Single Incision Laparoscopic Surgery in children – a preliminary report

Wiesław Urbanowicz, Janusz Sulisławski, Michał Wolnicki

Department of Pediatric Urology Collegium Medicum Jagiellonian University in Cracow, Poland

KEY WORDS

SILS ◗ laparoscopy ◗ children ◗ varicocele

ABSTRACT

The technique of pediatric Single Incision Laparoscopic Surgery (SILS) using a single multi-channel port started in 2008 [1]. The objective of the technique are minimizing abdominal scarring, reduction of postoperative pain and risk of wound healing complications. Objective of the report is to present preliminary experience in SILS in treatment of varicocele and abdominal cryptorchism. SILS procedures were performed in eight patients. Five due to left-side varicocele and three underwent orchiectomies for testicular dysplasia. In all cases, no additional ports or conversion to open surgery were necessary. All boys were discharged on day 1 postoperatively. No recurrent varicocele, hydrocele, or postoperative herniation were observed and the cosmetic effect was excellent. SILS allows to perform procedures like laparoscopic varicocelectomy, peritoneal exploration and orchiectomy for dysplastic intra-abdominal testis. The technique is safe and may be less invasive for the patient as compared to classic laparoscopy.

INTRODUCTION

The technique of Single Incision Laparoscopic Surgery (SILS), also known in the English-language literature under the names of LESS (Laparoendoscopic Single Side Surgery), SPA (Single Port Access Surgery) or SAS (Single Access Site Surgery), represents development of classic laparoscopy. The presently employed laparoscopic techniques achieve access to the peritoneal cavity to visualize abdominal organs and insert working instruments through several – usually 3-5 – ports. Using SILS, the same objectives are achieved by a single port inserted into the peritoneum through a 2.5-3 cm incision in the subumbilical region. The port has three operating channels – one for the optical system and two for surgical instruments. Additionally, the port is equipped with a drain connected with an insufflator (Fig. 1). Since the working distance between the particular instruments is small, classic instruments have been modified to avoid clashing. The modification consists in fitting the instruments with articulating working heads (roticulators), which prevents clashing of the involved instruments themselves with the instruments of the optical system (Fig. 3). The fundamental objective of the above technique is the reduction of the number of integument incisions; thus, reducing postoperative pain, decreasing the risk of wound healing complications such as wound suppuration and incision site herniation, as well as the achievement of a better cosmetic effect represented by a single small scar in the subumbilical region.

MATERIAL AND METHOD

To date, in our department, SILS procedures have been performed in eight patients, all of them boys aged 3 to 15 years. Five patients were treated for left-sided varicocele, while the remaining three 3-year old boys were operated on for non-palpable testis syndrome. The procedures were performed under intratracheal general anesthesia. During the surgery, a Nelaton catheter was maintained in the bladder to achieve bladder emptying. All the patients received a single perioperative antibiotic dose.

We have been using multi-channel 5-12 mm SILS™ Ports manufactured by Covidien™. Insertion of the port into the abdominal cavity requires a semicircular incision made below the umbilicus, similarly as it is done while achieving access by the Hasson technique. Having inserted the multi-channel port, the insufflator was attached and pneumoperitoneum was achieved to the value of 10-12 mm Hg.

In patients with varicocele, after identifying the distended vessels on the spermatic cord, the surgeon dissected the vessels (artery and veins) above the internal inguinal ring and subsequently, in two cases, the vessels were transected and sealed with LigaSure® together with the testicular artery, while in the remaining three children, the vessels were ligated with a Roeder loop. Following inspection of the peritoneal cavity and hemostasis check-up, the instruments were withdrawn, pneumoperitoneum was released, and the wound was closed with layered sutures after port withdrawal.

In boys with non palpable testis syndrome, two patients demonstrated a small dysplastic testicle along the contralateral normal gonad situated in the scrotum. The dysplastic gonads were resected, with the distal part of the spermatic cord being ligated with a Roeder loop. In the third patient, the *vas deferens* was found to be blind-ending and situated on the left side above the entrance to the inguinal canal; no testicular vessels were seen.

RESULTS

The mean operative duration was 47 minutes. None of the procedures required conversion to open surgery or placement of additional ports. None of the patients demonstrated any complications as a consequence of the port or instrument insertion into the peritoneal cavity, such as damage to abdominal organs. Postoperative hospitalization ranged from 24 to 48 hours. On day 2 postoperatively, the patients were mobilized. In all the eight cases, surgical wounds healed by primary adhesion and late cosmetic results were very good (Fig. 3). No incisional herniation was observed. Post-varicocelectomy patients showed no recurrent disease or hydrocele at the 2-3 month follow-up.

DISCUSSION

To date, laparoscopic treatment of varicocele and abdominal inspection in non-palpable testis syndrome has involved placement of three ports. In procedures of this type the literature reports limiting the number of ports to two [2].

