

Umbilical only access laparoscopic pyeloplasty in children: Preliminary report

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Access this article online

Website:
www.afripaedurg.org

DOI:
10.4103/0189-6725.181705

Quick Response Code:



ABSTRACT

Background: Over the past three decades, laparoscopic surgery has become a well-established alternative to open surgery in the management of ureteropelvic junction (UPJ) obstruction. Currently, several efforts are being made, aimed at further reducing the morbidity associated with conventional laparoscopy. We report our experience with modified umbilical port laparoscopic pyeloplasty in children.

Materials and Methods: Children presenting with hydronephrosis secondary to UPJ obstruction formed the study group. A 5 mm endoscopic port was placed on the inferior umbilical crease. The two 3 mm instruments were introduced through puncture sites created a few mm superior and lateral to the endoscopic port, under vision. Total operating time, the time taken for insertion of double pigtail catheter, time taken for pyeloplasty anastomosis and complications were noted. **Results:** During the study period, 16 children underwent modified umbilical only access laparoscopic pyeloplasty. The total operating time and the time for insertion of double pigtail catheter were significantly more in our earlier half of cases.

Conclusions: Modified umbilical port laparoscopic pyeloplasty reduces the morbidity associated with conventional multiport laparoscopy without the need of expensive multichannel cannulas, curved laparoscopic instruments and longer laparoscopic endoscopes. Though crossing instruments are a factor which prolongs the duration of surgery, it does not hinder complex suturing needed during pyeloplasty.

Key words: Laparoscopy, ports, pyeloplasty, ureteropelvic junction obstruction

INTRODUCTION

Ureteropelvic junction (UPJ) obstruction is a common clinical condition and occurs in all paediatric age groups, but there tends to be a clustering in the neonatal period because of the detection during antenatal scanning and again later in life because of the occurrence of symptoms. The surgical correction of UPJ obstruction has undergone a great revolution on a number of fronts, with open surgical techniques yielding way to endoscopic, laparoscopic and robotic-assisted approaches.^[1] Over the past three decades, laparoscopic surgery has become a well-established alternative to open surgery in the management of UPJ obstruction. Although the magnitude of impact varies, in general, the benefits of laparoscopy on postoperative pain cosmesis, hospital stay and convalescence are widely recognised.

Usually, routine laparoscopic procedures involve the placement of three abdominal ports through separate wounds:

1. Periumbilical for the optics and
2. Additional working ports.^[2,3] Wide spacing of trocars is considered a tenet of multitrocar standard laparoscopy. Instrument triangulation allows proper tissue retraction, which is essential for proper dissection along anatomical tissue planes.

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Cite this article as: Nerli RB, Magdum PV, Ghagane SC, Hiremath MB, Reddy M. Umbilical only access laparoscopic pyeloplasty in children: Preliminary report. Afr J Paediatr Surg 2016;13:36-40.

Laparoscopy has been constantly evolving with the intent to make surgery “scarless.” Without doubt, minimally invasive surgery is now inevitably moving towards even less invasive procedures which require a reduced number of access ports. Single-incision laparoscopic surgery (SILS) originated as an option to conventional laparoscopy. Early reports of SILS describe the placement of multiple ports through a single-incision with additional retraction utilising transabdominal sutures.^[4] In the beginning of the SILS era, the lack of proper devices to gain access to the peritoneal cavity motivated surgeons to implement new techniques and to generate innovative ideas.

