

Clinical Presentation, Diagnostic Approach, Laparoscopic Evaluation and Treatment of Impalpable Testis

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ABSTRACT

Objective: To find out the clinical presentation, utility of ultrasound for diagnosis, laparoscopic findings and treatment for clinically impalpable testis.

Study Design: Cross-sectional study.

Place and Duration of Study: Department of Paediatric Surgery, National Institute of Child Health, Jinnah Sindh Medical University Karachi, from September 2019 to April 2020.

Methodology: Patients with clinically impalpable testis were included. Ultrasound of inguinal region was done to locate testis. Presence of testis and its position was confirmed at laparoscopy and surgical procedure done according to the findings. Data was stratified according to the age and Chi-square test and Student t-test were applied to find out statistical significance among different variables in children below and above five years of age. A $p < 0.05$ was taken as significant.

Results: Ninety-one patients with 113 testes were included. The median age of the children was 48 months. Sixty-nine (75.8%) patients had unilateral undescended testis and 22 (24.2%) bilateral undescended testes. Fifty-three (58.2%) patients were less than five years of age. On ultrasound, testis was found near deep ring in 23 (25.3%) patients. At laparoscopy, 74 (81.3%) testes were found within the abdominal cavity. In 7 (7.7%) patients, only nubbin of tissue was identified and removed. The first stage of Fowler Stephen procedure was done in the majority of the patients. There was statistically no significant difference following stratification in relation to laterality and position of undescended testis ($p = 0.556$ and $p = 0.846$, respectively). However, mean size of the testis was found statistically significant ($p = 0.032$).

Conclusions: Most of the patients were above five years of age. Ultrasound helped in identifying low-lying intra-abdominal testis in more than 80% of patients. Laparoscopy was helpful in further defining the position of the testis and selection of surgical procedure.

Key Words: Undescended testis, Cryptorchidism, Laparoscopy, Orchiopexy.

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INTRODUCTION

The term cryptorchidism is used for any testis which is not palpable on clinical examination. However, strict usage of this term is suggested for only those testes which are located in abdominal phase cavity. Descent of testis from abdomen to scrotum occurs in two phases, the abdominal phase and inguino-scrotal phase. These phases are regulated by a complex regulatory mechanism.¹

It is important for the testes to remain at 2° C to 4° C lower than the core body temperature in order to achieve its growth and normal spermatogenesis.² It is, therefore, important to identify and operate upon these children, early for optimal outcome.

In most of the children, clinical examination can identify location of the undescended testis which may be anywhere in the path of its normal descent or in an ectopic position. Few of the testes are of peeping type that may enter transiently into inguinal canal and then retract into the abdomen through deep ring. About 20% testes are either intra-abdominal in location or congenitally absent.³ It is important to inform the parents about congenital absence and possibility of atrophic testis in some children.⁴

Ultrasound has been used extensively in diagnosing the location of undescended testis, though the diagnostic value of this investigation has been questioned by many. In one study, a sensitivity of 45% and specificity of 78% have been reported.^{5,6}

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Table I: Impalpable testis: laterality ultrasound and laparoscopic findings (number of patients = 91, number of testes = 113).

Variables	Age <5 years (n=53)	Age >5 years (n 38)	p-value
Distribution (n=91)			
Unilateral (n=69)	39 (73.6%)	30 (78.9%)	0.556
Bilateral (n=22)	14 (26.4%)	08 (21.1%)	
Ultrasound findings			
Found deep to internal ring (n= 60)	34 (64.2%)	26 (68.4%)	0.672
Not Found (n = 31)	19 (35.8%)	12 (31.6%)	
Laparoscopic findings			
Abdominal - High lying	06 (11.3%)	04 (10.5%)	0.846
Abdominal - Low lying	37 (69.8%)	27 (71.0%)	
Peeping - Vas deferens and testicular vessels entering into inguinal canal	05 (9.4%)	05 (13.2%)	
Absent / Nubbin of tissue at the end of vas deferens and testicular vessels	05 (9.4%)	02 (5.3%)	
Mean size of testis (Length x Breadth) cm	1.793 ± 0.623	2.118 ± 0.801	0.032*

An expert ultrasonologist can identify a testis that is located in abdominal cavity within 2cm of deep ring.⁷ MRI has been recommended in some studies for identifying testes that are intra-abdominal in location. However, a review article did not find it useful in patients with clinically impalpable testis.⁸ Laparoscopy is a modality that helps in diagnosis as well as treating patients with undescended testis located in the abdominal cavity.

