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Original Research Article

Laparoscopic herniotomy with orchidopexy: our experience and a review of literature

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ABSTRACT

Background: Congenital hernia and undescended testis are significant pediatric surgical conditions traditionally managed through open techniques. With advances in minimally invasive surgery, laparoscopic approaches now offer an alternative for treating these conditions.
Methods: We present a retrospective study outlining our experience with laparoscopic herniotomy and, when indicated, laparoscopic orchidopexy in paediatric patients. In all cases, pneumoperitoneum pressures were adjusted appropriately to ensure procedural safety and efficacy.
Results: Our findings demonstrate that laparoscopic repair of both congenital hernia and undescended testis is technically feasible and effective in children. All procedures were completed successfully, with minimal complications and satisfactory postoperative outcomes.
Conclusion: Laparoscopic management of congenital hernias and undescended testes is a safe and effective alternative to open surgery in paediatric patients, given the availability of an advanced surgical setup and experienced personnel.

Keywords: Congenital, Hernia, Herniotomy, Laparoscopic, Orchidopexy, Undescended testis

INTRODUCTION

Congenital inguinal hernias (CIH) affect 1-5% of full-term infants and up to 30% of premature neonates, with a higher incidence in boys.[1] Cryptorchidism, or undescended testes, is observed in approximately 3% of full-term and 30% of premature male infants at birth, though this figure typically decreases to about 1% by one year of age due to spontaneous descent.[2] Laparoscopic herniotomy (LH) with SOS laparoscopic orchidopexy (LO) is a modern, minimally invasive surgical procedure addressing both an inguinal hernia and an undescended testis, in children.

The objective of this study is to underscore the feasibility and importance of laparoscopic therapy, even in these 2 pediatric surgical conditions; and also to add to world literature on the topic, by sharing our experience on the same.

METHODS

A retrospective study of elective laparoscopic herniotomy and where indicated, laparoscopic orchidopexy, was conducted in a single centre, performed by a single surgeon over a 10-year period; from May 2005 to April 2015. A total of 47 patients were included in this study. The present study was conducted at the Department of General and Advanced Laparoscopic surgery, Dr. L. H. Hiranandani Hospital, Powai, Mumbai, Maharashtra, India. Ethics committee approval for this type of study is not required in our hospital. The data was collected from the hospital's electronic medical records (EMR). The diagnosis of congenital inguinal hernia and in some cases undescended testis was made on the basis of medical history, clinical examination and radiological investigation (ultrasound scan). All surgeries were performed by the same surgeon under general anaesthesia and on a 1-night

stay basis, with discharge on the next day. The patients were advised analgesic (paracetamol) as and when required and to avoid strenuous physical activity for the first 4 weeks after surgery. Data for the following parameters was obtained from the EMR – age, sex, duration of surgery, conversion to open surgery, duration of hospital stay, time to resume regular activity and recurrences. Follow-up was done on postoperative day 10 in the outpatient department (OPD) and then telephonically at three months and six months post-surgery. Patients were questioned about pain and recurrent swelling. Those who answered in the affirmative were called to the OPD for a physical examination.

In this retrospective study, the authors identified 47 patients (43 males and 4 females). These had a mean age of 5.74 years (range 0.33-11 years).

Inclusion criteria

The inclusion criteria for the patients of this series included all patients with congenital inguinal hernia with or without undescended testis, aged less than 12 years, those patients who were fit for general anaesthesia (GA), and those patients who had no coagulopathy.

Exclusion criteria

The exlusion criteria for the patients included patients aged more than 12 years, patients unfit for GA, and patients with known coagulopathy.

Nine patients had congenital bilateral inguinal hernia while the remaining 38 patients had unilateral congenital inguinal hernia (16 left sided and 22 right sided). Five patients in this series had concurrent undescended testis (UT) and underwent concurrent LO along with the LH. The CIH in all 47 patients of this series were diagnosed by clinical examination during the OPD consultation. The patients had presented with complaint of intermittent inguinal swelling (noted by one of the parent). Among the 5 patients with UT, 4 were diagnosed by clinical examination during the OPD consultation. One patient with UT was incidentally diagnosed ‘on table’, while undergoing laparoscopic appendectomy for acute catarrhal appendicitis. In four patients who were clinically diagnosed with UT pre-operatively, an ultrasound scan of the groin area was advised. In all these 4 patients, the location of the UT was diagnosed to be just deeper to the internal inguinal ring. In 2 out of the 4 patients, the UT was left sided and in the remaining 2, it was right sided. In the 1 patient incidentally diagnosed with UT, it’s location was also just deeper to the internal inguinal ring. In this patient, the left sided congenital hernia with undescended testis was incidentally detected ‘on table’ while performing emergency laparoscopic appendectomy. None of the patients of this series had any co-morbidities or any other congenital pathology. The only pre-operative laboratory investigation done for all 47 patients was hemoglobin.