The increasing need for an optimal access platform in SILS led to the invention of a multichannel “cannula” by a group in Spain.^[5] The idea of introducing multiple instruments through a single device or port was well received by surgeons making possible the development of sophisticated ports for laparoscopic procedures.^[6-8] However, the large size of these devices (which may require a 2-3 cm fascial incision) often precludes the use in small children. We took up this study to assess the feasibility of performing laparoscopic pyeloplasty in children using conventional laparoscopic instruments and modifying the peritoneal access using umbilical only access so as to reduce the morbidity associated with multiport conventional laparoscopy.^[10,11]

MATERIALS AND METHODS

Children presenting with hydronephrosis secondary to UPJ obstruction formed the study group. The diagnosis of UPJ obstruction was firmly established based on history, physical examination, renal sonography, and scintigraphy. Approval for the study was obtained from the institutional ethical committee. Children with unilateral primary UPJ obstruction were prospectively included and planned to undergo laparoscopic pyeloplasty. Exclusion criteria included children with the presence of active urinary tract infection and very poor renal function on scintigraphy (split renal function <10%). The parents/guardians of these children were fully explained regarding the risks of the operation, including postoperative infections, bleeding, failure of pyeloplasty the need to convert to open surgery, damage to other viscera and adhesion formation.

The child was positioned in a lateral position and secured to the table by placing a sandbag to support the back. The 5 mm endoscopic port was placed on the inferior umbilical crease. The 5 mm laparoscope was introduced and the whole of abdomen examined.

Two punctures were made with a No. 11 blade (Sterile surgical blade, magna marketing manufacturer division) on either side of the endoscopic port, few mm superior and within the umbilical crease. The 3 mm instruments (laparoscopic trocars were not used as they may be responsible for clashing of instruments and prevent adequate movement of the laparoscopic instruments) were introduced directly through these puncture sites under vision into the abdominal cavity [Figure 1]. The renal pelvis was dissected free from the medial side. The UPJ and the proximal ureter were identified. The adventitia around the proximal ureter and UPJ was cleared. The ureter was dismembered with a small cuff of renal pelvis, leaving an open pyelotomy. The excess pelvis was trimmed adequately to reduce the size of the pelvis. The lateral wall of the ureter was opened longitudinally and spatulated for about 1.5-2 cm along its lateral margin. The UPJ and proximal ureter attached at this point to the spatulated ureter were then excised. The ureteropelvic anastomosis was performed with an 18-cm, 6/0 Vicryl suture on a 3/8 round body needle. The first suture was placed at the apex of the spatulated ureter from the outside in, and then driven through the most dependent part of the pyelotomy [Figure 2]. The posterior anastomosis was completed running up the length of the spatulated ureter and pelvis. A 0.025-inch guide wire was introduced through a suction cannula (introduced through the same puncture site) into the spatulated ureter. A 3 Fr multi-length double pigtail catheter was introduced over the guide wire and placed across the anastomosis. The anterior anastomosis was completed as a continuous layer. The remaining pyelotomy was then closed with 6/0 Vicryl from a bove downwards.

The instruments that were passed through the punctured sites were changed as required in a similar fashion. Needle holder, scissors and suction cannula were the instruments that were changed as required. Conventional laparoscopic instruments were used for

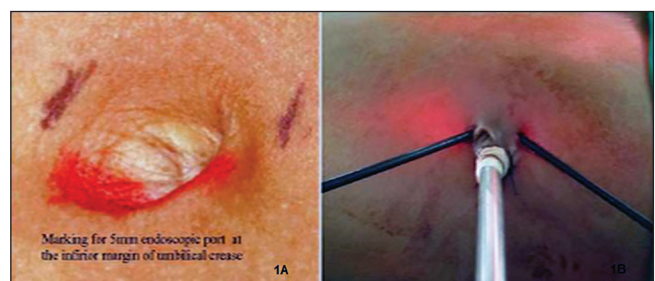


Figure 1: (a) Marking over the umbilicus for port and laparoscopic instrument insertion. (b) Intraoperative photograph showing 5 mm endoscopic port placed in the inferior margin of umbilicus. Two other incisions made on lateral margin of umbilicus through which 3 mm laparoscopic instruments were inserted into the abdomen under vision

this modified procedure. At the end of the procedure, a mixture of long and short-acting local anaesthetic agent was injected into the access site. No drain was left, and the urethral catheter was removed 24-48 h later. Total operating time, the time taken for insertion of double pigtail catheter, the time taken for pyeloplasty anastomosis and complications were recorded. Need for pain killers/sedation was noted in all children. The above-mentioned factors were used to compare between the early half with the latter half of children in our series. Student's *t*-test was used to compare the two groups.

