourethral fistula. Sometimes the fistula can be easily recognized during the laparoscopic pelvic dissection. However, at times it is difficult to determine the exact site of the rectourethral junction. In these cases, it is appropriate to open the rectum proximal to the rectourethral fistula and visualize the junction of the rectum and urethra from inside the fistula. Only minimal leakage from the rectum

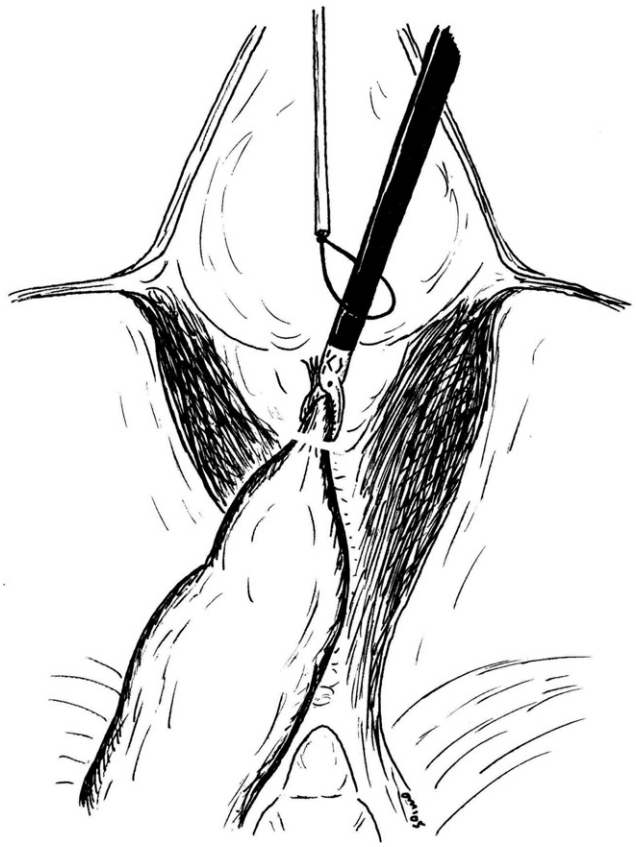

Figure 2 After circumferential dissection of the rectum, the fistula is grasped with a Maryland clamp preloaded with a loop ligature. The fistula is then divided on the rectal side of the clamp, and the ligature is tightened around the urethral side of the clamp.

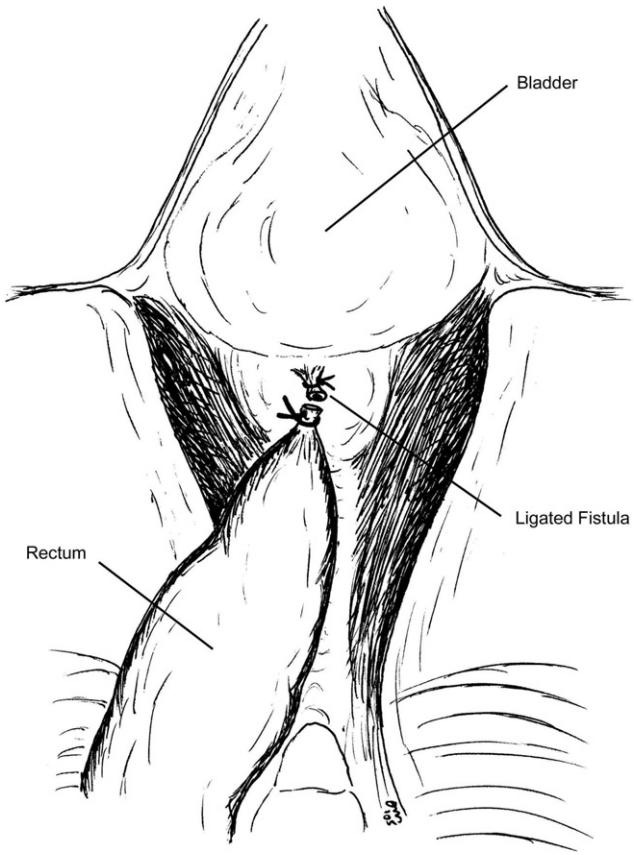

Figure 3 A second loop ligature is used to close the fistula on the rectum.

occurs if the rectum has been appropriately lavaged and suctioned before the procedure and with the additional aid of the increased intraabdominal pressure secondary to the pneumoperitoneum.