There is dearth of studies that address the management of testes that are intra-abdominal in location; and various approaches have been proposed to deal with them.⁹⁻¹² This study was conducted to find the current diagnostic and management practices for identifying impalpable testis with reference to diagnostic modalities, size, testicular pedicle length and procedure performed for its management.

METHODOLOGY

This was a cross-sectional study, conducted at the National Institute of Child Health, Jinnah Sindh Medical University, Karachi, from September 2019 to April 2020. The study was approved by the Institutional Review Board. The sample size was calculated using WHO sample size calculator. With 95% confidence interval, 7% margin of error (d), 13.4% of expected prevalence (p), and a sample size of n = 91 patients was obtained. Children who presented to the outpatient department with clinically impalpable testes were enrolled. Patients with disorders of sex development and urogenital anomalies were excluded.

Ultrasound was done in all cases for localisation of testis and its size. A baseline biochemical profile was obtained and anesthesia fitness has taken before the surgery. All patients in whom testes were not palpable on clinical examination and not found in inguinal canal on ultrasound were subjected to laparoscopy. Parents were counselled about the laparoscopic procedure and informed consent was taken. Laparoscopy was performed by standard technique with creation of pneumoperitoneum and placement of 5mm camera port through the umbilicus. If pedicle was found

short, then testicular vessels were either clipped or diathermised. The second stage procedure was scheduled after at least six months of initial surgery. If pedicle of the testis was found of adequate length, then single-stage procedure was performed. In children where vas deferens and vessels were found entering into the deep ring, an inguinal exploration was done. In patients where testis was found as a nubbin of tissue at the end of vascular pedicle then it was removed and sent for histopathology.

The data was entered into SPSS version 22.0 and analysed. Descriptive and analytic statistics were applied for data presentation. Mean with standard deviation and median were calculated for quantitative variables like age, and size of testis. Frequencies and percentages were computed for categorical variables like ultrasound findings, position at laparoscopy, and surgical procedure performed. The stratification of the results was done according to the age at presentation. Post-stratification, Chi-square tests, likelihood ratio test and Student t-test were applied for statistical significance. A p <0.05 was considered as significant.

RESULTS

A total of 91 children with cryptorchidism were included in the study. The mean age of the children was 63.98 ± 44.15 months, and median was 48 months, ranging from 9-156 months. There were 69 (75.8%) patients with unilateral undescended testis; of which, 47 (51.6%) were on the left and 22 (24.2%) on the right side. Twenty-two (24.2%) patients had bilateral undescended testes. Fifty-three (58.2%) patients were less than five years of age. There was no statistically significant difference in terms of laterality and position of testis between the groups (p=0.556 and p = 0.846, respectively).

On ultrasound findings, testes were found inside abdomen near deep ring in 23 (25.3%) patients and intraperitoneal in 45 (49.5%). At laparoscopy, 74 (81.3%) testes were found within the abdominal cavity. In seven (7.7%) patients, only nubbin of tissue (hypoplastic/atrophic) attached to tenuous

testicular vessels. In 8 (8.8%) cases, vas deferens and testicular vessels were seen entering into the inguinal canal. The first stage of Fowler Stephen orchiopexy was performed in 72 (79.1%) and single-stage procedure in 2 (2.2%) cases. Inguinal exploration was done in 10 (11.0%) patients where vas deferens and vessels were seen entering into deep ring. At inguinal exploration, nubbin of tissue was found in four cases, which was removed and sent for histopathology. In six patients, small size testis was present and orchiopexy was done. The mean size of the testis, after stratification with age, was significantly different ($p = 0.032$, Table I).

DISCUSSION

This study specifically addressed clinically impalpable testis only. The overall incidence of this type of undescended testis varies in different series and is reported as high as 20%.¹³ The overall incidence of bilateral impalpable testes also varies; and in one study, it was reported as 14.6%.¹⁴ In this series, unilateral undescended testis was found in more than 75% of the patients. This is much higher than the figures reported in the literature.

This data showed that patients with clinically impalpable testis were brought late to hospitals for treatment. The stratification of data according to the age showed that 42% of patients were above five years of age at the time of referral. The diagnosis was delayed as both parents and primary physicians did not notice the absence of testis. In a study from the United States on referral pattern of boys suspected of having undescended testis by Snodgrass *et al.*, the median age of referral was 43.3 months which is almost similar to this study figure of 48 months.¹⁵ Therefore, scrotal asymmetry should alert the parents to seek early opinion.