RESULTS

During the study period October 2012 to March 2014, 16 children with a mean age of 6.50 ± 1.29 years underwent umbilical only access laparoscopic pyeloplasty. Table 1 lists the results of the two groups. The total operating time and the time for insertion of double pigtail catheter were significantly more in the early period of our experience as noted in the first half of our patients. As we gained experience the total operating time as well as the time for insertion of double pigtail catheter significantly reduced. However, the time for pyeloplasty anastomosis was similar in both the groups.

Table 2 shows the details of the pain killers/sedatives used in the children. Sedatives included Syrup Promethazine (Phenergan®) Magnet Labs Pvt Ltd (Mankind Pharmaceuticals Pvt. Ltd) 5 mg once in 12 h. None of the children needed any pain killers. Most of the children accepted feeds within 12 h and all 16 children were taking feeds within 24 h after surgery. The hospitalisation period ranged from 72 to 96 h.

There were no major intraoperative complications noted in both the groups. There were no major complications such as fever or bleeding noted in the immediate postoperative period. The double J stent was removed 3 weeks after the surgery and postoperative radionuclide studies (done 6 weeks after surgery) showed improvement in function and proper adequate drainage in all the children. The umbilical scar appeared small and on a casual look appeared insignificant, in the postoperative period.

DISCUSSION

Laparoscopy has become an effective modality for treating many paediatric urologic problems that need

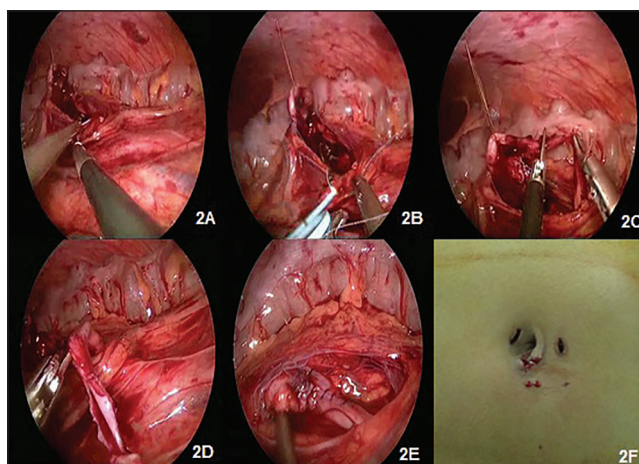


Figure 2: (a) Intraoperative photograph showing stay suture placed over the pelvis elevating the ureteropelvic junction. The ureter is being dismembered from the pelvis. (b) The upper ureter is being spatulated. (c) Introduction of guide wire into upper ureter through a suction cannula passed through the puncture site. (d) Anastomosis of pyeloplasty using by Vicryl 5-0. (e) Completion of anastomosis. (f) Immediate postoperative appearance of the umbilical area

Table 1: Analysis of parameters with operating and insertion time

Parameters	First half	Later half	P
Number	8	8	
Age (range)	6.50±1.30 (5-8)	7.50±3.5 (4-9)	0.5734
Gender			
Male	5	6	
Female	3	2	
Total operating time (min)	95.30±3.90	87.00±2.60	0.0474
Time for double J insertion (min)	7.50±1.40	4.60±1.30	0.0254
Time for pyeloplasty anastomosis (min)	14.45±1.28	14.10±1.00	0.6039
Complications	Nil	Nil	

Table 2: Details of the pain killers/sedatives used in the children.