All the patients of this series were analysed for age, sex, laterality, length of procedure, length of hospital stay, complications and recurrences. The patient demographics, intraoperative information and post operative follow up information is summarized (Table 1). At the time of writing this paper, the parent/s of all the patients were interviewed telephonically with a standard questionnaire. They were asked for recurrence of hernia or undescended testis. Patients were followed up at 1,4 and 6 weeks post-surgery. Further telephonic evaluation was carried on after 6 months and then annually for 2 years. This was a retrospective study of hospital in-patient records, OPD data and information obtained from the telephonic questionnaire. The demographics of all patients of this study is summarized (Table 1).

Table 1: Patient demographics.

Patient characteristics	N (%)
Total no. of patients	47
Male to female ratio	43/4
Age range	4 months – 11 years
Hernia side	
Right	23 (49)
Left	15 (32)
Bilateral	9 (19)
Undescended testis side	
Right	2 (40)
Left	3 (60)
Bilateral	0

Statistical analysis

The statistical analysis for the present study was conducted using statistical package for the social sciences (SPSS) version 22.0 software. Proportions, percentages, and means were calculated for the different groups and reported.

Operative technique

All patients were operated upon in supine position. A 5 mm telescope along with 3 mm pediatric laparoscopic special instruments were used. Initially pneumoperitoneum was established using Verress needle with a pressure of 10 mmHg. Then the sub-umbilical optic trocar was inserted and findings noted. Then one 3 mm trocar was inserted on either side of the optic trocar, to admit the operative instruments. The herniotomy was performed using 3-0 Prolene figure of ‘8’ stitches at the hernia orifices. In the patients with concurrent UT, the testis was located. The distal gubernaculum testis was transected. Then, the proximal mobilization was performed carefully taking due care not to injure the vas or the testicular vessels. Laparoscopy affords one the luxury of deep retroperitoneal proximal mobilization, which cannot be achieved by conservative open incisions. The mobilized UT was held by atraumatic grasper and taken towards the contralateral indirect inguinal ring. If one was

able to reach there without excess tension, then the mobilization was deemed adequate. Otherwise, some more of it was performed, to reach the above mentioned goal. Once this was achieved, the testis was then introduced into the ipsilateral deep inguinal ring and directed caudad towards the scrotum.

Externally, the instrument doing this was felt through the scrotal skin and a small incision was made on it from outside, after de-sufflating the pneumopritoneum. The testis was then gently pushed through. It was then optimally positioned, while checking its lie and ensuring it was in proper anatomic position. It was then suture fixed to the inside aspect of the scrotal wall by multiple non absorbable interrupted sutures.

The scrotal incision was suture closed and pneumoperitoneum re-established. The herniotomy was then performed as described above, to conclude the surgery. The intra and postoperative details of all patients of this series are summarized (Table 2).

Table 2: Intra and post-operative details.

Variables	N
Lap herniotomy (LH)	42
Lap herniotomy + orchiopexy (LHO)	5
Average operating time (LH/LHO)	32 minutes/61 minutes
Conversion to open	0
Average hospital stay	1 day
Intraoperative complication/s (port site bleeding, significant hemorrhage, major vascular injury, injury to vas, injury to urinary bladder)	0
Postoperative complication/s (wound infection, hemorrhage)	0
Recurrence – hernia/undescended testis	0/0

RESULTS

The average duration of surgery for laparoscopic herniotomy alone was 32 minutes (range 30-34 minutes). In those patients who underwent laparoscopic orchiopexy in addition to herniotomy, the average duration of surgery was 61 minutes (range 55-67 minutes). There were no conversions to open surgery, in this study. The average length of hospital stay was 1 day.

All the patients were evaluated for intraoperative complications such as port site bleeding, significant internal hemorrhage, major vascular injury, injury to vas, and injury to urinary bladder. None of the patients of this series had any of the above mentioned minor or major intraoperative complications.

Also, all the patients were assessed for postoperative adverse events such as wound infection, and hemorrhage. No patient developed any post-operative complications/ adverse events. There were no recurrences in the present series either of the CIH or of the UT.

