



NEEDLE ASSISTED LAPAROSCOPIC HERNIA REPAIR VERSUS OPEN HERNIOTOMY IN CHILDREN- A COMPARATIVE STUDY

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ARTICLE INFO

Article History:

Received 19th November, 2017

Received in revised form 5th

December, 2017

Accepted 23rd January, 2018

Published online 28th February, 2018

Key words:

Inguinal Hernia, Children, Laparoscopic Repair.

ABSTRACT

Laparoscopic inguinal hernia repair in children was started over two decades ago and it has been gaining popularity day by day. There were several emerging laparoscopic techniques with trends toward extracorporeal suturing and knotting technique, single-port access technique as well. In this study a prospective randomized controlled study was carried out in the Pediatric Surgery department of Sylhet M A G Osmani Medical College Hospital and 2 other private hospitals in Sylhet, Bangladesh from July 2015 to June 2017. One hundred and twenty-four patients with Inguinal Hernia (IH) were randomized into two equal groups by a random-number table sequence after taking a written informed parental consent. Group A (n = 62) was subjected to needle assisted laparoscopic inguinal hernia repair by Spinal Needle (20 G) and Group B (n = 62) was subjected to open herniotomy (OH). Results were satisfactory in Group-A. So laparoscopic inguinal hernia repair by Needle assisted extracorporeal knotting technique can be an alternative of open herniotomy in children.

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INTRODUCTION

Inguinal hernia is one of the most common surgical conditions in infants and children. Over the past few decades, inguinal exploration with clear dissection of the hernial sac off the vas deferens and spermatic vessels and secure high ligation of the patent processus vaginalis (PPV)--herniotomy, has remained the gold standard treatment. There are controversies regarding the management strategy for a possible contralateral patent processus vaginalis (20%) that may develop into a subsequent hernia. Recently, many centers routinely perform laparoscopic hernia repair in children and there have been numerous reports describing various laparoscopic techniques rather than the traditional open approach^{1,2,3,4}. Laparoscopic hernia repair also allows contra-lateral patent process vaginalis (PPV) hernias to be defined and repaired in the same operation^{5,6,7}.

Routine exploration of the contra-lateral side, as has been adopted by some workers, may result in a significant proportion of un-necessary inguinal explorations, along with the potential complications. Randomized control

study of laparoscopic hernia repair versus OH in pediatrics is rare in the literature^{8,9,10}. This paper presents a big series and describes a new technique which is the use of Spinal Needle in laparoscopic hernia repair in comparison with OH. To the best of our knowledge, this technique has not been reported before in our country. So, this prospective randomized controlled study was conducted to compare needle assisted laparoscopic hernia repair by Spinal Needle with OH in infancy and childhood as regards operative time, hospital stay, postoperative hydrocele formation, recurrence rate, iatrogenic ascent of the testis and cosmesis.

Pathophysiology

The processus vaginalis is an outpouching of peritoneum attached to the testicle that trails behind as it descends retroperitoneally into the scrotum. Failure of obliteration of the processus vaginalis causes inguinal hernia. In case of children there is always indirect inguinal hernia occurs because the contents passes through the deep inguinal ring and exit through superficial inguinal ring (Figure 1A & 1B).

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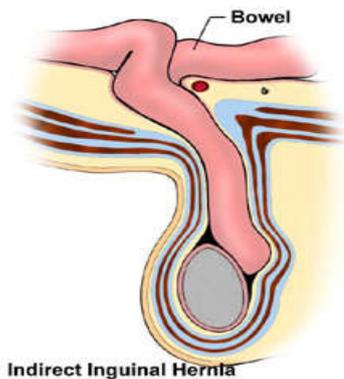


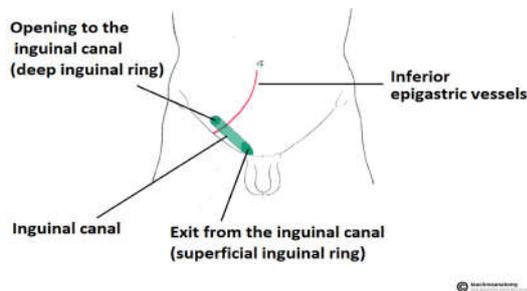
Figure 1A



Figure 1B

In the female embryo, the ovaries descend into the pelvis but do not leave the abdominal cavity. The upper portion of the gubernaculum becomes the ovarian ligament, and the lower portion becomes the round ligament, which travels through the inguinal ring into the labium majora. If the processus vaginalis remains patent, it extends into the labium majora and is known as the canal of Nuck. Failure of obliteration of canal of Nuck causes hernia.

