



ROLE OF LAPAROSCOPY IN TREATING PEDIATRIC INGUINAL HERNIA AND HYDROCELE – ITS SAFE AND EFFECTIVE.

Paediatric Surgery

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ABSTRACT

Aims: To study role of Laparoscopy in treating Pediatric Inguinal Hernia and Hydrocele. **Settings:** Department of Surgery, Government Medical College Srinagar. **Materials and Methods:** A prospective observational study involving 43 children who underwent laparoscopic repair of inguinal hernia / hydrocele over a period of 2 years in our tertiary care institute. **Results:** There were 57 children enrolled but only 43 patients were included for the study. Age ranged from 7 month to 12 years. There were 38 boys and 5 girls in the study group. There were 32 unilateral and 11 bilateral cases. Among unilateral 26 were on the right side and 6 on the left side. 54 hernia / hydrocele / open DIR were treated laparoscopically. IPSI for unilateral, SEAL for bilateral cases among boys and LIHIL technique was performed in girls. There were no significant differences among various techniques performed with respect to hospital stay, post operative analgesia requirement but difference was significant for higher complication rates in SEAL. Also the difference was found to be significant when compared unilateral versus bilateral cases for operative time and post operative return to activity. Absorbable suture material was used in all cases and there were no recurrences seen during a mean follow up period of 16.5 months. **Conclusions:** Laparoscopic treatment of pediatric inguinal hernia/hydrocele/Open DIR is a safe and effective approach. We found a very low rate of complications which were all minor in nature and were managed conservatively. There were no recurrences thus making laparoscopic herniotomy a potentially gold standard approach in the near future but the ideal/gold standard laparoscopic technique for pediatric inguinal hernia appears yet to be achieved.

KEYWORDS

Laparoscopy, Pediatric Hernia, Hydrocele, open DIR

INTRODUCTION:

Congenital Inguinal Hernia (CIH) is a common pediatric surgical disease. The incidence ranges from 0.8 to 4.4 percent. Males have higher incidence than females by 3 to 10 times.¹ Almost 60% of hernias are right sided and 10% are bilateral. Pediatric Inguinal Hernia (PIH) require surgical intervention when diagnosed whereas Congenital hydrocele can be offered expectant management for spontaneous closure till 2 years of age unless very large or complicated. A failed expectant management by 2 years of age in such patients merit surgical intervention. Inguinal hernia surgery has been performed since early 1200 BC. Some available literature hints towards medical/surgical management of hernias during the era of Acharya Sushruta compiled as Sushruta Samhita.² In 1871 Marcy described an open operation still in use by pediatric surgeons to this day and had been considered gold standard.³ The literature is flooded with studies comparing open hernia repair (OHR) and Laparoscopic pediatric hernia repair citing comparable results.⁴ Over the last decade various laparoscopic techniques had been evolved for managing pediatric hernia/hydrocele/open DIR (Deep Inguinal Ring) and are being further refined but an ideal technique for treating this condition by laparoscopy appears far from sight.

MATERIALS AND METHODS:

This was a prospective observational study conducted in the department of General Surgery, Government Medical College, Srinagar, Union Territory of Jammu and Kashmir for a period of 2 years. The study protocol was reviewed and duly permitted by the Institutional Scientific and Ethics Committees.

INCLUSION CRITERIA:

All children between 06 months - 14 years presenting with clinical and radiological evidence of inguinal hernia and children > 2 years of age having congenital hydrocele with radiological evidence of Patent Processus Vaginalis (PPV) were included.

EXCLUSION CRITERIA:

Complicated, recurrent hernias, defect > 2 centimetres, Inguinal hernia with Undescended testis, Pre-term birth, cerebral palsy, Syndrome children, Parents/Guardian refusing consent for Laparoscopic surgery, and medical condition contra-indicating laparoscopy.

