Open Journal of Urology, **2013, 3, 276-280**
Published Online November 2013 (http://www.scirp.org/journal/oju)
http://dx.doi.org/10.4236/oju.2013.37052

Laparoscopic Management for Non-Palpable Testis

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Received October 10, 2013; revised November 5, 2013; accepted November 12, 2013

ABSTRACT

Purpose: To present our experience with laparoscopic management of the non-palpable undescended testis. **Patients and Methods:** Between Nov. 2010 and Oct. 2012, 47 non-palpable testes in 41 patients were evaluated prospectively by laparoscopy. The age of the patients at the time of surgery varied from 1 to 9 years with a mean age of 2.85 years. Testicular viability and location were evaluated by physical examination and Doppler ultrasonography after 1 and 3 months. **Results:** Out of 49 testicular units, 47 (95.9%) were successfully treated by laparoscopic orchiopexy. 45 testicular units (91.8%) were treated by one-stage laparoscopic orchiopexy, 2 (4.1%) were treated by two-stage laparoscopic orchiopexy and 2 (4.1%) diagnosed as vanishing testis with detection of blind end spermatic vessels and vas deferens during laparoscopy. Physical examination and Doppler study demonstrated that 46 of 47 testes (97.9%) were viable and 45 of 47 (95.7%) were located in the lower scrotum and 2 of 47 (4.3%) in the upper scrotum at the end of follow-up. **Conclusion:** The laparoscopy is a reliable technique for diagnosis and treatment of the non-palpable intra-abdominal testis with high success and survival rates of the testes.

Keywords: Laparoscopy; Orchiopexy; Undescended Testis

1. Introduction

An undescended testis is one of the most common clinical disorders of childhood, occurring in approximately 3% of full-term newborns, 21% of premature newborns, and 0.8% - 1.8% of 1-year-old boys [1]. In the boys with undescended testis, the testis is palpable in the groin in 80% [2] and non-palpable in 20% and 20% - 50% of those with non-palpable testis, the testis is absent [3]. A non-palpable testis is defined as, a testis not palpated by any examination technique, including pre-operatively under anaesthesia [4]. Non-palpable testes have an increased risk of malignant transformation, infertility and epididymal malformation [5].

Many diagnostic methods have been described of which the most promising method is the use of diagnostic laparoscopy. Non-palpable undescended testis management basically includes four surgical techniques: 1) Open orchidopexy in stages; 2) Fowler-Stephens orchidopexy in which spermatic vessels are sectioned and the deferential artery is preserved in 1 or 2 stages by open or laparoscopic approach; 3) Testicular autotransplant with spermatic vessel section and microsurgical anastomosis to the epigastric vessels and 4) laparoscopic orchidopexy.

Of the above mentioned techniques, laparoscopic orchidopexy is gaining in popularity, and has an 88% - 100% cure rate [4]. Its advantages are greater dissection of spermatic vessels and vas deferens and the creation of a medial neohiatus that consequently shortens the distance between the abdominal cavity and the scrotum during testicular descent. This technique was originally described for intra-abdominal undescended testis management but it has also been employed in high palpable undescended testis with good results [6]. We aimed to present our experience with laparoscopic management of the non-palpable, intra-abdominal, undescended testis.

2. Patients and Methods

Study design, patient selection and assessment: This prospective study was conducted between Nov. 2010 and Oct. 2012, Patients were consecutively enrolled from patients referred to the urology and pediatric clinics at Ghodran Hospital, Baljurashi, Kingdom of Saudi Arabia (KSA) for treatment of undescended testis. All patients underwent thorough history-taking, physical examination and abdominal ultrasonography. A testis was considered non-palpable if it was not palpable clinically or detected

by abdominal ultrasonography. The intra-abdominal vanishing testis syndrome (unilateral anorchia) was diagnosed if the spermatic vessels and vas deferens were noted to end blindly during laparoscopy. Accordingly, surgical exploration was not performed in these cases. If an intraabdominal testis was identified laparoscopically, orchiopexy was done. The study protocol was approved by the Ethics Committee of Ghodran Hospital, KSA and parents of all patients enrolled in this study provided written informed consent.