Anatomy of inguinal canal in children



Specialty of Inguinal ring in children

In the newborn child, the deep ring lies almost directly posterior to the superficial ring so that the canal is considerably shorter at this age

Incidence

Incidence of inguinal hernia in infant and children is about 1-5%. Indirect hernias are more common on the right side because of delayed descent of the right testicle. Right sided inguinal hernias are common (60%) than left side (30%). Incidence of bilateral inguinal hernia is about 10% and male to female ratio is 8:1.

Patients and Methods

A prospective randomized controlled study was carried out in the Pediatric Surgery department of Sylhet M A G Osmani Medical College Hospital and 2 other private

hospitals in Sylhet, Bangladesh over two years period. One hundred and twenty-four patients with IH were randomized into two equal groups by a random-number table sequence after taking a written informed parental consent. Group A (n = 62) was subjected to needle assisted laparoscopic inguinal hernia repair by Spinal Needle (20 G) and Group B (n = 62) was subjected to open herniotomy (OH). The demographic data were matched between both groups (Table 1).

Table 1 The demographic data for the two groups.

Groups	Group-A %	Group-B %	Total	P value
Sex:				
Male	47	53	100(80%)	0.48**
Female	15	09	24(20%)	
Age/months:				
1-12	08	16	24(19.3%)	0.80**
12-24	22	20	42(33.8%)	
>24	32	26	58(46.7%)	
Presentation:				
i.Unilateral				0.18**
ii. Bilateral				
iii.Recurrent	32	45	77(62%)	
iv. Inguinal hernia with umbilical hernia.	01	01	02(1.6%)	
v. Inguinal hernia with questionable other side.	02	06	08(6.4%)	
	07	04	11(8.8%)	

** Insignificant.

All children were subjected to full history taking, thorough clinical examination, routine laboratory investigations, and inguino-scrotal U/S. The main outcome measures were operative time, hospital stay, postoperative hydrocele formation, recurrence rate, iatrogenic ascent of the testis and cosmesis. All operations were done by the first author, and a senior resident holds the camera. In group A, after induction of general endo-tracheal tube anesthesia, the patient was placed supine in Trendelenburg's position. Insertion of the main umbilical port was accomplished by the open method. Pneumo-peritoneum was established to a pressure of 8 to 12 mm Hg. Laparoscopy was used for initial visualization of the pelvis and internal inguinal rings (IIRs) on both sides. Laparoscopic Needle assisted hernia repair was done according to standard technique described in literatures¹¹. A 3 mm Maryland forceps was inserted into the abdomen with trocar at the lateral border of the rectus muscle just above the level of the umbilicus.