The role of ultrasound in the diagnosis of clinically impalpable testis is controversial. Abbas *et al.* in their study did not find ultrasound as a reliable investigation in localising testis.¹⁶ Tasian *et al.* in a meta-analysis on the diagnostic performance of ultrasound in patients with impalpable testis found sensitivity of 45% and specificity 78%. They concluded that this diagnostic modality did not identify testis in a large number of cases and the cost of treatment increased.⁵ However, in this study, ultrasound could identify testis in 65.9% of cases in abdomen, deep to internal ring. These findings were later confirmed at laparoscopy. In a study of 23 patients with clinically impalpable testis, laparoscopy was more cost-effective with the added advantage of being therapeutic in patients with clinically impalpable testis.¹⁷ Thus, this modality helps both in diagnosis as well as treatment.

Mehendale *et al.* in a study that spanned over 20 years, performed laparoscopy in children with impalpable testis and performed the Fowler Stephen technique.¹⁸ In this study, the same technique for orchiopexy was used. Single-stage orchiopexy is possible where testis has a long vascular pedicle. Testicular vessels in the staged procedure are divided after application of titanium clips or may be suture

ligated. The duration of the procedure on average was less than 15 minutes. Patients in this study had hospital stay of less than 24 hours in postoperative period. In follow-up, no procedure-related early complications were found.

According to Matsumoto *et al.*, anorchia is a condition in which testis is congenitally absent. The bilateral anorchia is reported to occur in 1 in 20,000 and unilateral in 1 in 5000 males.¹⁹ In vanishing testis syndrome, it is hypothesised that *in-utero* torsion of testis occurs. Testicular hypoplasia and atrophy are often used synonymously and referred to those cases where nubbin of tissue is found at the end of vas deferens and spermatic vessels. In this study, no testis was found in one patient. Seven (7.7%) testes were represented as a nubbin of tissue, which were removed. In a study of Cisek *et al.*, testicular hypoplasia was found in 9.8% of patients at laparoscopy. They removed all such structures.²⁰

In this study, anomaly of vas deferens was not found. However, Samadi *et al.* reported two patients where vas deferens was absent at laparoscopy. They also found four hypoplastic testis in a cohort of 173 patients managed over eight years.²¹ In a series by Mehendale *et al.*, no testis was found in 21 (8.7%) out of 241 patients. They also performed laparoscopic orchiectomy in 20 cases for nubbin of tissue found at endoscopy.¹⁸ In this study, vas deferens and vessels were found entering the inguinal canal in eight patients. All these patients underwent inguinal exploration in the same sitting. In six patients, testes were found and orchiopexy was done. By definition, these were either of peeping type or testes may be of small size and thus not picked up either at clinical examination or during ultrasound, especially in a chubby child.

Documentation of size of undescended testis helps in following the children into the adolescent age. There is minimal change in the size of the testis pre-pubertal children. Nomograms have been developed for documenting size of the testis in different age groups. These are based upon measurement done on normal population. For this purpose, various types of orchidometers are available of which the instrument made by Prader is the most frequently used. More accurate measurement can be done with the help of ultrasound. The volume of the testis can be calculated by multiplying its length, breadth and width. There are other methods of calculating size and different equations have been proposed when only length and breadth of testis are used.²²

Peroperative measurement of the size of testis with Vernier caliper is the most accurate method. However, during laparoscopy it is not practically possible to use it. In this study, the size was measured by approximating length and breadth of the testis with silk thread. There was significant increase in mean area of the testis in children older than five years. This reflects that growth of testis does take place while it is in the abdominal cavity.

In this study, Fowler Stephen-staged orchiopexy was performed in the majority of the patients. By adequate mobilising vascular pedicle of testis where possible, single-stage orchiopexy can be done. However, there are instances where single-stage procedure may not be possible and one has to resort to staged-orchiopexy. Various techniques have been introduced to improve the testicular salvage rate in a staged procedure.²³ This strengthens the observation that intra-abdominal testes still pose a challenge to the surgeons, thus further research is needed in terms of clinical presentation, treatment methods.

CONCLUSIONS

A large number of children were brought late to hospital for the treatment of intra-abdominal testis. Ultrasound was an effective method in identifying testes that were just proximal to deep ring. Laparoscopy provided details of location of testis inside abdomen and helped in most of the patients to complete the first stage of orchiopexy.

ETHICAL APPROVAL:

Approval was obtained from the Ethical Committee of the Institution.

PATIENTS' CONSENT:

Informed consents were obtained from the parents of the patients to publish the data.

CONFLICT OF INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

RA, JA: Concept, design.

RA: Data collection.

RA, JA, SMRHT, NZ, SB: Analysis or interpretation, writing and critical reviews and final approval.

RA, JA, SMRHT, NZ: Literature search.

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