Laparoscopic technique: Diagnostic laparoscopy was performed in 41 patients with non-palpable testis. A clear diet was started on the day before surgery and a fasting of 4 - 8 hours according to their age was applied before laparoscopy. A single dose of cefazolin sodium 40 mg/kg was given by IM route for prophylaxis. Before laparoscopy, physical examination was repeated under general anaesthesia in order to palpate the testes. A urethral catheter was inserted into the bladder. A patient was placed supine in the frog-leg position and in the 30 degrees Trendelenburg position. A U-shaped incision of 1 cm length was made just below the umbilicus. The anterior wall of the abdomen was pulled upwards and then a 10 mm trocar was inserted into the abdominal cavity by open technique. CO_2 was insufflated to achieve pneumoperitoneum at a pressure of 10 mm Hg. A zero degree 10 mm laparoscope was inserted and the abdominal organs were inspected. During the diagnostic laparoscopy, intraperitoneal examination for a unilateral non-palpable undescended testis began with examination of the normal contralateral internal inguinal ring, vas deferens and spermatic vessels. Followed by determination and evaluation of the median (urachus), medial (obliterated umbilical artery) and lateral (inferior epigastric artery) umbilical ligaments, external iliac vessels, any potential intra-abdominal testis, the vas deferens, spermatic vessels and the patency of internal ring of the affected side were determined. Anatomic orientation of the localization and volume, mobility of the testis, the distance between the testes and the inguinal canal, paratesticular anomalies, lengths of vas deferens and spermatic vessels and presence of inguinal hernia were assessed to proceed with either orchiectomy or orchiopexy and either one or two stage orchiopexy. Blind-ended vas deferens and spermatic vessels were considered as vanishing testis.

Mobilization of the testis was performed by incising of the peritoneum over the superior border of the internal ring. The gubernaculum was identified and mobilized circumferentially to provide traction by grasping its testicular end. Dissection was continued distally along the gubernaculum until the scrotum began to invaginate. The gubernaculum was transected using electrocautery as far as possible. Dissection was continued cranially toward the renal hilum as far as possible to gain enough length on the spermatic cord to allow tension free orchiopexy. The peritoneum over the vas may also be incised to gain additional length. If the spermatic vessels remained too short, we performed a first stage Fowler Stephens procedure by placing 2 endoscopy clips as far proximal as possible on the cord vessels, the vessels were transected between clips. If adequate length was obtained, the tip of the endoscopy dissector was placed medial to the inferior epigastric vessels and lateral to the medial umbilical ligaments on the anterior abdominal wall. Then the dissector tip was directed toward the ipsilateral hemiscrotum. A 5 mm trocar cannula was passed over the dissector through the scrotal incision into the abdominal cavity and the free end of gubernaculum was grasped and the testis was brought into approximation with the end of the trocar. The testis, grasping forceps and trocar were withdrawn through the scrotum. The cord structures were inspected to verify that were not twisted. Two 3-zero polydioxanone sutures were used to complete the orchiopexy distally as possible in created sub-dartos pouch. Finally, the pneumoperitoneum was deflated and the fascia and skin were closed.

The patients underwent the hospital care and medications (cefazolin sodium 40 mg/kg) and discharged on outpatient medications (amoxicillin 45 mg/kg). They were invited to visit the outpatient clinic for follow-up.

Follow up: Patients were followed after one week, one month and 3 months from laparoscopic orchiopexy operation. Detailed medical history and physical examination were done at each follow-up visit. Scrotal Doppler ultrasound was performed at 1, 3-month visits.

The time of the procedure, intra-operative complications, hospital stay, recovery from operation, defined as the time at which the child returned to his normal preoperative activities, and testicular location and viability were estimated.

3. Results

Forty one patients with non-palpable testis were enrolled in this study. The mean age of studied patients was 2.85 ± 0.85 years (range, one year to 9 years). The non-palpable testis was bilateral in 16 (32.7%), right unilateral in 23 (46.9%) and left unilateral in 10 (20.4%) (**Table 1**). Out of 49 testicular units, diagnostic laparoscopy showed that 45 were located within 3 cm of the internal inguinal ring, 2 were more than 3 cm from the internal inguinal ring and 2 diagnosed as vanishing testis with detection of blind end spermatic vessels and vas deferens, one at right side and other at left. None of the patients associated with oblique inguinal hernia. Of 49 testicular units, 45 (91.8%) were treated by one-stage laparoscopic orchiopexy in which the non-palpable testis was located within 3 cm from the internal inguinal ring and two-stage laparoscopic orchiopexy was performed in 2 (4.1%) in which the non-palpable testis was located more than 3 cm from the internal inguinal ring side (**Table 2**).