Figure 2A

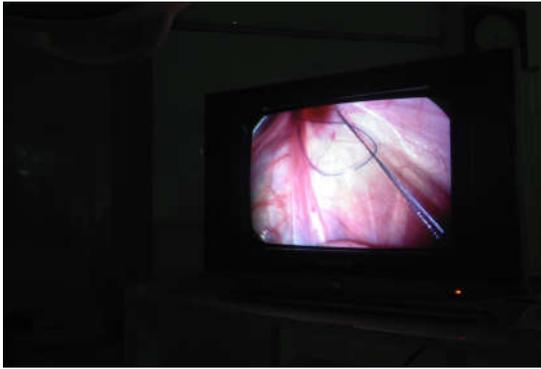


Figure 2B

Insertion of Needle on the right side

A stab incision of the skin was done just above the IIR on the right side, and also at the same level on the left side when required. A 3/0 prolene suture was anchored with the 1st Spinal needle (Figure 2A) and then the needle was manipulated to pierce the skin and fascia over the IIR and was advanced to pass through the lower margin of IIR under the peritoneum and in front of the spermatic vessels and vas to pierce the peritoneum. Care was taken to avoid injury of the spermatic vessels, and was by grasping and lifting the peritoneum with Maryland forceps. The loop of prolene was held by Maryland forceps and the needle was withdrawn backward in the same path. Then the 2nd Spinal Needle was loaded with 3/0 vicryl and inserted at the previous stab incision site, advanced along the upper margin of the IIR beneath the peritoneum and fascia transversales to come into the peritoneal cavity through previous entry point. Prolene loop was spread into the peritoneal cavity, short end of the thread was inserted (Figure 2B), needle was withdrawn and vicryl was pulled outside the abdominal cavity along with prolene loop for extracorporeal suture tie.

Before tightening the knot, the scrotum was squeezed and the intra-peritoneal pressure was released to expel the gas from the hernial sac. A contra-lateral internal ring with a patent processus vaginalis (more than 2 mm) was regarded as a possible cause of developing clinical hernia and repaired at the same time. The skin incisions were closed with Steri-strips. All patients were followed up in the out-patient clinic after 7 days, 2 weeks and 3 months. Parents were advised to contact with the department of pediatric surgery, if there were any concerns in the immediate postoperative period. All patients resumed normal activities within 6 hours after surgery. All patients had uneventful postoperative recoveries and were discharged on the 1st post-operative day.

Statistical Analysis

The collected data were organized, tabulated, and statistically analyzed using Statistical Package for Social Science (SPSS) version 16 (SPSS Inc., USA). Qualitative data, frequency, and percent distribution were calculated and Chi square test was used for comparison between groups. Quantitative data, mean, standard deviation (SD), and range were calculated, and for comparison between two groups, the independent samples (*t*) test was used. For

interpretation of results, $P < 0.05$ was considered significant.

RESULTS

One hundred and twenty four patients with IH were operated upon by 2 different techniques. Group A ($n = 62$) was subjected to needle assisted laparoscopic inguinal hernia repair by Spinal Needle and Group B ($n = 62$) was subjected to OH. There were 100 males and 24 females. The youngest was 5 months and the oldest was 96 months, given an overall mean age of 61.56 ± 28.32 months. All procedures of group A were completed laparoscopically without any conversion. No intra-operative complications occurred during this study. In group A the patients resumed normal activities within 6 hours after surgery, whereas in patients of group B they resumed normal activities within 08 hours. All patients had uneventful postoperative recoveries and were discharged on the 1st post-operative day. The mean hospital stay was 12 ± 3.23 hours after operation with no significant difference between both groups. There is significant statistical difference between the studied groups as regards operative time (Table 2).

Table 2 Distribution of operative time in studied group

Groups	Group-A	Group-B	P-value
Unilateral	7.6+3.5 min	12.8+4.5 min	<0.001*
Recurrent unilateral	9.2+4.6 min	14.3+3.6 min	<0.001*
Bilateral	11.4+2.7 min	21.9+7.2 min	<0.001*

*Significant

One patient developed hydrocele in the early postoperative follow-up period in group A, while in group B, postoperative hydrocele was reported in 2 cases. However, all cases responded well to conservative management within 2 weeks (Table 3).

Table 3 Post-operative complications in studied groups.

Groups	GroupA	%	GroupB	%	P value
Hydrocele	01		02		0.52**
Recurrence	01		01		0.31**
Iatrogenic ascent of the testes	00		02		0.049*
Ugly scar	00		03		0.024*

*Significant, ** Insignificant.

Over a mean follow-up period of 24 months (range of 16–30 months), the recurrence rate was 1.6% (one case) in each group (Table 3). In group A, there were no cases of iatrogenic ascent of the testis, while in group B, 2 cases (3.22%) developed iatrogenic ascent of the testis. The early cosmetic results for bilateral cases were excellent in group A (Figures 3(A) and 3(B)).