All patients within the included age group were assessed by thorough history taking and clinical examination including presence and status of swelling, reducibility, cough impulse, status of gonads, bi-laterality. Complete Blood Count, Kidney Function Tests with serum electrolytes, Serology, Electrocardiogram and Chest skiagram were done preoperatively as institutional protocol. Ultrasound (US) abdomen including inguinal and scrotal region was done in all cases for presence of Patent Processus Vaginalis, contents of sac. Selected patients with large and long-standing hernias were subjected to Colour Doppler US for assessing the status of gonads. Once the diagnosis was made Parents/Guardian were counselled and given option for laparoscopic intervention. Proper informed consent was taken from the parents/Guardian. All procedures were done under General Anaesthesia with Endotracheal Tube/ LMA. Boys with unilateral lesion underwent Intraoperative Purse string Suturing after peritoneal Incision (IPSI). Boys with bilateral lesions underwent Subcutaneous Endoscopy Assisted Ligation of Sac (SEAL). Girl patients irrespective of the laterality underwent Laparoscopic inguinal Hernia Inversion and Ligation (LIHIL).

All the data collected was analysed for the parameters like operating time, hospital stay, requirement of post operative analgesia, post operative return to activity, complication rates. The data was compared with the global trends. The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 23.0 (SPSS Inc., Chicago, Illinois, USA).

RESULTS:

We performed laparoscopic repair of 54 hernias/congenital hydrocele/open DIR in 43 paediatric patients in our institute over 2 years period. Out of total 57 patients enrolled 14 patients were excluded from the study analyses due to various reasons like Parents refused for Laparoscopic approach (02 cases); Patients lost to follow up (02 cases); Laparoscopic 2 ports method (03 cases); Post operative port site local anaesthesia infiltration done (03 cases); SEAL done in unilateral hernia (03 cases); recurrent hernia (following open approach) operated by laparoscopic approach (01 case). After exclusion the study group included 43 cases. Age ranged from 7 months to 12 years with mean of 65 months. The male to female ratio

showed significant male preponderance (7:1). Eleven cases had bilateral lesions. Out of 11 bilateral open DIR detected on laparoscopy only 4 were seen clinically, and 7 by US. There were 32 unilateral lesions out of which 26 were on the right side and 6 on the left side. (Table 1) Forty-seven lesions presented as inguinal/scrotal swellings, 25 were reducible, 26 were brilliantly trans-illuminating and 39 had positive cough/cry impulse. There was history of SARS Cov 2 in one girl child in the past and 2 patients had gonads small for age. All patients underwent inguinal-scrotal US examination (Figure 1) and were subjected to laparoscopic intervention. (Figure 2) Thirty two lesions were treated by IPSI, 6 male cases with bilateral lesions underwent SEAL and 5 girls having 2 unilateral and 3 bilateral lesions underwent LIHIL. The Contralateral Patent Processus Vaginalis (CPPV) was detected in 8 cases (19%). The average size of the DIR was 7.22 mm (range 1 mm – 15 mm). One child had ectopic left sided pelvic kidney and one girl child had left fallopian tube adhered with the medial peritoneal fold along the left ring. The overall average operative time was 22.31 minutes $\pm$ 7.28 (2SD). For IPSI it was 20.90 $\pm$ 5.52 minutes (16 - 25 minutes), for SEAL it was 27.49 $\pm$ 4.14 minutes (range 25 – 30 minutes), For LIHIL unilateral cases it was 20.33 minutes (range 17 - 25 minutes) and for bilateral LIHIL it was 27.50 minutes. (Figure 3) There were no intra-operative complications and late post operative complications like port site hernia, recurrences during a median follow up period of 16.5 months (range 6 months to 29 months). There were 5 minor complications noted in form of post-operative transient hydrocele formation in 2 cases (SEAL), 1 port site infection (SEAL), 1 febrile episode (LIHIL), and 1 allergic reaction post operatively (IPSI). (Table 2) All minor complications were managed conservatively. There were no recurrences seen in our study which involved use of absorbable synthetic multifilament 3-0 Vicryl suture (Polygalactin 910, Ethicon) Hospital stay was found out to be similar in all the procedure (1 day) except 1 case of LIHIL which had hospital stay for 2 days owing to febrile episode post operatively (Past history of positive for SARS Cov 2). All patients returned to activity within 20 hours, majority within 12 hours. Requirement of post-operative analgesia was just 2.18 doses per patient. (Table 3)

DISCUSSION:

Congenital Inguinal Hernia is a common pediatric surgical disease. In current era inguinal hernia repair is one of the most common pediatric surgical interventions performed constituting more than 15% of all the pediatric patients.⁵ In this study we studied performed and observed intervention in 54 hernias/congenital hydrocele in 43 pediatric patients by IPSI, SEAL and LIHIL techniques.

