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Efficacy of Laparoscopy in The Management of Unilateral Nonpalpable Testis

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Abstract

Background Undescended testis is one of the most common malformations seen in the field of pediatric surgery. The most problematic aspect of undescended testis is the diagnosis and treatment of nonpalpable testis. Laparoscopy has been widely used for the diagnosis and treatment of nonpalpable testis.

Objective To evaluate the role of laparoscopy in the diagnosis and treatment of unilateral nonpalpable undescended testis.

Methods This is a prospective study carried out in the period from December 2012 to December 2017 in the Pediatric Surgery Department of a tertiary hospital in Baghdad. We used laparoscopy in the diagnosis and treatment of 40 patients aged between one and 12 years (median age 4.9 years) with unilateral nonpalpable undescended testis. Boys with a palpable testis at any point were excluded from the study. Surgical procedure was individualized according to the laparoscopic findings either by one stage laparoscopic orchiopexy, two stage Fowler-Stephens procedure or laparoscopic orchiectomy.

Results Laparoscopy was able to diagnose the site of the nonpalpable testes in all the patients. Out of 40 nonpalpable undescended testes, 26 testes (65%) were intra-abdominal (12 testes were low intra-abdominal, 14 testes were high intra-abdominal). In 9 patients, (22.5 %), the vas deferens and spermatic vessels were found entering the internal inguinal ring. In 3 patients, (7.5 %), the testes were vanishing, and the testes were absent in 2 patients (5%). All patients with low intra-abdominal testes (n=12) were subjected to one stage laparoscopic orchiopexy through the normal inguinal ring. Out of 14 patients with high intra-abdominal testes, 7 patients underwent two staged Fowler-Stephens laparoscopic procedures, while three patients were treated by laparoscopic Prentiss maneuver and the remaining 4 patients underwent immediate laparoscopic orchiectomy due to presence of an atrophied testis. Patients with the vas deferens and spermatic vessels entering the internal inguinal ring (n=9) were treated by orchiopexy via conventional inguinal approach.

Conclusion Laparoscopy for unilateral nonpalpable testis has an excellent diagnostic yield combined with high success rate following repair.

Keywords Laparoscopy, nonpalpable undescended testis, Fowler-Stephens procedure

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List of abbreviations: None

Introduction

Undescended testis or cryptorchism is the most common genital problem in male children [(1)]. It occurs in

approximately 3% of term male infants and in up to 33-45% of premature infants [2]. However, the prevalence of cryptorchidism drops to 1% at end of 12 months [3]. Cryptorchism is associated with a variety of potential consequences like neoplasia, infertility, testicular torsion, inguinal hernia, psychological stigma, and parents' anxiety. Treatment of undescended testes is aimed at minimizing these risks [4,5]. The clearest classification divides testes into palpable (80%) and nonpalpable (20%). The nonpalpable testes may be due to intra-abdominal location, vanishing testis, agenesis, inguinal location with a different grade of dysplasia or atrophy, or ectopic testis [6].

The mainstay of therapy for the palpable undescended testis is orchiopexy with creation of a subdartos pouch. For a unilateral unilateral undescended testis that is not palpable under anesthesia, initial management may be either through diagnostic laparoscopy or inguinal exploration. In the last decade, laparoscopy has become the preferred approach [7]. It has replaced ultrasound and magnetic resonance imaging for the localization of a nonpalpable testes and become the most widely used and most useful diagnostic modality in the management of the nonpalpable testis [8]. Laparoscopy is the most sensitive and specific procedure to localize the nonpalpable testis with an accuracy rate of over 95% [9]. The primary advantage of laparoscopy over initial inguinal exploration for a nonpalpable testis is that laparoscopy avoids injury to the collateral vasculature that may occur with initial inguinal dissection [10].

Options for dealing with the intraabdominal undescended testis include:

1. If the testicular vessels appear blind ending, some have recommended no further exploration, although this is controversial.
2. If the testicular vessels are seen entering the internal ring, inguinal exploration is performed [7].
3. If the testicular vessels end blindly in the inguinal canal, the tip of the vessels can be sent for pathologic examination.
4. If diagnostic laparoscopy reveals a viable intra-abdominal testis, several options are available depending on its location, including:

A. If the gonadal vessels are long enough and the testis lies caudal to the iliac vessels, orchiopexy may be performed via open or laparoscopic approach depending on surgeon preference [11].