At a follow-up examination more than 6 months later, there were practically no visible scars in group A, while in group B 3 cases had ugly scars as reported by parents (Figure 4). The umbilical scars were not visible in all of the patients of group A.

DISCUSSION

In children, the standard surgical treatment of IH is limited to division and ligation of the hernial sac at the IIR without narrowing the ring⁵. Open herniotomy is an excellent method of repair in the pediatric population. However, it has the potential risk of injury to the spermatic vessels or vas deferens, hematoma formation,

wound infection, iatrogenic ascent of the testis, testicular atrophy, and recurrence of hernia.

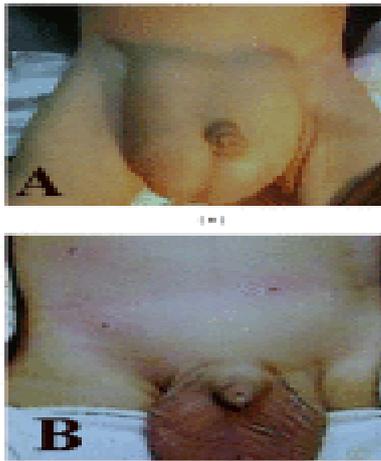


Figure 3A and 3B



Figure 4

It also carries the potential risk of tubal or ovarian damage which may cause infertility^{12,13,14}. Laparoscopic approach is rapidly gaining popularity with more and more studies validating its feasibility, safety, and efficacy^{5,15}. Laparoscopic hernia repair in children is known to take longer operative time than OH. Many reports showed that it ranged from 20 to 74 minutes^{5,17,18,19}. However, the operative time is reduced with experience. In laparoscopic surgery, approaching the hernial defect from within the abdomen, makes the area of interest bloodless, and the magnification renders anatomy very clear, making surgery precise^{13,15,20}.

In our series the operative time is less than that reported in the literature as we use an easy simple and rapid technique for repair of IH using Spinal Needle which can be done within a very short time. Also, we used the extracorporeal suture ligation which is less time consuming²¹. Open herniotomy in children has been reported to have recurrence rates of 0.8-3.8%⁸. While in laparoscopic hernia repair it is ranged from 0.7% to 4.5%. That is may be due to the presence of skip areas during placement of purse-string sutures as well as the tension resulting from intracorporeal knotting particularly in closure of large defects. The critical steps of hernia sac neck transaction at the IIR were not achieved in many laparoscopic procedures unlike during OH. Thus, transient or persistent hydrocele was unavoidable after these laparoscopic techniques. The natural history of the PPV in infants remains a controversial topic. Prior studies indicate that 40% of PPVs close spontaneously by two months of age and 60% by 2 years of age; however, the risk of

incarceration is highest during infancy, while in some other series PPVs less than 2 mm were not closed⁶. Our approach has been to ligate all PPVs to avoid the development of metachronous hernia. However, more studies are needed to clarify this point. Cosmesis: five-millimeter and 3 mm incisions in group A were indeed cosmetically more appealing compared with 2 cm incisions during OH in group B. All parents were satisfied with the cosmetic results of group A. The potential risks of open herniotomy in Males are injury to the spermatic vessels or vas deferens, Hematoma formation, wound infection, Iatrogenic ascent of the testis, testicular atrophy and recurrence (0.8 – 3.8%) And that of Female are, tubal or ovarian damage which may cause infertility. Advantage of laparoscopic hernia repair are excellent visual exposure, the ability to evaluate the contra lateral side, minimal dissection and avoidance of access trauma to the vas deferens and testicular vessels, less chance of Iatrogenic ascent of the testis and less operative time.

CONCLUSION

The result of conventional open herniotomy is similar to that of laparoscopic hernia repair. Needle assisted laparoscopic inguinal hernia repair is feasible, safe and rapid technique which reduces operative time, recurrences, testicular atrophy, iatrogenic ascent of the testis and ensure cosmesis. Contra-lateral Patent processus vaginalis found in 20% cases & best option for detection and repair of CPPV is Laparoscopy. Long-term follow-up is needed to determine the validity of this technique.

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