



Research Article

LAPAROSCOPIC ASSISTED INTERNAL RING SUTURING (LAIRS): INITIAL RESULT IN A SERIES OF GIRLS WITH INGUINAL HERNIA, RETROSPECTIVELY REVIEWED

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ABSTRACT

Introduction: Hernia in children is a common congenital disease. The gold standard treatment is open herniotomy. However, minimal access surgery is being widely used and the results are being compared to open surgery. We introduce a modification of percutaneous internal ring suturing (PIRS) for repairing hernias in girls. We also propose the name for this modification as Laparoscopic Assisted Internal Ring Suturing (LAIRS)

Material & Method: This is a retrospective study in which LAIRS was done in 20 girls with 25 hernias. All girls < 12 years were included in the study. They were followed up till 6 months.

Results: The age ranged from 4 months to 8 years, with a mean age of 4.2 years. None of the cases were converted to open and there was no intra-operative event in any of the cases. We encountered one recurrence (4%) due to an accidental removal of the internal ring suture.

Conclusion: LAIRS is a cost effective, safe modification of PIRS and can be applied to the treatment of hernias in girls.

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INTRODUCTION

Hernia in children is a common congenital disease. The gold standard treatment is open herniotomy¹. However, hernia in girls may be associated with Mullerian defects and some may be cases of complete androgen insensitivity syndrome with absence of Mullerian structures². This warrants investigations to determine their genetic sex and macroscopic evaluation of Mullerian structures. Minimal access surgery in hernia in girls eliminates the need for these additional investigations. In addition, laparoscopic repair of hernia in boys is associated with more recurrence than in girls³. It is due to these facts our department practices open herniotomy regularly for boys and laparoscopic hernia repair for girls. There are a few studies who have also preferred laparoscopy over open surgery for hernia repair in girls^{3,7,8}. Initially we performed conventional three port laparoscopic herniotomy with intra-corporeal suturing. Gradually we started doing subcutaneous endoscopically assisted ligation (SEAL), using the technique described by Harrison *et al*. Since last year we started performing PIRS as described by Patowski *et al*, Saha *et al*, and Tatakawa *et al*^{4,5,6}.

However, due to some technical difficulties described later and also due to the high cost and non-availability of spinal / epidural needle, we modified the technique by using intravenous cannulas, readily available in our operating rooms. We also suggest that since SEAL does not specify ligation of internal ring and PIRS does not specify use of endoscope / laparoscope, a suitable change of name of the procedure should be Laparoscopic Assisted Internal Ring Suturing (LAIRS). We present here our retrospective data and initial experience of LAIRS in our institution.

MATERIAL AND METHOD

This is a retrospective study of all the LAIRS performed in our institute between January 2019 to August 2019. Ethical clearance is exempted as the study is retrospective. We included all girls < 12 years with inguinal hernia. We performed LAIRS in 20 girls with 25 hernias. No antibiotics were used in this study. The girls were discharged as day care or next day (on parent's request). The girls were followed up for a period of 6 months for any post-operative complications.

Operative technique

The child received general anaesthesia. The bladder was emptied by crede manoeuvre. Part was painted and draped. Camera port was created by open technique through the umbilicus and a 5 mm metallic trocar was inserted and fixed with silk 2-0. A 30-degree telescope was inserted to inspect the

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abdominal cavity including uterus, adnexa and status of the bilateral internal rings. We used two sets of cannulas. A loop of Nylon 4-0 was introduced through the 18G cannula and the 20G cannula was used to deliver Prolene 4-0 which was subsequently delivered out of the abdominal cavity by the Nylon loop (Figure 1). Firstly, the 18G cannula was inserted through the medial part of the internal ring and punctured into the intra-peritoneal cavity at six o'clock position. The loop as described was passed through the cannula after removal of the stellate (Figure 2A). Next was manoeuvring the 20G cannula through the lateral margin of the internal ring and also punctured at six o'clock position of the internal ring, very close to the exit of the previous cannula. The 20G cannula was manipulated so that it enters the loop of nylon thread (Figure 2B). The loop was then pulled and a Prolene 4-0 was passed through the 20 G cannula (after removing the stellate) (Figure 2C). Adequate amount of Prolene was inserted into the peritoneal cavity. The loop was then pulled out along with the Prolene sutures (Figure 2D). The Prolene suture was brought subcutaneously adjacent to the other limb, using a fine mosquito forceps. Extra-corporeal knot was tied under laparoscopic vision to close the internal ring (Figure 3A & 3B) and the knot was buried. The overlying skin was closed by skin glue or adhesive tapes. We propose that with the use of cannulas, in male hernias, it could be easy to hydrodissect vas and vessels, when connected with saline syringe.