B. When the gonadal vessels are too short, there are various options:

i. A neoinguinal ring may be created medial to the inferior epigastric vessels to shorten the path for scrotalization of the testis (Prentiss maneuver) [7].

ii. A staged orchiopexy can also be performed in which the high abdominal testis with its cord structures is first mobilized as low as possible. Six to 12 months later, it is mobilized into the scrotum.

iii. Two-stage Shehata orchiopexy can be performed laparoscopically. In the first stage the intraabdominal testicleis first mobilized and then the gonad is placed on tension within the abdomen. In the second stage, further mobilization of the testicle into the scrotum is performed while preserving the spermatic vessels [12].

iv. Alternately, a two-stage Fowler-Stephens orchiopexy can be performed typically laparoscopically. In the first stage the tethered testicular artery is divided. In the second stage, after 6 months when collaterals have formed, the testis is brought down on a wide pedicle of peritoneum containing the remaining vessels [13].

v. The single-stage Fowler-Stephens procedure can also be performed [13].

vi. Other options include microvascular orchiopexy (autotransplantation).

5. If the testis is atrophied, whether found in the abdomen or the inguinal canal, a laparoscopic or open orchiectomy is recommended. Debate exists regarding the role of contralateral fixation in cases of monarchism because of differing assumptions related to potential torsion. This largely remains the surgeon's preference [7].

This study aimed to evaluate the role of laparoscopy in diagnosis and treatment of unilateral undescended testis.

Methods

This is a prospective study of 40 patients with unilateral nonpalpable undescended testis conducted over the period from December 2012 to December 2017 in the Pediatric Surgical Department in a tertiary hospital in Baghdad. The study included all patients aged between one and 12 years with unilateral nonpalpable undescended testis whereas patients with palpable undescended testis at any point and those with bilateral nonpalpable undescended testes were excluded from the study.

A special data form had been used including variables such as name, age, clinical examination, investigations (including ultrasonography and magnetic resonance imaging), anatomical site affected, laparoscopic finding and follow-up findings after 6 months-2 years.

After confirming the diagnosis, a written informed consent was taken from each patient's parent or guardian. All patients were examined under general anesthesia with muscle relaxation and endotracheal ventilation, the inguinal region and scrotum of the affected side were carefully palpated.

Laparoscopy was performed with the patient in supine position. Small umbilical incision was made and a 5 mm umbilical port was inserted. Thereafter, the peritoneal cavity was insufflated with CO_2 under a pressure of 6 to 10 mmHg. After the insertion of the telescope, hollow viscera and other organs were assessed to exclude injury. Next, the internal inguinal ring, vas deferens and spermatic vessels, testicular size and position were evaluated. Comparison with the contralateral side was made. Then two (5 mm) working ports were inserted at both iliac fossae for orchiopexy and vessels clipping and transaction. Subsequent surgical procedure was individualized according to the laparoscopic findings.

1. Intraabdominal testes:
   a. Low intraabdominal testes (<2.5 cm from deep inguinal ring): single-stage laparoscopic orchiopexy through normal deep inguinal ring
   b. High intraabdominal Testis (≥2.5 cm from deep inguinal ring): two-stage Fowler–Stephens procedure or Prentiss maneuver.
2. When vas deferens and vessels were found entering the ring: inguinal exploration with assisted laparoscopy followed by orchiopexy.
3. Vanishing testes (blind ending vessels) and absent testes (no vas and vessel): no intervention was required
4. Atrophied testes: Laparoscopic orchiectomy.

All patients who underwent laparoscopic procedure were discharged from the hospital on the next day. Thereafter the patients were followed up at regular intervals (6 months to 2 years). The testes assessed by clinical examination, ultrasound and color doppler study for its position and size. For outcome analysis, success was defined as a testis that remained in the scrotum with no atrophy or decrease in size at a follow-up.

Results

Within the study period, a total of 40 patients underwent diagnostic and therapeutic laparoscopy for unilateral nonpalpable testis. The age ranged between 1 and 12 years, the median age was 3.9 years. Twenty-six patients (65%) had right sided nonpalpable testes, while 14 patients (35%) had left sided nonpalpable testes.

During laparoscopy, A total of 26 testes (65%) were detected intra-abdominal, including 12 patients (30%) with low intra-abdominal testes

within 2.5 cm of internal inguinal ring, and 14 patients (35%) with high intra-abdominal testes. The laparoscopic treatment of intra-abdominal testes varied according to their morphology and position. In patients with low intra-abdominal testes (n=12), one stage laparoscopic orchiopexy through normal inguinal ring had been performed. Seven out of 14 patients of those with high intraabdominal testes underwent two staged Fowler–Stephens laparoscopic procedure with initial vascular transection. Three patients were subjected to laparoscopic Prentiss maneuver. In the remaining four patients with high intra-abdominal testes, the testes were found to be atrophied, so immediate laparoscopic orchiectomy had been done for them (Table 1) (Figure 1).

In nine patients (22.5%) the vas deferens and spermatic vessels were seen entering the internal inguinal ring. These patients were subjected to open orchiopexy using the conventional inguinal approach. In one of them hypoplastic testis was detected. Vanishing testes were found in three patients (7.5%) while the testis was absent in two patients (5%). No surgical treatment was needed in these five patients (Tables 1 and 2), (Figure 2).