Table 1. Patients' criteria.

No. of patients	41	
No. of testicular units	49	
Age, year (mean ± SD)	2.85 ± 0.85	
Laterality of intra-abdominal testis	No. of testicular units	(%)
Unilateral	33	67.3
Right	23	46.9
Left	10	20.4
Bilateral	16	32.7

Table 2. Location of non-palpable testis and its management.

Location	No.	%	Procedure
Within 3 cm of internal ring	45	91.8%	One stage laparoscopic orchiopexy
Beyond 3 cm from internal ring	2	4.1%	Two stages laparoscopic orchiopexy
Vanishing testis	2	4.1%	None

The mean operation time was 22.3 ± 7.8 minutes, (range, 15 to 30 minutes) for diagnostic laparoscopy; 88.9 ± 20.2 minutes (range, 79 to 110 minutes), for laparoscopic one stage unilateral orchiopexy; 117.7 ± 11.66 minutes, (range, 95 to138 minutes), for laparoscopic one stage bilateral orchiopexy and 177.4 ± 12.6 minutes (range, 153 to 192 minutes), for laparoscopic two stages unilateral orchiopexy.

All patients who underwent diagnostic laparoscopy were discharged from the hospital within 6 hours after the operation. The patients who underwent unilateral or bilateral laparoscopic orchiopexy were discharged within 24 hours. The mean time for recovery was 3 ± 0.83 days for diagnostic laparoscopy, 7 ± 2.09 days for laparoscopic one stage unilateral orchiopexy, 10 ± 2.8 days for laparoscopic one stage bilateral orchiopexy and 7 ± 1.9 days for laparoscopic two stages unilateral orchiopexy for each stage.

Subcutaneous emphysema was reported in only one case, most probably due to improper placement of first trocar. None of the patients had late postoperative complications.

The mean operation time, hospital stay, complications of the operations and recovery periods are summarized in **Table 3**.

One month after the laparoscopic orchiopexy, physical examination and Doppler ultrasonography showed that 46 of 47 testicular units had average size and normal vascularity, giving a testicular survival rate (TSR) within 1 month of 97.9%. Only one testicular unit (3.1%) was atrophied and avascular. 45 of 47 (95.6%) were located in the lower scrotum and 2 of 47 (4.3%) in the upper scrotum. No changes in testicular size and viability were found at 3-month follow-up (**Table 4**).

4. Discussion

The current series represent our experience with laparoscopic management of non-palpable testis over 2 years. Our results were in accordance with previous global result patterns demonstrating that laparoscopy is an excellent technique not only for diagnosis but also for treatment of non-palpable undescended testis.

Early recognition and surgery for undescended testis, before 1 year of age, remain the most important interventions to reduce the negative impact of both unilateral and bilateral cryptorchidism [7]. Since 1976, when Cortesi *et al.* [8] first reported a case of abdominal testis identified by laparoscopy, the laparoscopy founded by many authors a valuable adjunct to clinical examination in the search of the non-palpable undescended testes. The treatment of non-palpable testes by laparoscopy was used only after 1990 as the urologists gained experience with the method and since then laparoscopic orchiopexy and orchiectomy have been increasingly used [9,10]. During the diagnostic laparoscopy, we looking at the internal inguinal rings for vas deferens (medially) and the testicular vessels (laterally), in unilateral cases, it is prudent to inspect the contralateral side especially in the interpretation of findings in relation to the diameter of the vessels. Laparoscopic detection of the distance of the testes from the internal ring, the length of the vas deferens and the vessels will give an indication to the ease of the subsequent orchidopexy. Laparoscopic identification of blind-ending testicular vessels prior to entering the internal ring is sufficient to diagnose a vanishing testis, which does not require further surgical exploration [11, 12].

In the literature, the laparoscopic accuracy rate of in determination of the location of th e testes was more than 95% [12-14]. Laparoscopy allows the visualization of the testis, to assess its presence, position, size and the relative lengths of the vas deferens and the gonadal vessels which permits the planning of further management (orchidopexy or orchidectomy), or indeed avoids extensive exploration for an absent testis when blind ending vessels

Table 3. The mean operation time, hospital stay, complications of the operations and recovery.