The rectourethral fistula is divided 5 mm proximal to the junction of the rectum and urethra. The distal stump is grasped with a 3-mm Maryland clamp passed through the right lower quadrant trocar site, which has been preloaded with a loop ligature. The loop ligature is then slid down over the Maryland clamp and onto the fistular stump (Figure 2). The plastic guide is positioned with its point distal to the rectourethral fistula on the urethra. The loop is then tightened snugly around the fistular stump. The proximal end of the rectourethral fistula is secured in a similar fashion (Figure 3). The rectum is retracted out of the pelvis. The outline of the pubococcygeus muscle is often visualized at this point (Figure 4). In some patients, the muscle is well developed. In others it is very poorly developed.

The transperineal dissection through the muscle complex follows completion of the pelvic dissection of the rectum and rectourethral fistula. The sphincter complex is mapped using a transcutaneous electrostimulator. The area of maximal contraction is identified and marked with sutures on either side of the perineal groove. A 1-cm incision is made at the site of maximal muscle contraction. A small Maryland clamp is used to dissect through the intersphincteric plane from below. This blunt dissection is quite easy to perform and rapidly leads proximally for about 1.5 cm (Figure 5). At that point, a fascial plate is encountered which limits further blunt dissection from below. A Veress needle with a radially expanding sheath is then passed through the perineal plane in the muscle complex and fascial plate using laparoscopic surveillance from above. The Veress needle is probed gently in and out. By determining where the tip of needle is located with laparoscopic surveillance, the appropriate point of penetration is identified. The needle is then pushed through this fascial plate directly in the midline 3 or 4 mm behind the urethra. Accurate passage of the needle tip is readily apparent due to the laparoscopic surveillance. The Veress needle can be redirected into a more appropriate position if needed. Once the appropriate point is identified, the Veress needle and the surrounding trocar sheath are passed through the fascial plate into the pelvis, the Veress needle is removed, and the tract is dilated radially with 5-, 10-, and 12-mm trocars. An Allis or Babcock laparoscopic clamp is passed through the perineal trocar into the pelvis. The proximal end of the rectourethral fistula is placed in the Babcock clamp by the assistant using laparoscopic instruments from above. The rectum is pulled through the perineal tissue plane trailing behind the perineal trocar (Figure 6). The anastomosis between rectum and anus is completed using polyglycolic acid suture. Hitch stitches are used to pull the rectum rostrally to lengthen the skin-lined anal canal and to prevent future prolapse. The hitch stitches are passed through the

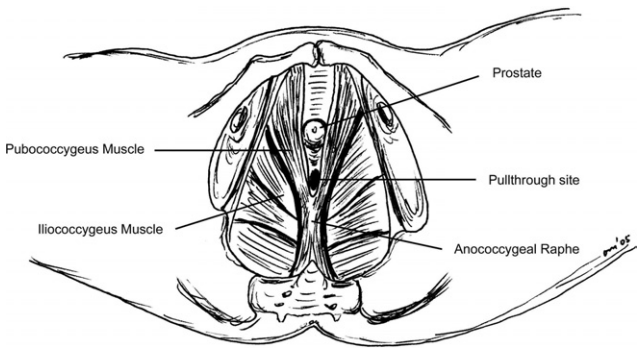

Figure 4 Anatomic diagram of the pull-through site in relationship to the pubococcygeus muscle.

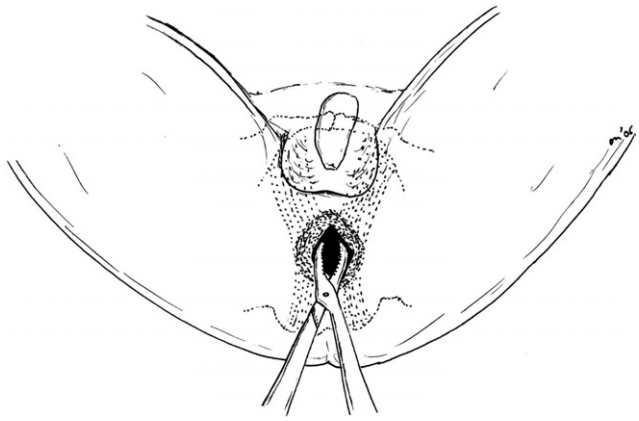

Figure 5 Transperitoneal blunt dissection of the intersphincteric plane is performed through a 1-cm vertical midline incision using a clamp (the underlying external sphincter muscle complex and the pubococcygeus muscle are dotted).