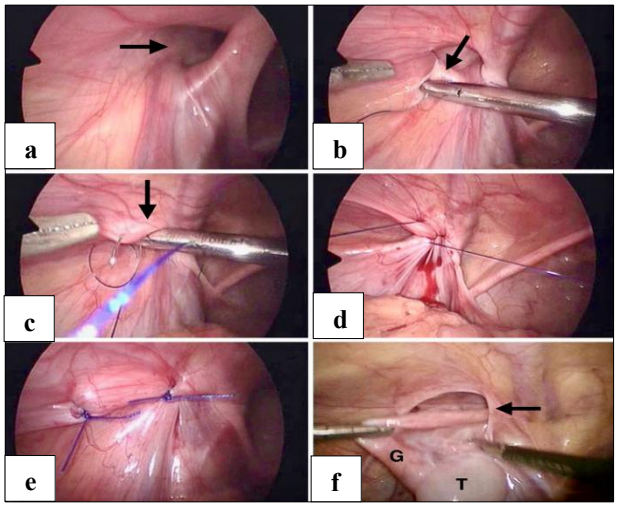

Figure 1: Operative pictures (a) left congenital inguinal hernia (black arrow), (b-e) herniorrhaphy in progress using 3-0 Prolene (black arrows), and (f) undescended testis (black 'T') in another patient seen just deep to internal inguinal ring. Gubernaculum (black 'G') being retracted and indirect congenital hernial defect noted (black arrow).

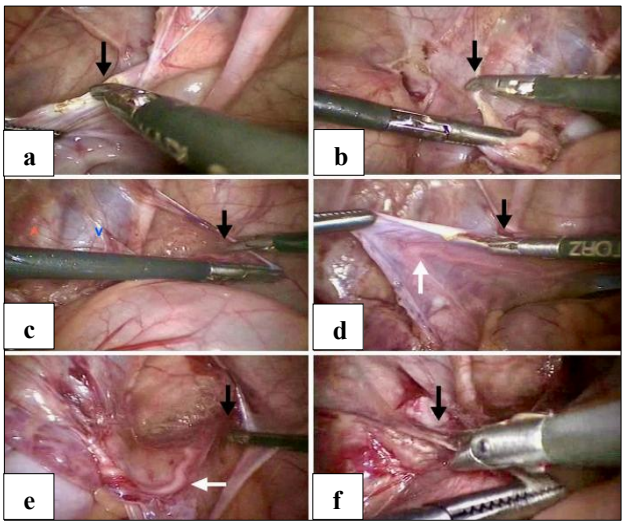

Figure 2: (a) Gubernaculum being transected (black arrow) at the beginning of orchidopexy, (b) dissection extended proximally into retroperitoneal space, (c) division of medial peritoneal fold (black arrow), (d) peritoneal attachments of vas (white arrow) carefully dissected and divided, and (e and f) mobilization extended medially (black arrow), while keeping vas (white arrow) in view.

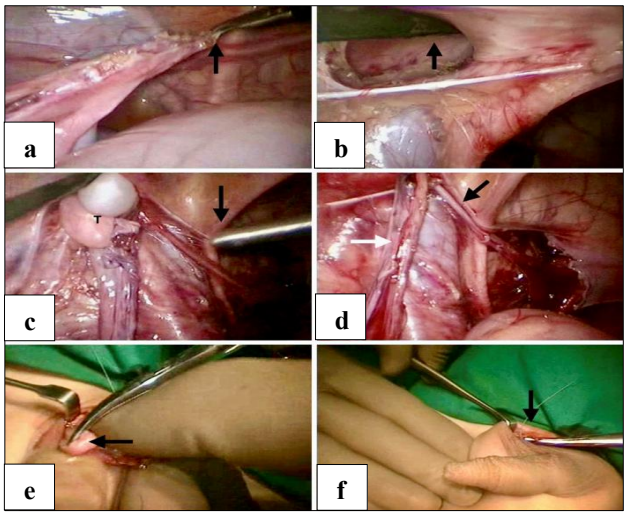

Figure 3: (a) The mobilised undescended testis being hoisted towards the contralateral indirect inguinal orifice (black arrow) to assess completeness of mobilization, (b) a curved dissector being passed thru' indirect congenital hernial defect into scrotum (black arrow), (c) the optimally mobilised testies held in anatomical position (black arrow), (d) it's insertion into the base of scrotum in anatomical position (black and white arrow), (e) scrotum incised and testis delivered out (black arrow), and (f) testis being suture-fixed to the scrotal skin from inside (black arrow).

DISCUSSION

Given their shared developmental pathway involving the patent processus vaginalis, the co-occurrence of inguinal hernia or a patent processus vaginalis with an undescended testis is remarkably high, with various studies reporting an association rate ranging from 20% to over 90%.[3] This strong correlation suggests that the presence of an undescended testis often indicates an underlying patent processus vaginalis or an associated inguinal hernia. Congenital inguinal hernias also demonstrate a distinct laterality in pediatric patients; right-sided hernias are the most common (approximately 60% of cases), left-sided hernias constitute about 30%, and the remaining 10-20% are bilateral.[3,4] The higher incidence on the right side is frequently attributed to the later descent of the right testis and the slower obliteration of the processus vaginalis in that region.[4] Even though the ideal window for orchidopexy is between 6 and 18 months of age, the procedure should still be performed if an undescended testis is diagnosed in an older child or adolescent due to the persistent risks of malignancy, impaired fertility, and potential for torsion, as well as the psychological benefits.[5]