	Operation time, minute (mean ± SD)	Hospital stay, hour (mean ± SD)	Complications No. (%)		Recovery, day (mean ± SD)
			Peri-operative	Post-operative	
Diagnostic laparoscopy	22.3 ± 7.8	6 ± 2.1	1 (%) (subcutaneous emphysema)	0	3 ± 0.83
Laparoscopic unilateral orchiopexy	88.9 ± 20.2	23.4 ± 12.1	0	0	7 ± 2.09
Laparoscopic bilateral orchiopexy	117.7 ± 11.66	23.8 ± 15.6	0	0	10 ± 2.8
Laparoscopic two stages orchiopexy	177.4 ± 12.6	24 ± 11.7	0	0	7 ± 1.9 (for each stage)

Table 4. Testicular survival outcomes of laparoscopic orchiopexy and post operative location of the testis according to the laparoscopic technique and the location of the nonpalpable intra-abdominal testis.

Laparoscopic procedure	No. of testicular units	Preoperative location of the testis	Postoperative location of the testis	Testicular survival
One stage laparoscopic orchiopexy	45	Within 3 cm of internal ring	Bottom of scrotum	45/45
Two stages laparoscopic orchiopexy	2	Beyond 3 cm from internal ring	High/mid scrotum	1/2

are noted [3]. By laparoscopy it possible to avoid unnecessary surgical interventions in the cases of impalpable undescended testis. In fact, unnecessary surgical operations can be avoided in 42% of the cases [15].

Jongwon *et al.* [3] reported that of 86 testicular units, 17 testicular units (19.8%) were treated by Fowler-Stephens laparoscopic orchiopexy (FSLO). One-stage FSLO was performed in 14 testicular units (16.3%) and two-stage FSLO in 3 testicular units (3.5%).

In our study, 47 out of 49 testicular units (95.9%) were treated by laparoscopic orchiopexy. 45 testes (91.8%) located within 3 cm of the internal inguinal ring were treated successfully by one-stage laparoscopic orchiopexy and 2 testes (4.1%) located more than 3 cm from the internal inguinal ring were treated by two-stage laparoscopic orchiopexy. So, the choice of laparoscopic technique mostly depended on the distance from the internal inguinal ring to the non-palpable intra-abdominal testis.

Riquelme-Heras *et al.* [4], reporting that twenty-five patients were released 24 hours after surgery and 2 patients with a history of bronchial hyperactivity who developed respiratory symptoms were released 48 hours after surgery.

In our study, one of most advantages of laparoscopy are early discharge, rapid recovery, minimal intra-operative and none postoperative complications.

Samadi *et al.* [16] conducted PLO in 70.5% and FSLO in 29.5% of a total of 203 testicular units and reported a success rate of 95%, which was higher than the 76% success rate of open surgery. Lindgren *et al.* [17] did a 6 month clinical follow-up after laparoscopic orchiopexy and reported a success rate of 93%. Lintula *et al.* [18] reported a success rate of 88% for 19 testicular units undergoing laparoscopic orchiopexy and a success rate of 82% for 18 testicular units receiving open surgery, highlighting the excellent surgical outcomes of the laparoscopic orchiopexy.

Jongwon *et al.* [3] performed PLO in 80.2% and FSLO in 19.2% of 86 testicular units. In examination that took place 3 months after the laparoscopic orchiopexy, the TSR was 93.7% and the rate of fixation in the lower scrotum was 76.2%. If classified on the basis of laparoscopic techniques, the PLO showed a fixation rate in the lower scrotum of 79.6%, one-stage FSLO showed a rate of 63.6% and two stages FSLO showed a rate of 66.7%.

In our study, the testicular survival rate was 97.9%. The location of the viable testis after the laparoscopic orchiopexy was 95.6% in the lower scrotum. Therefore, the success rate of the laparoscopic orchiopexy for a non-palpable intra-abdominal testis was 95.6%. The testicular survival rate (TSR) not only affected by the size, viability of the testis, length and caliber of the spermatic vessels and vas but also by the distance between the testis and internal ring and subsequently the number of laparoscopic orchiopexy stages.

5. Conclusion

The laparoscopy is a reliable technique for diagnosis and treatment of the non-palpable intra-abdominal testis with high success and survival rates of the testes. In our study, the non-palpable testis was properly managed by laparoscopy with short hospital stay, rapid recovery and minimal complications.

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