Table 1. Diagnostic findings of laparoscopy in nonpalpable undescended testis

Diagnosis	No. (%) of patients
Low intra-abdominal testis (within 2.5cm from deep inguinal ring)	12 (30%)
High intra-abdominal testis (more than 2.5 cm from deep inguinal ring)	14 (35%) (10 not atrophied and 4 atrophied)
Vas and vessels entering the inguinal ring	9 (22.5%)
Vanished testis (blind-ended vessels and vas deferens)	3 (7.5%)
Absent testis	2 (5%)
Total	40 (100%)

Table 2. Therapeutic approach for nonpalpable undescended testis

Therapeutic approach	No. (%) of patient
Single stage laparoscopic orchiopexy through normal inguinal ring	12 (30.0%)
Two stages Fowler-Stephen laparoscopic procedure	7 (17.5%)
Prentiss maneuver (single stage laparoscopic orchiopexy)	3 (7.5%)
Laparoscopic orchiectomy for atrophied intraabdominal testes	4 (10.0%)
Open orchiopexy (when the spermatic vessels are entering inguinal ring)	9 (22.5%)
No surgical intervention (vanished and absent testis)	5 (12.5%)
Total	40 (100%)

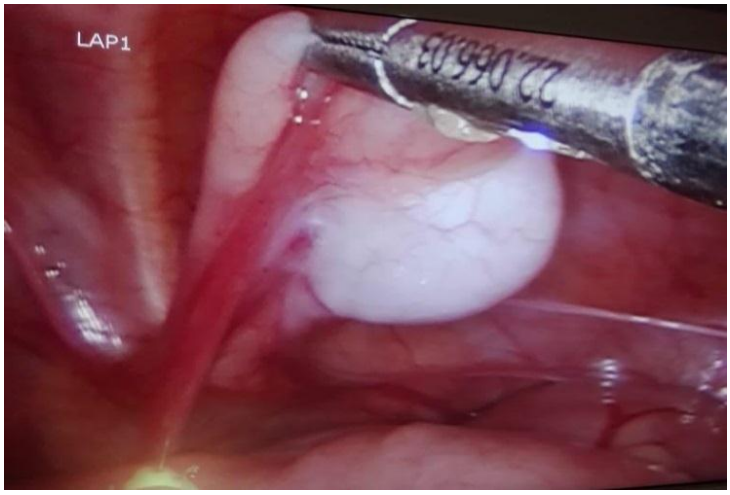

Figure 1. The testis is within 2.5 cm of deep inguinal ring

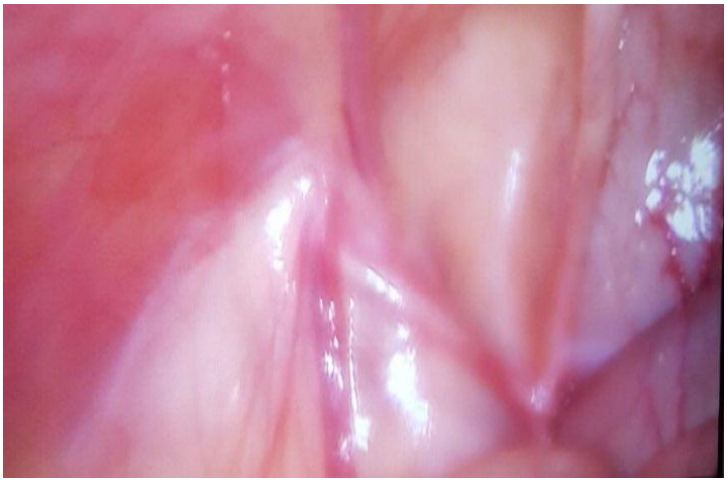

Figure 2. The testis is within 2.5 cm of deep inguinal ring

Regarding period of follow-up (6 months to 2 years with median follow up of 12 month) after operation, patients with orchiectomy and vanishing testes had been excluded from follow up (9 patients). By clinical examination, ultrasound and color doppler study, a good size and morphology of the testes were found in 28/31 patients (90.3%) whereas 3/31 (9.7%) testes had been found to be atrophied during follow-up. Two of these atrophied testes were became atrophic after 2 stages Fowler-Stephens technique, and the remaining other atrophied testicle was becoming atrophic after conventional inguinal approach for open orchiopexy (this was hypoplastic during primary orchiopexy). The successful rate of laparoscopic orchiopexy in patients with intraabdominal testes was (90.9%) (Table 3).

All testes underwent single stage laparoscopic orchiopexy were located in their hemiscrotums with good size. Whereas 5/7 (71.4%) testes which had 2 stages Fowler-Stephens laparoscopic orchiopexy were found in their hemiscrotums with good size and remaining 2/7 testes were atrophic.

