Journal of Pediatric Surgery 49 (2014) 1689–1694

Contents lists available at ScienceDirect

Journal of Pediatric Surgery

journal homepage: www.elsevier.com/locate/jpedsurg

Single-incision laparoscopic-assisted anorectoplasty using conventional instruments for children with anorectal malformations and rectourethral or rectovesical fistula

Mei Diao [a], Long Li [a,*], Mao Ye [a], Wei Cheng [b,c,**]

[a] Department of Pediatric Surgery, Capital Institute of Pediatrics, Beijing 100020, P. R. China
[b] Department of Paediatrics and Department of Surgery, Southern Medical School, Faculty of Medicine, Nursing and Health Sciences, Monash University, Clayton, Victoria 3168, Australia
[c] Department of Surgery, Beijing United Family Hospital, China

ARTICLE INFO

Article history:
Received 2 May 2014
Received in revised form 23 July 2014
Accepted 13 August 2014

Key words:
Single-incision
Laparoscopy
Anorectoplasty
Anorectal malformations
Recto-urethral or rectovesical fistula
Children

ABSTRACT

Background: This study aims to evaluate the safety and efficacy of single-incision laparoscopic-assisted anorectoplasty (SILAARP) for children with anorectal malformations (ARM) and rectourethral or rectovesical fistula.
Methods: Children with ARMs and rectourethral or rectovesical fistula who underwent SILAARP between May 2011 and December 2012 were reviewed. The operative time, early postoperative and follow-up results were analyzed.
Results: Thirty-one patients (ARM with rectovesical vs. rectoprostatic fistula vs. rectobulbar fistula: 9/6/16) successfully underwent SILAARPs without conversions. Mean ages at operation were similar in 2 groups (ARM with rectovesical or rectoprostatic fistula vs. ARM with rectobulbar fistula: 4.94 months *vs.* 5.67 months, $p = 0.46$). Average operative time in ARM children with rectobulbar fistula was 1.94 hours, which did not differ from 1.78 hours in ARM children with rectovestical or rectoprostatic fistula ($p = 0.39$). All patients resumed feeding on postoperative day 1. The median follow-up period was 20 months. No injuries of vessels, urethral or vas deferens occurred in operations. No mortality or morbidities of wound infection, rectal retraction, recurrent fistula, urethral diverticulum, anal stenosis, or rectal prolapse was encountered.
Conclusions: SILAARP is safe, feasible and effective for ARM with rectourethral or rectovesical fistula. One-stage SILAARP may offer a viable alternative treatment for ARM children with rectourethral or rectovesical fistula.

Single-incision laparoscopic surgeries have been increasingly utilized in pediatric patients [1–6]. Recently, umbilical colostomy has been successfully performed in children with anorectal malformations [7]. One-stage single-incision laparoscopic-assisted anorectoplasty (SILAARP) will achieve the goal of "scarlessness" in children with anorectal malformations (ARM) and rectourethral or rectovesical fistula. Besides the laparoscopic advantages of accurate central placement of the distal rectum without massive muscle incision [8], in-line placement of the telescope and instruments in SILAARP is favorable for the dissection and closure of the fistula in ARMs with rectobulbar fistula, which is situated in deeper pelvic cavity. The current study is the first series to evaluate the safety and efficacy of SILAARP for children with ARMs and rectourethral or rectovesical fistula.

1. Materials and methods

Between May 2011 and December 2012, patients with ARMs and rectourethral or rectovesical fistula in our center who were operated on by the same surgeon using a single-incision laparoscopic-assisted anorectoplasty technique were reviewed. SILAARP is an innovative procedure. To evaluate its efficacy, we applied this new technique initially in a group of selected ARM patients who had well-developed pelvic muscles and partial sacral agenesis (with at least 3 remaining sacral vertebrae) to minimize the influence of other prognostic factors. Once this new technique is proven to be safe and effective, it will be adopted in all patients with ARMs and rectourethral or rectovesical fistula. The efficacy of SILAARP will be assessed in different types of ARM. Ethics approval from the Ethics Committee of Capital Institute of Pediatrics was obtained. Written informed consents were obtained from the parents of the ARM patients prior to the surgery.