Period	First half	Later half
First 12 h after surgery	4 (50%) needed sedation	3 (37.5%) needed sedation
12-24 h	No pain killers, no sedation	No pain killers, no sedation

both extirpative and reconstructive techniques. The ability to treat children effectively in a minimally invasive fashion has been fuelled by improvements in instrumentation, robotics and the creativity of minimally invasive surgeons.^[9,12] One of the disadvantages of conventional paediatric laparoscopy and robot-assisted surgery is the need for multiple incisions that are significant in size with relation to patient size.^[1,12] SILS originated from the concept of natural orifice transluminal endoscopic surgery, wherein surgeons began to use the umbilical scar as the portal of entry to

the abdomen, giving origin to “transumbilical surgery” or SILS. Early reports of SILS describe the placement of multiple ports through a single-incision with additional retraction utilising transabdominal sutures.^[4]

In the beginning, the lack of proper devices to gain access to the peritoneal cavity motivated surgeons to implement new techniques and to generate innovative ideas. Homemade devices were initially used as an alternative to the currently available multichannel ports.^[13-15] The increasing need for an optimal access platform in SILS led to development of a multichannel cannula. Despite the development of improved single-access ports, the need for instrument triangulation remained a concern when using SILS. Hansen *et al.* emphasised the importance of using graspers of different lengths and upsidedown grip of instruments to avoid instrument and hand clashing when working with straight conventional laparoscopic instruments.^[16] Unique instruments with bent tips and roticulating mechanisms were developed to address this issue and have the benefit of avoiding in-line viewing and clashing of instruments.^[16,17] Unfortunately, the availability of these sophisticated instruments is restricted, costs are high, and their applicability to young children is limited by their large size.

SILS was introduced in children much later than in adults,^[14,18] probably due to the perception that the small scars left by paediatric laparoscopic instruments were acceptable and moreover application of minimally invasive techniques in children, in general, has historically lagged behind those in adults. Moreover, there is a concern regarding the limited manoeuvrability of laparoscopic instruments in the small peritoneal cavity of children, which is already challenging even with multiple trocars laparoscopy. Although popular among adult single-incision laparoscopic procedures, the use of multichannel ports is limited in small children due to their large size. Instead, many paediatric surgeons often prefer to place several 3-5 mm ports through a single umbilical wound. de Lima *et al.*^[15] reported on the use of single-incision multiport access in three boys with cryptorchidism, wherein 3 ports (a 5/10 mm port placed using open technique and 2 additional 3/5 mm ports) were inserted through the same periumbilical skin incision with different entrances through the abdominal wall. The authors felt that by placing the conventional laparoscopic instruments in parallel in a single periumbilical wound, they were able to accomplish the surgical steps necessary without difficulty including complex manoeuvres such as intracorporeal suturing for the closure of the internal

ring. Moreover, the use of a 30° telescope provided better visualisation and manipulation of the instruments. The single-incision multiport surgery has been also reported for a number of other paediatric urological conditions, including varicocelectomy,^[18] insertion of peritoneal dialysis catheters^[3] and nephrectomy.^[19]

Our study has shown very clearly that it is feasible to perform complex laparoscopic surgeries such as pyeloplasty in children using modified umbilical only access ports. The main advantage of this procedure is that surgery can be performed with the use of conventional laparoscopic instruments. There is no need of multichannel cannula nor is there a need for flexible or curved instruments and longer laparoscopic endoscopes. This brings down the cost of the procedure. Crossing instruments in this procedure may prolong the duration of operative times. However, complex suturing required during pyeloplasty can be performed without difficulty. The drawback of our study remains the small patient population, and one would be cautious to make startling conclusions.

CONCLUSIONS

Modified umbilical only access laparoscopy is a modification of periumbilical multiport laparoscopy. Complex laparoscopic procedures in children such as pyeloplasty can be performed using this new access technique without the need of multichannel cannulas, sophisticated laparoscopic instruments, curved instruments and longer endoscopes. Crossing instruments may prolong operating times, but complex suturing is not hindered by this technique.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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