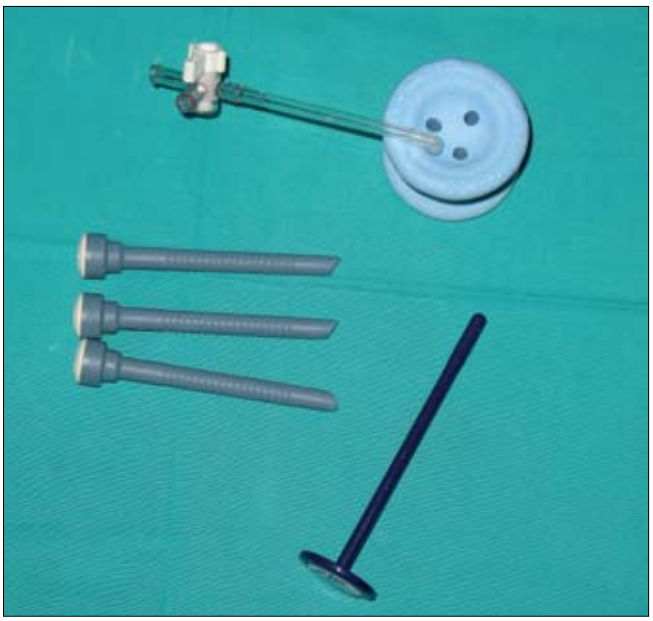

Fig. 1. Multi-channel 5-12 mm SILS™ Ports manufactured by Covidien™.

Fig. 2. The laparoscopic instruments with flexible ends – roticulators.

Within the past 20 years a marked development of minimally invasive surgical techniques has occurred. In endoscopic surgery for adults, the search for a method that would allow for minimizing scars has culminated in the development of NOTES (Natural Orifice Transluminal Endoscopic Surgery), where a surgical procedure is performed through an approach that takes advantage of natural body orifices; e.g. the gastrointestinal tract (the stomach, the rectum), the vaginal vault, or urinary bladder. However, to date, this type of surgery has not yet been approved in children [3].

Development of new instrumentation with articulating heads and four-channel ports has allowed for performing laparoscopic procedures while employing a single incision of the abdominal integument. Among the initial reports on such procedures being employed in urology is the description of a varicocelectomy performed in 2008 [4]. Further reports presenting the use of SILS in pediatric surgery were published in 2008 and 2009 [1, 3].

The main objective underlying the employment of this operative technique is to minimize surgical scars. Another important aspect of introducing the new surgical technique is the reduction in incidence of postoperative complications, such as port-site bleeding, wound healing complications, or surgical scar herniation. A reduced number of port punctures in the abdominal cavity contributes to reduction of postoperative pain, allowing for decreased dosage of analgesics while accelerating convalescence [1]. According to some authors, fewer visible scars may also affect the psychosocial development of the child [3].

Fig. 3. Sutured wound in lower umilical fold after procedure.

Fig. 4. Sub-umbilical scar healed by adhesion hidden in umbilicus – 3 months after procedure.

Difficulties in operating while using the technique are mainly associated with the small distance between the instruments inserted into the peritoneal cavity and their parallel positioning, which hinders maneuvers while dissecting tissue. In order to minimize the drawback, instruments with articulating heads have been developed. However, no complete reduction of clashing of the instruments and the optical system has been achieved, which may hinder tissue dissection or suturing. For this reason, some authors recommend optical systems equipped with built-in digital cameras, not only in view of the integration of the camera and laparoscope that results in the absence of the camera head at the extra-abdominal end of the laparoscope, but also in view of the fact that there is no separate light cable in this type of camera [5]. To achieve further improvement of surgical conditions, the development of instruments with flexible tips is in progress [6].

To date, our experience in employing the surgical technique has been limited to the simplest urological procedures, such as varicocelectomies, abdominal cavity revision in patients with non palpable testis syndrome, and orchidectomies in patients with dysplastic testicles. Yet, it provides a foundation for further improvement and usage of SILS in more complex operations, such

as nephrectomies. Observations made to date allow for concluding that SILS, as a surgical technique, may be successfully employed in the above-mentioned conditions as a replacement of classic three-port laparoscopy. The advantage of the former lies in reducing the number of postoperative scars to one, what not only improves the overall cosmetic effect, but also may decrease intensity of postoperative pain and the risk of potential postoperative complications.

CONCLUSIONS

The above-mentioned single-port technique may replace the hitherto used methods employing 3-4 ports.

Based on our experience, we may conclude that SILS is a workable and safe surgical technique.

SILS has advantages over classic videoscopy.

Using the technique requires that the surgeon has appropriate experience and instrumentation with articulating working heads is available.

REFERENCES

1. Ponsky T, Diluciano J, Chwals W et al: *Early experience with single-port laparoscopic surgery in children*. J Laparoendosc Adv Surg Tech A 2009; 19 (4): 551-553.
2. Niedzielski J, Jankowski J, Miodek M, Krakós M: *Laparoscopic varicocelectomy in adolescents - two-port approach*. CEJUrol 2009; 62 (4): 177-180.
3. Dutta S: *Early experience with single incision laparoscopic surgery: eliminating the scar from abdominal operations*. J Pediatr Surg 2009; 44: 1741-1745.
4. Kauok J, Palmer J: *Single-port laparoscopic surgery: initial experience in children for varicocelectomy*. BJU Int 2008; 102: 97-99.
5. Bayazit Y, Aridogan I, Abat D et al: *Pediatric transubilical laparoendoscopic single-site nephroureterectomy: initial report*. Urology 2009; 74 (5): 1116-1121.
6. Rane A, Rao P, Rao P: *Single-Port Access nephrectomy and other laparoscopic urologic procedures using a novel laparoscopic port (R-Port)*. Urology 2008; 72 (2): 260-264.

Correspondence

Wiesław Urbanowicz
Department of Pediatric Urology
Collegium Medicum Jagiellonian University
265, Wielicka Street
30-665 Kraków, Poland
phone : +48 12 658 20 11 int. 1590
miwolnic@cyf-kr.edu.pl