



Original Article

LAPAROSCOPICALLY ASSISTED ANORECTOPLASTY USING PERINEAL ULTRASONOGRAPHIC GUIDE

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Summary:

Background/Purpose : As minimal invasive surgery, laparoscopy assisted anorectal pull-through has been reported with new devices. However, it is not easy to create an accurate pull-through canal (PTC), because of the narrow space between the urethra and puborectal sling. The authors describe a new method employing perineal ultrasonography.

Methods: The rectourethral prostatic fistula was dissected laparoscopically. Externally, electrostimulation identified the center of the muscle contraction, over which a 1.2 cm of skin incision was made, and the lower part of PTC was created by hemostat forceps guided by electrostimulation. An ultrasonographic probe applied to the perineum demonstrated the urethra, and the forceps was advanced behind the urethra into the pelvic cavity using the ultrasonographic guide. Anorectal pull-through was performed following dilatation of the PTC with dilators.

Results: The authors applied this procedure in 9 cases of male high anomalies. Surgical damages to the urethra, the levator and vertical muscles were not encountered. Postoperative MRI demonstrated a good location of the rectum, and fluoroscopic study showed a good anterior angulation and intact contraction and relaxation of those muscles.

Conclusion: The combination of laparoscopic dissection, pinpointing the center of anal sphincter by electrostimulation and identification of the urethra by ultrasonographic images from the perineum facilitated creation of appropriate PTC in the muscle complex.

Introduction:

Posterior midline incision provides direct visualization of striated muscle complex, not only puborectal sling but also vertical muscle complex engaged in continence¹. Therefore, the posterior sagittal approach enabled us to place the rectum in the optimum position

and perform appropriated anorectoplasty (PSARP). Thus, PSARP contributed to achieving better reconstruction for imperforate anus², however, continence after PSARP is less than ideal. Pena and his colleague³ reported that 38% of their large series of patients who underwent PSARP achieved continence and 25% were totally incontinent. For excellent exposure of the pelvic structure, large incision might damage the sphincter muscle as well as nerves contributing anorectal sensation and motility. To avoid these damages, Georgeson et al⁴ invented a new technique, laparoscopically assisted anorectal pull-through (LAARP). However, it is not easy to create an accurate PTC, because the narrower the space between urethra and puborectalis sling, the higher the fistula locates. Therefore, some new techniques, such as intraoperative laparoscopic muscle electrostimulation^{5,6} and endosonography⁷, have been devised. The authors describe a new method employing perineal ultrasonography to identify the right space between the urethra and puborectalis sling, where the rectum should be pulled through.

Materials and Methods:

Since June 2003, five boys have undergone LAARP for high and intermediate imperforate anus. The types of malformation include rectourethral prostatic fistulae in two, rectourethral bulbar fistulae in two and rectoscrotal cutaneous fistula in one. In all patients except one with rectoscrotal cutaneous fistula, intraoperative perineal ultrasonographic guide was employed. Shortly after birth, all patients had colostomy under the diagnosis of high or intermediate imperforate anus. After induction of general anesthesia, the patient was placed in a spine position, the feet

were tied to a changeable cradle with which both a spine and a lithotomy position can be taken. The abdomen, perineum and bilateral thighs were disinfected. At first, in a lithotomy position, the lower urinary tract was examined endoscopically and a transurethral balloon catheter was placed. After the position was turned to spine, a 5-mm camera-port was inserted through an umbilical semicircular incision, and the abdominal cavity was insufflated with CO₂ to a pressure of 8mmHg, then additional two 5-mm trocars were inserted in the lower abdomen on either side. The dissection of the distal rectum was begun at the peritoneal reflection under laparoscopy (45œ05-mm, Olympus, Tokyo, Japan), and then carried down to the fistula using a Harmonic Scalpel (Ethicon EndoSurgery, Cincinnati, USA), with meticulous care to avoid injury to the spermatic duct and urethra. After the fistula was divided, the distal stump was ligated with an Endoloop (Ethicon, Somerville, USA). Blunt dissection was extended along the urethra until the levator muscle was exposed. The electrostimulation with Pena Muscle Stimulator (Radionics, Burlington, USA) identified the contraction center of pubococcygeus muscle, and puborectalis muscle sling that weakly contracted toward the urethra. After the cradle was raised to take a lithotomy position, externally, the anal area was mapped with the Muscle Stimulator. The center of the muscle contraction was identified, over which a 1.2 cm of skin incision was made, and the perineal part of the PTC was created by insertion of a hemostat forceps into the center of the muscle contraction shown by electrostimulation. An ultrasonographic probe (9MHz Linear probe, Toshiba, Tokyo, Japan) applied to the perineum to demonstrate the urethra (Fig.-1), and the forceps was advanced through the tight space between the urethra