1.1. Single-incision laparoscopic assisted anorectoplasty techniques

The patients were placed in a Trendelenburg position to facilitate the dissection. A surgical towel roll was placed under the buttocks to achieve good exposure of pelvic cavity. The endotracheal tubes holder

* Correspondence to: Prof. Long Li (requests for reprints), Department of Pediatric Surgery, Capital Institute of Pediatrics, Beijing, P. R. China. Tel.: +86 10 85695669.
** Correspondence to: Prof. Wei Cheng, Departments of Paediatrics and Surgery, Southern Medical School, Faculty of Medicine, Nursing and Health Sciences, Monash University, Victoria, Australia, Department of Surgery, United Family Hospital, Beijing, China. Tel.: +61 3 9594 5674; fax: + 61 3 9594 6495.
E-mail addresses: lilong22@hotmail.com (L. Li), wei.cheng@monash.edu (W. Cheng).

http://dx.doi.org/10.1016/j.jpedsurg.2014.08.010
0022-3468/

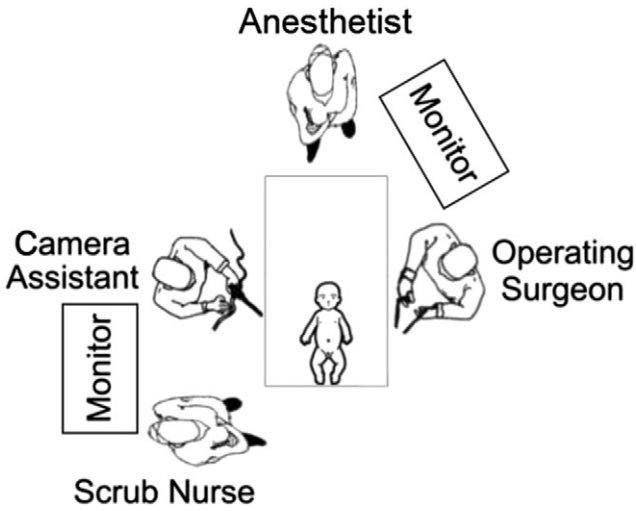

Fig. 1. Settings of operation room for single-incision laparoscopic-assisted anorectoplasty.

was angled 60 degree to provide enough space for surgeon's maneuver. The bladder was catheterized before surgery to create adequate working space in cavity. The faeces were removed by preoperative enema, and intraoperative normal saline irrigation of distal stoma of colostomy with a 12 F rectal tube. Surgeon stood on the patient's left side. Camera assistant stood on the patient's right side (Fig. 1). A 2 cm vertical umbilical incision was made and stretched horizontally. An extra-long 5-mm 30° laparoscope (26046BA, Karl Storz GmbH & Co. KG, Tuttlingen, Germany) was inserted through the 5 mm middle port. A 3 mm straight cautery hook and a 3 mm straight grasper were inserted into the lateral ports (Fig. 2). Carbon dioxide pneumoperitoneum was established at a pressure of 10 mmHg.