The first report of laparoscopic closure of pediatric hydrocele was published by Janeschek et al. in 1994.⁶ It is believed that all inguinal hernias in pediatric patients are repaired in order to avoid complications.⁷ Many comparative studies and retrospective laparoscopic series in the past had asserted the feasibility of laparoscopy in PIH repair and compared laparoscopic herniotomy (LH) with open herniotomy (OH)^{8,9} but the results were not consistent because of the limited case number and varied demographic characteristics. Many authors are still doubtful about the benefits of laparoscopy citing it to be more time consuming, having higher recurrence rate, it violates the peritoneal cavity, and there is no overall advantage compared to the open procedure.¹⁰ The aim of our study was to present our experience with children who underwent IPSI, SEAL and LIHIL laparoscopic procedures over a period of 2 years.

Reliability of clinical examination and US is considered inferior to laparoscopy for detecting CPPV. Diagnostic laparoscopy has proved to be the most reliable method and has helped to eliminate the future development of contralateral hernias. We found CPPV to be present in 8 (19 %) cases which were missed either of the clinical or radiologic methods as seen in many previous studies and were closed in the same sitting when the size of DIR was > 3 mm.^{8,9} But some author described wait and watch policy for contralateral side while operating the affected side by mini-open method based on their findings of Metachronous contralateral inguinal hernias (MCIHs) incidence of just over 5% cases.¹¹

Traditionally the teachings has been that hydroceles that are persistent into the third year of life should be repaired.¹² Many authors suggest different age limit for expectant management but are unclear for the age at which surgery should be done.¹³ In our study in cases of congenital hydroceles we recommended surgical intervention after the age of 2 years when the size of the ring was more than 3 mm.

The overall operative time for IPSI in our study was 20.90 minutes with range from 16 minutes to 27 minutes (20.90 $\pm$ 2.76 minutes). This was calculated from the point of insertion of pediatric veress needle to the closure of the port site incisions. It was comparable with few earlier done studies but longer or shorter than operative time in many other studies.¹⁴ Maybe lack of uniformity in calculating the operative timing from starting point could be the reason for large variations.

Our average operative duration for SEAL was 27.49 $\pm$ 2.07 minutes (range 25 – 30 minutes) for bilateral procedures and is comparable with other series describing similar percutaneous approaches.¹⁵⁻¹⁷ We experienced no intraoperative complications observed no hernia recurrences. Significant complications have been reported with percutaneous hernia repair approaches, however, including isolated femoral nerve and vascular injuries,¹⁶ iliac vein puncture injury, and bowel strangulation from adhesion.^{16, 17} We experienced a few minor complications (2 cases of post operative hydrocele formation out of 12 hemias/open DIR operated in six bilateral cases managed by SEAL) early until we learned to minimize or eliminate the gap. There was 1 case of SEAL with post operative port site infection which was managed by topical antibiotics and wound dressings as day care management.

The average operating time in our study for performing one sided LIHIL (3 cases) was 20.33 minutes (range 17-25 minutes) and 27.50 minutes for performing LIHIL on both the sides (2 cases). The difference between performing unilateral and bilateral LIHIL was just 7 minutes which is also seen in many previous studies with higher number of cases.¹⁸ There have been no intraoperative complications, and the estimated blood loss was negligible in all cases. Only 1 patient having ovary as content (20%) had a sliding component to their hernias and required dissection of the fallopian tube from the hernia sac. The ovary found in this case was viable. The same girl had post operative transient febrile period which was managed by antipyretics. This girl also had history of being positive for SARS Cov 2.