Congenital inguinal hernias arise primarily from the incomplete obliteration of the processus vaginalis, allowing abdominal contents to protrude.[6] Risk factors include prematurity, low birth weight, and family history.[2] Undescended testes result from disruptions in the complex fetal testicular descent, influenced by hormonal, genetic, and physical factors, with potential contributions from maternal health and environmental exposures.[5]

Investigation of congenital inguinal hernias primarily relies on physical examination. Imaging is rarely needed for straightforward diagnoses, though it may be considered for unclear cases. For undescended testes, initial assessment also begins with a physical examination.[6,7] When the testis is non-palpable, imaging modalities like ultrasound and MRI often have limited accuracy in localization.[7] Specifically, ultrasound is considered to have insufficient sensitivity and specificity for reliably locating non-palpable testes.[6] Therefore, diagnostic laparoscopy is recognized as the gold standard for non-palpable undescended testes, offering superior accuracy and the significant advantage of allowing for simultaneous therapeutic intervention.[8]

Congenital inguinal hernias generally require early surgical repair after diagnosis to prevent complications like incarceration or strangulation, as they do not resolve spontaneously.[6] For undescended testes, surgical intervention (orchiopexy) is recommended between 6 and 18 months of age if spontaneous descent has not occurred by 6 months, to mitigate long-term risks of infertility and cancer.[9] While both conditions can be treated with open surgical techniques, laparoscopy offers a minimally invasive alternative, providing advantages such as smaller incisions, reduced pain, faster recovery, and the ability to assess and treat bilateral issues or non-palpable testes in a single session.[8,10] However, arguments against laparoscopy include its requirement for specialized technical skills, lack of tactile feedback, and potentially higher initial costs.[10] Conservative management is generally not recommended for true inguinal hernias due to high complication rates, and for undescended testes, it is only suitable during the first 3-6 months of life.[6,9]

The combined laparoscopic approach for pediatric inguinal hernia and simultaneous orchiopexy (addressing an undescended testis concurrently) represents a significant evolution in pediatric surgical practice. This minimally invasive technique offers compelling advantages, including reduced postoperative pain, superior cosmetic outcomes due to smaller incisions, and expedited recovery periods, which are particularly beneficial for children and their families.[11,12] Furthermore, the ability to treat both conditions in a single surgical session diminishes the overall anesthetic exposure and streamlines the patient's healthcare journey.[13]

A pivotal strength of this laparoscopic method lies in its diagnostic and therapeutic capabilities, especially concerning non-palpable undescended testes. Laparoscopy serves as the gold standard for accurately locating intra-abdominal or elusive testes, facilitating immediate orchiopexy or orchiectomy if testicular viability is compromised.[13] Critically, the magnified intraoperative view allows for the comprehensive assessment of the

contralateral inguinal region, enabling the identification and concurrent repair of an occult patent processus vaginalis or incipient hernia, thereby potentially preventing future complications and re-operations.[13,14]

However, the adoption of combined laparoscopic procedures also presents areas for discussion. One consideration is the technical learning curve associated with advanced laparoscopic pediatric surgery, requiring specialized training and equipment.[10]

While studies generally report favorable outcomes, the potential for unique complications, such as injuries related to trocar insertion or the absence of direct tactile feedback, must be acknowledged.[14]

The overall operative time for combined laparoscopic procedures might be longer than a simple unilateral open hernia repair but is generally comparable to or less than performing two separate open surgeries.[13] Ultimately, the choice between open and combined laparoscopic repair hinges on factors such as surgeon proficiency, specific patient anatomy, and the precise characteristics of both the hernia and the undescended testis.

Limitations

This study has several limitations. Since it is retrospective in nature, there is a scope for recall and misclassification biases. It was conducted at one centre, and this limits the generalizability of the results to other setups. No cost-effectiveness analysis or evaluation of cost-benefit ratio vis-a-vis open surgery was performed. This information would have been valuable in assessing the financial implications of the present procedure/s. The absence of a control group in the present study brings in the possibility of bias in the results. Without a comparison group, the true effectiveness of the procedure cannot be ascertained with absolute certainty.

CONCLUSION

As seen in this study, laparoscopic repair of congenital hernia and undescended testis is feasible in an advanced setup which is ably complemented by surgical expertise. Apart from minimal invasion, the advantage of laparoscopic intervention over open surgery for undescended testis, is extended mobilization in the high retroperitoneum, thereby enabling a single stage procedure. Another distinct advantage of laparoscopic repair of congenital hernia, especially for patients with bilateral defects, is the easy access from the same standard 3 port sites, to both groins. This obviates the need to make 2 separate incisions for such patients, as is the norm in open surgery.

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