RESULTS

There was a total of 25 hernias in 20 girls. Five girls had bilateral hernias out of which only 2 were clinically evident pre-operatively. The rest three (15%) were diagnosed during laparoscopy. The age ranged from 4 months to 8 years, with a mean age of 4.2 years. None of the cases were converted to open and there was no intra-operative event in any of the cases. The mean operative time was 20.4 min ± 6.2 min for unilateral and 30.6 min ± 9.8 min for bilateral hernias. The operative time decreased significantly in the later part of the study. We had one recurrence (4%) in our study which also occurred due to accidental removal of the internal ring suture at the 10th day by a nursing staff, who removed it in addition to the umbilical suture, as the suture at the internal ring was visible through the inguinal wound. We realized with this incident, that proper communication was must and even a slight miscommunication could be detrimental to the outcome. We had 2 patients (8%) with suture granuloma which was managed with local dressings and topical antibiotics. The mean hospital stay was 2 days.



Figure 1 showing a 18G and 20G cannula used in LAIRS

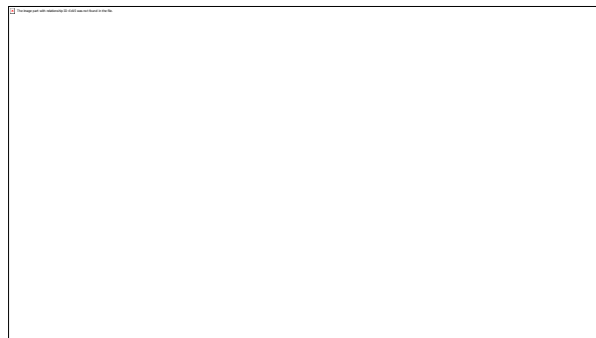


Figure 2A showing the 18G cannula in situ at the medial wall of internal ring along with a loop of Nylon 4-0 through it, Figure 2B showing the 20G cannula negotiated through the loop of Nylon suture, Figure 2C showing passage of Prolene 4-0 suture through the 20G cannula into the peritoneal cavity, Figure 2D showing withdrawal of the Prolene 4-0 suture along with Nylon loop



Figure 3A showing closed internal ring, 3B showing the extra-corporeal knotting

DISCUSSION

Hernia in children is common and therefore the surgery for the same is also very frequently performed. Till recently open herniotomy remains the gold standard and the standard of care for this condition. However, like other sub-specialities, minimal access surgeries are being increasingly performed and few studies have started to compare the results of open surgery to laparoscopic repair.

On reviewing the literature, we did not find an added advantage of laparoscopy in boys over open herniotomy⁹. However, in a female child laparoscopy definitely has advantages over open surgery as, it is now well reported that female hernias may be a manifestation of complete androgen insensitivity syndrome and therefore the girl should have karyotyping and macroscopic evaluation of reproductive organs². These investigations can be deferred in a girl if laparoscopy is performed to look at the reproductive organs¹⁰. Keeping this in mind we prefer laparoscopy in girls with hernia and open herniotomy for boys.

The laparoscopic technique for pediatric hernias has also evolved from conventional three port technique with intra-corporeal suturing to single port subcutaneous endoscopically assisted ligation (SEAL) using extra-corporeal suturing¹¹. The technique of SEAL was first introduced by Harrison *et al*¹². The advantages of SEAL were evaluation of the contralateral internal ring, shorter duration of surgery, better cosmetic results, technically easier procedure and comparable recurrence rates to open surgery. However, SEAL has disadvantages as well, as sometimes it is difficult to negotiate a needle around the internal ring in some children. SEAL in

male babies leave a rim of peritoneum around the vas and vessels, in order to prevent injury, thus contributing to recurrence^{12,13}.

Authors have tried modifying SEAL procedure to overcome its technical limitations. In a large series Shalaby *et al* compared conventional three port laparoscopic herniotomy with SEAL using Reverdin needle. He used an additional instrument (Maryland) to manipulate the vas and vessels. The recurrence rates were comparable to open surgery¹⁴.