On application of statistics the difference between operative time for unilateral (35 cases) and bilateral (8 cases) was found to be statistically significant (p value < 0.00015). When comparing complications among various techniques performed the complication rates were found to be significantly less for IPSI and high for SEAL (p value < 0.006) as shown in Table 2.¹⁴⁻¹⁹

The hospital stay of LH was not significantly different from that of OH or among various laparoscopic techniques used.^{20,21} In our study the hospital stay was found out to be similar in all the procedure except 1 case of LIHIL which had hospital stay for 2 days owing to febrile episode post operatively.

(Table 3) Though it was possible to discharge many patients on the day of surgery but all patients were kept for at least 24 hours as per institution protocol. Few studies calculated the dosage of analgesia as doses per patient post-operatively in laparoscopic and open herniotomy as well.²¹ The amount of acetaminophen taken by patients in our group was 2.18 doses per patient. Majority of the patient required only 2 doses as parents were instructed to discuss telephonically regarding need for additional doses. When analgesia dosage required for bilaterally operated cases (Total 21 doses in 8 cases) was compared with unilaterally operated (Total 73 doses in 35 cases) on application of statistics the difference was found to be not significant (p value 0.619). (Table 3) Koivusalo et al studied recovery and outcome after open repair and laparoscopic hernia repair in children and found that laparoscopic hernia repair was associated with increased theatre time and postoperative pain which did not agree with our study.²⁰

Analysis of the pooled data revealed that the resume to full activity of LH was not significantly different from that of OH in these studies.^{20,21} In our study involving LH majority of the patients (26/43, 65 %) were started oral feed and were made ambulatory 6 hours post operatively. Nine patients (21 %) returned to normal activity by 12 hours and 6 patients (14 %) were active 20 hours post-operatively. When data was compared statistically for differences in early return to activity among unilateral and bilateral cases it was found to be significantly in favour of unilateral cases (p value < 0.00015). When compared between IPSI and SEAL it was found to be significant in favour of IPSI (p value < 0.0022) as shown in Table 4. Available data suggest that laparoscopic management of congenital hernia/hydrocele/open DIR in paediatric patients can be considered as a day care surgery.

CONCLUSION:

Laparoscopic treatment of pediatric inguinal hernia/hydrocele/Open DIR is a safe and effective approach. We found a very low rate of minor complications which were all managed conservatively and no recurrences after using absorbable suture thus making laparoscopic herniotomy a potentially gold standard approach in the near future but the ideal/gold standard laparoscopic technique for pediatric inguinal hernia appears yet to be achieved and requires further studies with

larger number of cases.

Conflict of Interest – Nil

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Table 1: Intra Operative Findings

S. No	Age Group	Pressure (mm Hg)	No of Pts	No of Hernia	U/L	B/L	Size of DIR	CPPV	Content of Sac					No Content
									Bowel	Omentum	Fluid	Gonad		
1	6 Months – 2 Years	6-8	06	07	05	01	1 mm to 15 mm	0	3	2	1	0	1	
2	2 Years - 5 Years	8-10	20	26	14	06		5	3	4	16	0	3	
3	5 Years - 9 Years	10-12	11	14	08	03		2	2	3	6	1	2	
4	9 Years - 14 Years	10-12	06	07	05	01		1	3	0	3	0	1	
Total			43	54	32	11		8 (19 %)	11	9	26	1	7	

Table 2: Operative Time and Complications

Mean Operative Time (Minutes)	No of cases (Procedures)		Observation	IPSI (32)	SEAL (6)	LIHIL (5)
	Unilateral	35 (35)				
Open DIR - 54 Procedures – 51 22.31 ± 7.28	Bilateral	11 (16)	3 open DIR(1mm)	-----	27.49 (6)± 4.14	27.50 (2)
Complications (Mean Follow up of 16.5 Months)	Intra operative	Bleeding/Hematoma; Injury to Vas/Bladder; Injury to Gonads	Nil	Nil	Nil	Nil
	Immediate Post Operative	Transient Fever	Nil	Nil	Nil	1
		Allergic Reaction	Nil	1	Nil	Nil
		Port Site Infection	Nil	Nil	1	Nil
		Transient Hydrocele	Nil	Nil	2	Nil
	Late Post Operative	Recurrence	Nil	Nil	Nil	Nil
		Port Site Hernia	Nil	Nil	Nil	Nil
		Total Complications - 5 (11.6 %)	Nil	1	3	1

*One case of bilateral open DIR in a girl underwent LIHIL on one side only; other side kept under observation wing (size 1 mm)

** Statistically significant difference in the average operating time for unilateral and bilateral cases. (p value 0.000157).