With laparoscopic guidance, a trans-abdominal suture retraction was placed through posterior bladder wall to facilitate exposure of surgical field (Fig. 2). Laparoscopic rectal dissection was performed from peritoneal reflection to the rectourethral fistula. The distal rectum was divided with the 3 mm hook cautery along anterior → lateral → posterior rectal wall (Fig. 3a). The dissection was performed adjacent to the rectal wall to avoid incidental injury of surrounding structures, such as ureters, vas deferens, iliac vessels. The rectourethral fistula was identified. In patients with intermediate ARMs, rectourethral fistula is usually located in the deep pelvis. Their rectal blind pouches were pulled up to the abdominal cavity for identification and dissection of the fistula. The distal blinded rectal pouch was dissected along submucosal layer from 0.5 cm proximal to the urethra. The mucosa of the fistula was peeled off at the junction of the fistula and urethra (Fig. 3b). The mucosa of the fistula was completely transected at the insertion on the posterior urethra to prevent postoperative urethral diverticulum (Fig. 3b). The muscular cuff was closed with Hemolock clip or suturing. In those patients who had narrow and long fistula length (>0.5 cm) which were located in relatively shallow pelvis, the stump of fistula was closed by Hemolock clip (544965, medium-large clip designed for 3-10 mm size vessels, Teleflex Medical, Research Triangle Park, NC, USA; Fig. 3c). In those patients who had wide and short fistula length (≤0.5 cm) or the fistula located in deeper pelvis (no adequate space allowing 5 mm Hemolock to work), the stump of fistula was closed by 5/0 PDS horizontal running suture (Fig. 3d). In suture fistula closure, the telescope was rotated 180 degrees to assess the transected fistula and facilitate fistula closure to avoid postoperative recurrent fistula. The distal rectum was ligated before pull-through to minimize faecal contamination in the pelvic cavity.

The transperineal dissection was performed after flexing the infant's legs towards the head to expose the perineum. The center of the external sphincter on the anal dimple was mapped using transcutaneous electro-stimulator externally. A 1 cm vertical midline incision was made in the perineum at the site of the proposed anal orifice. Based on our clinical experience, there is a potential space through the center of the striated muscle complex. We identified the midline of external sphincter using electrical muscle stimulator, and gently divided "potential tunnel" by a 7-inch curved hemostat forceps along the midline (Fig. 3e). Under the guidance of the laparoscope, the forceps is advanced through the center of levator ani, just behind distal end of the divided fistula and urethra (Fig. 3f). The rectal blind pouch was then pulled through the potential tunnel to the perineal wound with the forceps. Grossly dilated distal rectum was excised.

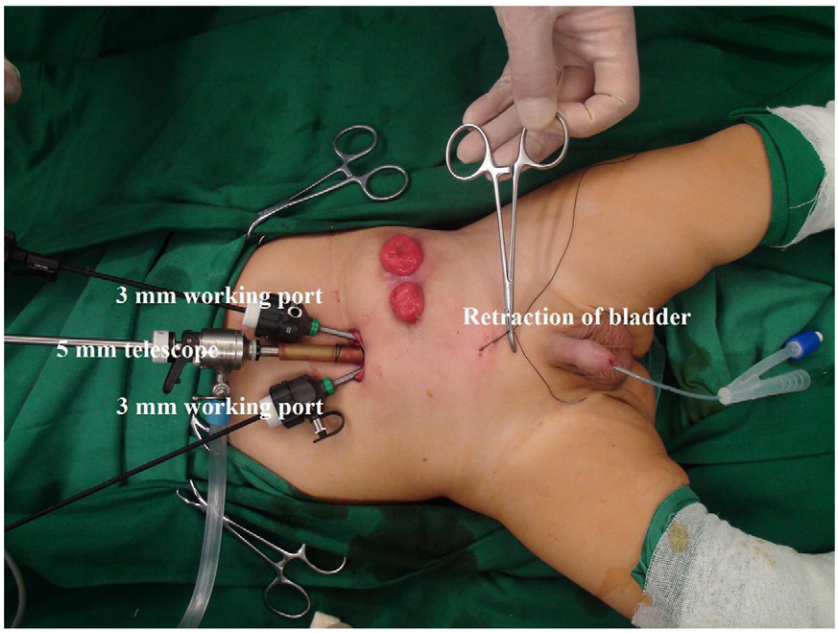

Fig. 2. External view of the 3 ports clustered at the umbilicus with trans-abdominal retraction suture through the posterior bladder wall in a 13 month old boy with high anorectal malformation with rectoprostatic fistula.