Table 3. Postoperative follow up regarding site and size of testis

Site and size of the testis	No. (%) of patient
Good scrotal position and size of testis	26 (83.8%)
Good scrotal position but atrophied testis	2 (6.5%)
Testis at the neck of scrotum with good size	2 (6.5%)
Atrophied testis at the neck of scrotum	1 (3.2)
Total	31 (100%)

Discussion

An undescended testis is one of the most common clinical disorders of childhood [14]. About 20% of undescended testes are nonpalpable on physical examination [15]. Nowadays, laparoscopy is the most reliable diagnostic modality in the management of nonpalpable testes [16].

In our series, laparoscopy was used as a tool for diagnosis and definitive management of unilateral nonpalpable testes in 40 patients over a period of 5 years (2012-2017). The median age group of our study was 3.9 years with patients from 1 to 12 years. Zubair et al. [17] have reported similar median age group as 4 years (9 month-12 years). The mean age of presentation reported by Zouari et al. [18] was 3.8 years. Despite the recommendations for the treatment of the undescended testis before 2 years of age, many of our patients were older. Illiteracy, ignorance and poor awareness, late referral to the surgical clinic in and low socioeconomic condition may be the reason for this late presentation in our patients. Tang et al. [16] identified that the main cause of delay in presentation to the surgical clinic was due to late referral of patients.

Regarding the laterality of nonpalpable undescended testes we found that undescended testes is more common on the right side than the left side, which is similar to Hamidi et al. [19] study who reported right sided undescended testes in 61% and left sided in 39% of all patients. The commonest position of nonpalpable testes in our study was intra-abdominal 26 out of 40 (65%) of which 30% were low intra-abdominal and 35% were high intra-abdominal). Other studies found that the percentage of intra-abdominal testes range from 52% to 87% [20-23]. In our study morphology of the testis was correlated with the position of testis and the actual age of the patient which revealed that features of atrophy were higher in high intra-abdominal testis and older age groups and this was similar to that reported in Humphrey et al. [24] and Boeckmann et al. [25] studies.

During the follow-up period, all 12 testes that underwent single stage laparoscopic orchiopexy were located in their hemiscrotums with good size, which translate to a success rate of 100%. Whereas 5 out of 7 testes, which had two staged Fowler-Stephens laparoscopic orchiopexy were found in their hemiscrotums with good size while 2/7 were found to be atrophied. So, the success rate of 2 stages Fowler-Stephens laparoscopic orchiopexy in our study was 71.4%. Most of the unsuccessful outcomes involved the high intra-abdominal testis with very short pedicle. Other studies reported similar success rates for single and two staged laparoscopic orchiopexy [17,26]. The two-stage laparoscopic Fowler-Stephens procedure is currently the most popular technique for intra-abdominal testes, with success rate of about 80–85% [27,28].

During the study period, laparoscopic orchidopexy for intra-abdominal testes provided an overall success rate of (90.9%). The success rate of operation was varies from 74- 91.1% in the literature [29].

In this study, the deep inguinal ring with vas deferens and vessels traversing it were found in 9 patients (22.5%). All these patients underwent conventional inguinal exploration with orchiopexy. The significance of this fact was that these patients had testis in the superficial inguinal pouch. The difficulty in

palpating the testis could be contributed to obesity, the small size of the testis or peeping testes. Other studies described a percentage of inguinal testes in range of 24-42% [22,23,26,30].

In this study, the testes were vanishing in three patients (7.5%) and absent in two patients (5%) due to agenesis. In these patients, laparoscopy has benefit in avoiding unnecessary groin exploration. Zubair et al. [31] and Godbole et al. [32] have reported that unnecessary exploration can be avoided in 20% and 42% cases, respectively. Denes et al. [30] reported that laparoscopic surgery was the definitive diagnostic method in patients with testicular agenesis or vanishing testis and saved these patients from any further incision or unnecessary investigation.

Collectively, the diagnostic yield of laparoscopy in our study was 100% and the overall therapeutic yield was 87.5%, as there were five patients (12.5%) with vanishing and absent testes on laparoscopy. Dar et al. [22] has reported 100% diagnostic yield of laparoscopy and 96.9% therapeutic yield as they could localize and manage 32 nonpalpable testes with only one vanishing testes on laparoscopy.

This study concluded that laparoscopy for unilateral nonpalpable testis has an excellent diagnostic yield combined with high success rate following repair, which agree with previous studies.

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Author contribution

Dr. Zain and Dr. Fadil: collection of data, statistical analysis and writing the first draft of manuscript. Dr. Mohammed and Dr. Abdul-Hassan made the final draft of manuscript.

Conflict of interest

The authors declare no conflict of interest in publishing this article on competitive intention.

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