***Statistically significant complication rates were seen in SEAL group. (p value 0.006)

Table 3: Post operative analgesia requirement and Average Hospital stay

S. No	Procedure	No of Patients	Number of Doses				No of Days (Mean Hospital Stay)
			01	02	03	04	
1	IPSI	32	0	28	2	2	32 (1day)
2	SEAL	6	0	5	1	0	6 (1day)
3	LIHIL	5	1	3	0	1	6 (1.2 days)
Total 94 doses 2.18 doses per patient		43	1	72	9	12	

*Difference in requirement of Analgesia for unilaterally operated (73 doses in 35 cases) and bilaterally operated (21 doses in 8 cases) was Not Significant (p value 0.619)

Table 4: Return to Activity (As per the Developmental Milestones)

S. No	Age Group	At 6 Hours	At 12 Hours	At 20 Hours
1	6 Months – 2 Years	2	2	2
2	2 Years - 5 Years	13	5	2
3	5 Years - 9 Years	10	0	1
4	9 Years - 14 Years	3	2	1
Total		28 (65%)	9 (21%)	6 (14%)

* Post operative early return to activity was statistically significant for unilateral cases when compared to bilateral (p value 0.0001) ** For different techniques performed it was statistically significant for IPSI (p value 0.002)



Figure 1A: Showing Left Sided Hernia With Ovary As Content In A 6 Years Old Girl; 1b. Right Sided Hernia (enterocele) In 7 Months Old infant; 1C-D. US findings of hydrocele and PPV.

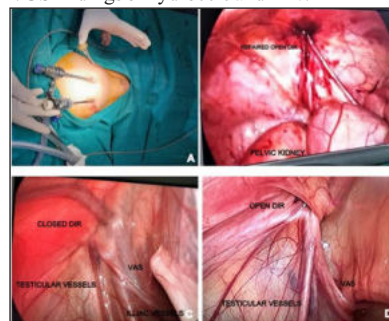


Figure 2A. Port Placement; **2B.** Additional Intra-perative Finding Of Pelvic Kidney; **2C.** Closed Normal Appearing DIR; **2D.** Open DIR

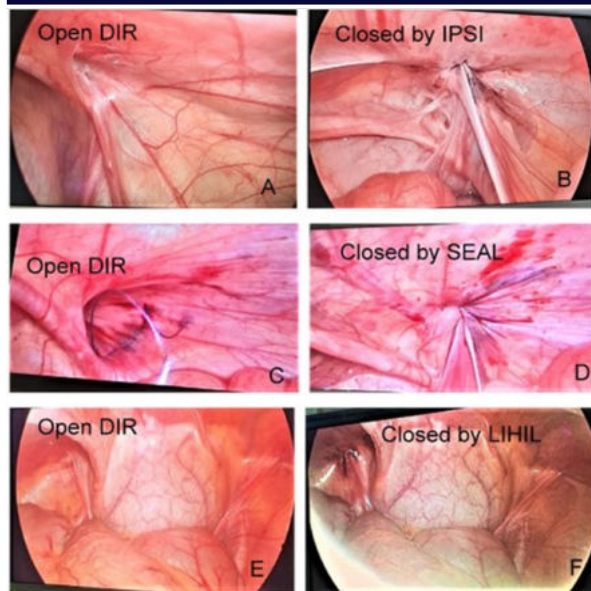


Figure 3A-B Showing Right Sided Open DIR Closed By IPSI Technique; 3C-D. Right Sided Open DIR Closed By SEAL Technique; 3E-F. Left Sided Open DIR Closed By LIHIL Technique.

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