Fig.-1 : Perineal ultrasonographic guide

and the puborectalis muscle sling, into the pelvic cavity guided by the ultrasonographic image and laparoscopic direct vision (Fig.-2,3). The forceps was replaced by a Penrose drain, and then Hegar dilators were inserted into the Penrose drain to dilate the PTC. After the PTC was dilated enough, the distal rectum was pulled onto the perineum, and the anoplasty was performed in a usual manner.

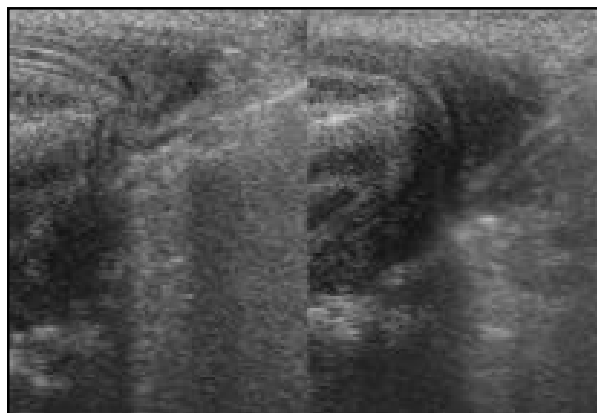


Fig.-2 : Creation of PTC under Perineal Ultrasonographic Guide

Results :

Laparoscopically assisted rectal pull-through and anorectoplasty was achieved with perineal ultrasonographic guidance successfully in all the cases. Operative complications including damages to the seminal duct, urethra, levator and vertical muscles were not encountered. Postoperative MRI demonstrated that the rectum is pulled down through the center of the muscle complex (Fig.-4). Postoperative contrast study demonstrated good anterior angulation of the rectum (Fig.-5). Defecation functions have to be followed up in a long-term period.



Fig.-3 : Laparoscopic visualization of the pelvic floor

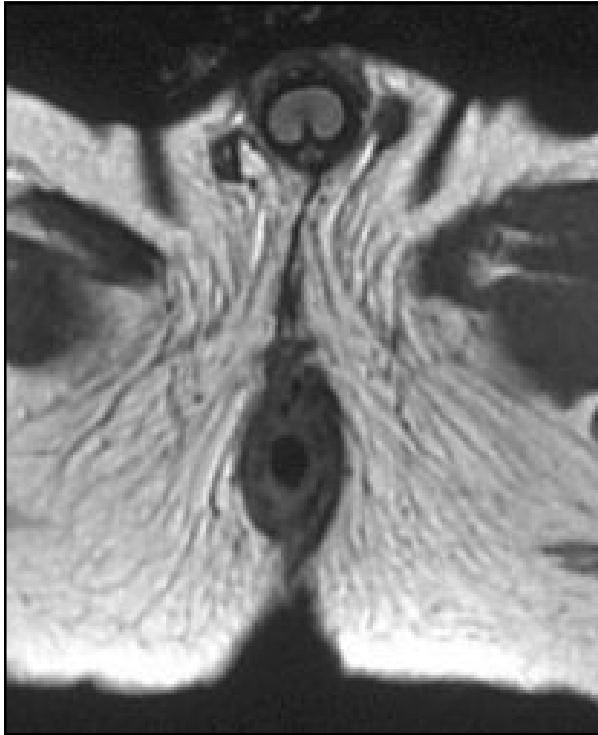


Fig.-4: Postoperative MRI

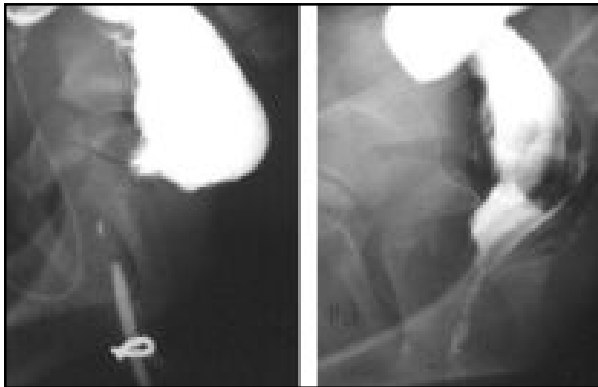


Fig.-5: Postoperative contrast enema showing good angulation

Discussion:

With posterior midline incision, Pena and Devries¹ demonstrated that the higher the malformation, the closer the space between the urethra and the levator funnel. Therefore, it is not easy to create a PTC in the right place, especially without direct vision of the muscle complex provided by posterior sagittal incision. Laparoscopically, Georgeson⁴ demonstrated the pelvic floor musculature clearly, and guided by the laparoscopic visualization they created PTC between 2 bellies of the pubococcygeus muscle, not in the puborectalis sling. To identify the center of levator

muscle contraction, Yamataka et al⁵ applied the Pena Muscle Stimulator, and Iwanaka et al⁶ devised a muscle stimulator for laparoscopy. We also applied the Pena Muscle Stimulator to clarify the pelvic floor musculature, and recognized the puborectalis muscle sling right behind the urethra. In order to create an accurate PTC between the urethra and the puborectalis muscle sling, we applied an ultrasonographic probe to the perineum, which clearly demonstrated the urethra and enabled us to advance a forceps into the right space assisted by laparoscopic view. On the other hand, to make a PTC in the right space without separating the musculature, Saeki^{8,9} applied an ultrasonic probe over the subcutaneous tissue dorsal to the muscle complex after a posterior sagittal incision was made. Yamataka et al⁷ inserted an ultrasonographic endoprobe into the proposed route to confirm the muscle thickness around the PTC. Our method did not require a long midsagittal skin incision or a special probe, solely a conventional ultrasonographic probe was used over the perineal skin, and cooperated with the muscle electrostimulation from the proposal anus an accurate tunnel were able to be created, which was proved by postoperative contrast enema. We performed LAARP to three cases of intermediate malformation, in which the fistula joined the urethra before it bent ventrally. In those cases, the laparoscopy can visualize the fistula at the concurrence, so the fistula can be divided properly. We also noticed that in cases of intermediate malformation, the fistula was dissected without damage to the musculature.

References :

1. Pena A, deVries PA: Posterior sagittal anorectoplasty: important technical considerations and new applications J Pediatr Surg 1982; 17: 796-811.
2. Tsuji H, Okada A, Nakai H, et al: Follow-up studies of anorectal malformations after posterior sagittal anorectoplasty. J Pediatr Surg 2000.; 37:1529-1533.
3. Pena A, Hong A: Advances in the management of anorectal malformations. Am J Surg 2000; 180: 370-376.
4. Georgeson KE, Inge TH, Albanese CT, et al: Laparoscopically assisted anorectal pull-through for high imperforate anus-a new technique. J Pediatr Surg 2000; 35: 927-931.

5. Yamataka A, Segawa O, Yoshida R, et al: Laparoscopic muscle electrostimulation during laparoscopy-assisted anorectal pull-through for high imperforate anus. *J Pediatr Surg* 2001; 36: 1659-1661.
6. Iwanaka T, Arai M, Kawashima H, et al: Findings of pelvic musculature and efficacy of laparoscopic muscle stimulator in laparoscopy-assisted anorectal pull-through for high imperforate anus. *Surg Endosc* 2003; 17: 278-281.
7. Yamataka A, Yoshida R, Kobayashi H, et al: Intraoperative endosonography enhances laparoscopy-assisted colon pull-through for high imperforate anus. *J Pediatr Surg* 2002; 37: 1657-1660.
8. Saeki M, Hagane K, Nakano M, et al: Sacroperineal anorectoplasty using intraoperative ultrasonography: a preliminary report. *J Pediatr Surg* 1993; 28: 779-781.
9. Saeki M, Nakano M, Kuroda T: Sacroperineal anorectoplasty using intraoperative ultrasonography: evaluation by computed tomography. *J Pediatr Surg* 1994; 29: 1484-1486.