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ORIGINAL ARTICLE

EVALUATION OF THE ROLE OF LAPAROSCOPY IN MANAGEMENT OF THE NONPALPABLE TESTIS

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Aim: *To evaluate the safety, efficacy of the laparoscopic treatment of nonpalpable testes (NPT) and follow up the results for 12 months after orchiopexy.*
Methods: *Between June 2004 and June 2007, 40 nonpalpable testes in 35 patients were evaluated by laparoscopy. Patients age ranged from 2 years to 22 years (mean age 8±4 y). The laparoscopy was used in all cases under general anesthesia.*
Results: *Laparoscopic diagnosis was successful in 32 of 35 cases (91.4%) and 36 of 40 NPT (90%). Laparoscopic orchiopexy was successful in treatment of 12 testes (30%) and laparoscopic orchiectomy was successfully done in 9 testes (22.5%). The reasons for orchiectomy included dysgenesis in 2 cases, atrophic remnants in 4 cases and ischemia after Fowler-Stephens in 3 cases. While the standard orchiopexy was done in 13 testes (32.5%) and standard orchidectomy was done in 2 testes (5%) due to canalicular vanishing testes. The mean laparoscopic operative time was 62 ± 14.3 minutes. The mean hospital stay was 1.8 ± 0.6 days. The mean length of follow up was 12 + 4.3 months. The testes were located in the scrotum in all orchiopexies.*
Conclusion: *laparoscopy is the diagnostic modality of choice for evaluating the nonpalpable testis because it is reliable and safe in locating the testis or in proving its absence. Laparoscopic orchiopexy is feasible.*

Keywords: *cryptorchidism, minimal invasive surgery, diagnosis.*

INTRODUCTION

Cryptorchidism affects approximately 1 in 150 boys. In 10% of these boys, a testis is located completely inside the abdominal cavity.[1] Traditionally; an intra-abdominal testis has been managed through an open-groin exploration, followed by an extensive retroperitoneal dissection or laparotomy. However, the overall success (i.e., scrotal position and no atrophy) of the conventional open orchidopexy has not been satisfactory.[2] The use of laparoscopy for locating NPT was first reported in 1976 by Cortesi et al.[3] and since then multiple reports on use of laparoscopy have been published.[4,5] Laparoscopy has been established as the most reliable method in the diagnosis of intra-abdominal testes. Despite recent advancements in laparoscopic technique and instrumentation, the natural extension of diagnostic laparoscopy, laparoscopic orchidopexy has remained controversial.[6]

However, several researchers have reported their success rate in placing the testicle into the scrotum by Laparoscopy.[7] Therefore, we performed this prospective study to evaluate the safety, efficacy of the laparoscopic treatment of nonpalpable testes and follow up the results at 12 months after orchiopexy in our hospital.

PATIENTS AND METHODS

Between June 2004 and June 2007, 40 nonpalpable testes in 35 patients were evaluated by laparoscopy.

Patients age ranged from 2 years to 22 years (mean age 18±4).

A testis was considered nonpalpable if it was not palpable clinically and by abdominal ultrasonography. Patients with bilateral nonpalpable testes, male phenotype and 46 XY karyotype were first evaluated with a human chorionic gonadotropin stimulation test and serum gonadotropin levels. Diagnosis was anorchism if such patients failed to respond to human chorionic gonadotropin with an increase in serum testosterone and if basal serum gonadotropin levels were elevated.

The intra-abdominal vanishing testis syndrome 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 the vas deferens and spermatic vessels were observed to enter the internal inguinal ring, formal surgical exploration was done. If an intra-abdominal testis was identified laparoscopically, orchiopexy was done. Fowler-Stephens technique may be required.

The Storz laparoscope was used in all cases. After administration of general anesthesia with endotracheal intubation, the bladder was first drained with an 8F pediatric feeding tube. A small infraumbilical incision was done to introduce the Veress needle with the patient in the Trendelenburg position. The 5mm laparoscopic trocar was introduced after insufflation with carbon dioxide. The patient was placed in the Trendelenburg position and pelviscopy was performed with 0 and 30 degrees telescopes. The bowel and great vessels were visualized to rule out injury during initial instrument placement.

Intraperitoneal examination for a unilateral nonpalpable undescended testis was begun with examination of the normal contralateral internal inguinal ring. Anatomic orientation was facilitated by noting intraperitoneal landmarks as the medial umbilical ligament, vas deferens, external iliac vessels, inferior epigastric and spermatic vessels.

The affected side was then inspected to evaluate any potential intra-abdominal testis, the vas deferens, spermatic vessels and the patency of internal ring .If an intra-abdominal testicle was not present, the vas and vessels were followed distally to determine whether they entered the internal ring together. The caliber and size of the spermatic and vassal vessels were noted and compared to the opposite side. Blind ending vas and vessels were diagnosed if the vas and vessels were seen to taper and end proximal to the internal ring (Fig 1). The vas was identified and followed from the point where it crossed the obliterated umbilical artery to the epididymis (Fig.2). It was important to note if the vas looped distally along the gubernaculum into the inguinal canal to avoid its injury during mobilization of 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. The aim was to use it to manipulate the testis without injury of testis. The peritoneum over the spermatic vessel was freed laterally and medially by grasping the free edge of gubernaculum and swinging the testis to either side. 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. We avoided injuring the peritoneum that bridges the spermatic vessels and the vas since this area may contain collateral vessels, which may be important when the Fowler – Stephens's orchiopexy is required. 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, a laparoscopic Prentiss maneuver was performed. This was done by passing an endoscopy dissector into the 5 mm port on the ipsilateral side of the abdomen. The tip of the 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.