Hinoki *et al* performed a prospective study in 14 girls with indirect inguinal hernia. A total of 19 SEAL were performed in these girls. The study used two ports (5mm and 2mm) for the procedure. The 2 mm port was used to place a suture extra-peritoneally around the internal ring. The mean age was 6 ± 3.3 years (11 to 128 months). The mean operative time was 20 ± 6 min for unilateral and 42 ± 7 min for bilateral. There were no intra-operative complications or recurrences reported³.

In a retrospective study of 163 children Bharathi *et al*, compared the three-port laparoscopic herniotomy with intra-corporeal suturing and SEAL. The operating time of SEAL was much less and was statistically significant. The recurrences were higher in the SEAL group, but the difference was not statistically significant. The author concluded that SEAL works well for average sized internal ring and thin patients¹¹. Dutta *et al* performed a similar study using an instrument in addition to the camera port, for separating the vas and vessels. He also mentioned two disadvantages of laparoscopy, one was recurrence and the second was possible iatrogenic damage to intra-peritoneal organs. However, the recurrence rates were comparable to open surgery¹³. Apart from recurrences SEAL technique has suture abscess, granulomas, and hydrocele in boys as minor complications¹⁶. To reduce the recurrence with SEAL further St Louise *et al* attempted to do thermal injury to the internal ring along with SEAL. However, there was no significant decrease in recurrence rates¹⁷. Similarly, Takehara *et al* performed a modified SEAL which he called as Laparoscopic Percutaneous Extra-peritoneal Closure (LPEC). He used a LPEC needle for the purse string suture around the internal ring. The authors reported a recurrence rate of 0.73% which was extremely low. In addition, they concluded that LPEC was safe and cosmetically superior¹⁸. Shibuya *et al* also proved that LPEC procedure could be easily taught to pediatric surgery trainees in approximate 10 months and results are promising¹⁹. SEAL being technically easy was also advocated by some authors to be done even at secondary care centres. The study reported a recurrence rate of 2.7%²⁰. Single port LPEC called SILPEC has also been described by Amano *et al*¹.

In the quest for finding an easier, quicker and cosmetically superior procedure than SEAL, Patkowski *et al* described a technique which was known as Percutaneous Internal Ring Suturing (PIRS)⁴. He also proposed that his technique would overcome the difficulty to negotiate a percutaneously placed needle in SEAL. Our technique is similar to this with the exception that we have used two cannulas (18G and 20G) which is a cheap instrument and easily available. There were two fold advantage of using the cannula in our study compared

to the needle with a suture in situ, as described by Patkowski *et al*. Firstly, the absence of the suture just at the tip of the needle in our scenario facilitated easy insertion and manipulation. Secondly, it is theoretically possible to connect a syringe with saline for hydrodissection of vas and vessels, if the technique is used in boys. In the study by Patkowski *et al*, since the suture is present in the needle, it would be difficult to connect a syringe for the same purpose. During PIRS the author reported injury to Iliac vein besides other complications like recurrences and hydrocele⁴. However, we did not report any vascular injury in our series. The same findings were also reported by Przemysław *et al*²¹.

Some studies by Saha *et al*, Tatakawa *et al*, and Eerginel *et al* have done PIRS using spinal needle and epidural needle^{5,6,8}. These needles are costlier and not easily available in remote areas in contrast to venous cannulas used in our case.

The other study where the technique used was similar to PIRS was performed by Endo *et al*¹⁰. However, he used an additional grasper for the procedure thus making it a two-port procedure. Another disadvantage is use of a specialized needle for the procedure unlike our technique which uses easily available consumables.

Recently Shalaby 2019 has reported another modification and called it Needlescopic Assisted Internal Ring Suturing (NAIRS). In this technique, instead of using laparoscopic instruments he has used various needles to achieve the same task and in addition cauterize the processus vaginalis as well. The instruments required to perform this new technique are 5mm port with 30-degree telescope, endoclose device, 18G epidural needle, 14G venous access cannula, suture retriever device, and a thin diathermy probe. All these instruments are costly and therefore may not be feasible for a high-volume centre with financial constraints. A total of 314 patients with 407 hernias were operated using this novel technique. No recurrences reported. However, since needles have replaced instruments therefore the end cosmetic result is same as single port procedure²².

CONCLUSION

LAIRS is an effective modification of SEAL and PIRS. It is affordable, easy, shorter operative time, and is associated with minimum complications. In this study we also acknowledge that communication between the entire team involved is very vital as the only recurrence we had in this series was due to an accidental removal of the internal ring suture.

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