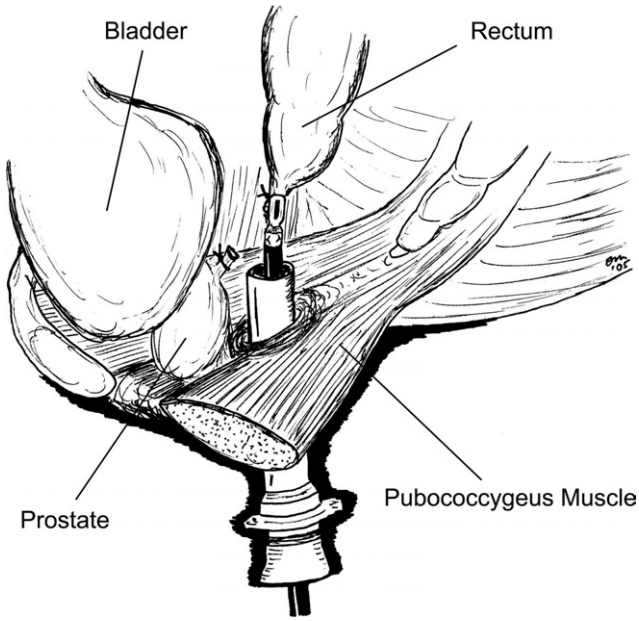

Figure 6 Schematic diagram of the trocar passing from the peritoneum between the two bellies of the pubococcygeus muscle into the abdomen. A grasper is advanced through the port to grasp the distal end of the dissected rectum. The rectum is then pulled down through the perineum trailing the trocar.

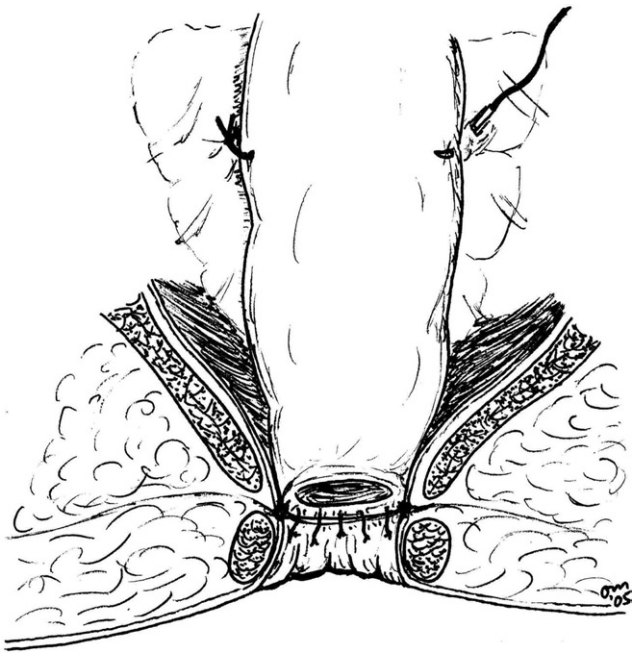

Figure 7 After performing the anastomosis between rectum and anus, the rectum is retracted cephalad and secured to the presacral fascia using lateral hitch stitches to avoid prolapse of the rectal mucosa through the anus.

fascia anterior to the sacrum in the midportion of the hollow of the sacrum, and then passed through the rectal wall to preserve the traction on the rectum rostrally (Figure 7). This hitch stitch also sharpens the anorectal angle, which may improve future continence.

Patients are fed on the first or second postoperative day. Anorectal dilation is begun 2 to 3 weeks after surgery starting with a 6- or 7-French Hegar dilator to a size 13 or 14 French over a 6-week period. The colostomy is closed 6 to 12 weeks after completion of the pull-through procedure.

Results

Several studies have now shown that the laparoscopic-assisted anorectal pull-through for high anorectal malformations have equivalent early outcomes when compared to the posterior sagittal anorectoplasty. These studies indicate a higher incidence of an anorectal reflex after the laparoscopic procedure.[5,6] Additionally, compliance of the rectum appears to be superior.[4,6,7] However, there are no long-term studies that compare continence rates between the two techniques. It will take another 5 to 10 years before outcome studies can be used to evaluate possible differences between the laparoscopic and posterior sagittal pull-through approaches.[8]

Discussion

The laparoscopic-assisted anorectal pull-through achieves some of its stated goals. The centrality of the pull-through appears to be equal to that developed by the posterior sagittal anorectal approach.[9] There also appears to be less perineal and pelvic scarring associated with the laparoscopic approach, leading to better compliance of the rectum. Neither of the operations, however, deal with the problem of a diminished internal sphincter in these patients. It may take stem cell technology to develop a normally functioning internal sphincter in these children.

In summary, laparoscopic anorectal pull-through is anatomically sound and leaves the external sphincter muscles intact. It allows for the rectal fistula to be pulled through the muscle complex without dividing the external sphincters. There appears to be less scarring in the pelvic floor and less injury to the muscles with the laparoscopic technique as compared with the posterior sagittal technique.

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