Finally, the pneumoperitoneum was deflated and the fascia and skin were closed. The time of the procedure was estimated.

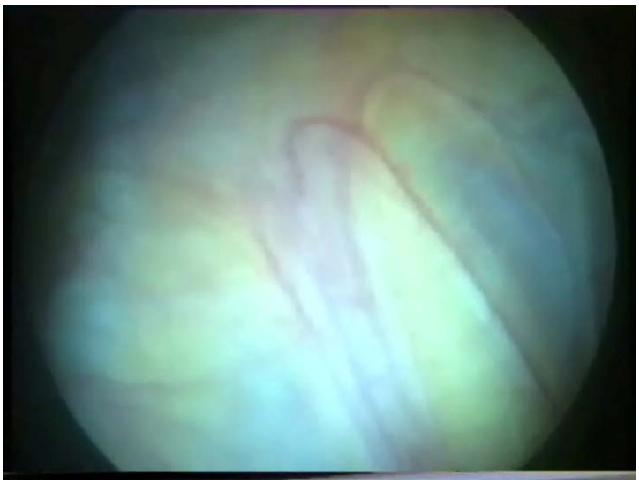

Fig 1. Blind end vas and vessels (vanishing testis).

Fig 2. The vas crosses the obliterated umbilical artery.

Inguinal exploration was performed with exposure to retroperitoneum if needed.

Statistical analysis: Proportions and percentages were used to summarize categorized variables, while descriptive statistics such as mean (SD) were used for numerical values. The x2 test was used to investigate the statistical significance of any categorical values .P value was considered significant if ≤ 0.05.

RESULTS

Laparoscopy was performed on 35 patients with 40 nonpalpable testes; 17 (48.5%) on the right side, 13 (37.2 %) on the left side and 5 (14.3%) bilaterally Table 1.

The mean age was 8±4 years.

Laparoscopic diagnosis was successful in 32 of 35 cases (91.4%) and 36 of 40 valuable testes (90%). The laparoscopic findings are listed in Table 2. A total of 12 testes (30%) were visualized above the internal ring, while 15 (37.5%) were localized below the internal ring. The intra-abdominal vanishing testis syndrome was diagnosed in 6 patients (17.1%) with 9 nonpalpable testes. Laparoscopic diagnosis was unsuccessful in 3 patients (4 testes) due to scarring in one patient and equipment failure in 2 patients.

Table 1. Patient characteristics.

Patient characteristics	No.	%
Unilateral	30	85.7
Right side	17	48.5
Left side	13	37.2
Bilateral	5	14.3
Previous inguinal exploration	6	17.1

Table 2. Laparoscopic findings of 40 testes.

Laparoscopic findings	No.	%
Testes below internal ring	15	37.5
Blind ending vas and vessels	9	22.5
Intra-abdominal testis above internal ring	12	30
Failed	4	10
Patent internal ring	15	37.5
Closed internal ring	21	52.5

Laparoscopic orchiopexy was successful in 12 testes (30%) and laparoscopic orchiectomy was successfully done in 9 testes (22.5%). The reasons for orchiectomy included dysgenesis in 2 cases, atrophic remnants in 4 cases and ischemia after Fowler-Stephens in 3 cases. While the standard orchiopexy was done in 13 testes (32.5%) and standard orchidectomy was done in 2 testes (5%) due to canalicular vanishing testes.

The mean laparoscopic operative time was 62 + 14.3 minutes.

The mean hospital stay was 1.8 + 0.6 days.

The complications are listed in Table 3. The intestine was punctured by the Veress needle in one patient. It was sutured laparoscopically with successful outcome. Wound infection was detected in one patient.

Table 3. Complications in 35 patients.

Complications	No.	%
Small intestinal perforation	1	2.8
Preperitoneal insufflation	2	5.6
Paralytic ileus	1	2.8
Wound infection	1	2.8

The mean length of follow up was 12 + 4.3 months. The testes were located in the scrotum in all orchiopexies. There is no significant discrepancy in size of normal versus operated testes (mean size is 3 ± 1.1cm Vs 2.9 ± 1.2cm, respectively). P value was > 0.05. In the present study, 6 patients (17.1%) had undergone prior inguinal exploration elsewhere, with failure to locate the testes.

DISCUSSION

The evaluation and treatment of nonpalpable testes can be difficult as evidenced by the multiple modalities for evaluation and treatment options.[8] The classic treatment has been inguinal exploration with intra-peritoneal exploration until the testis or hypo-plastic spermatic vessels were identified. A high testis may not be reached and visualization of the vessels, when they are found, may be inadequate using this approach. Preoperative knowledge of testicular position facilitates the placement of surgical incisions as well as the choice of operative technique.[9] In addition, the decision to transect the testicular vessels must be made early in the exploration so that a wide peritoneal strip can be left attached to the vas deferens and testis distally to preserve the vassal collateral vessels. Disruption of this collateral supply may occur during dissection, thus adversely affecting the outcome.[10]

Several diagnostic modalities have been advocated for the assessment and diagnosis of NBT such as CT or MRI, but only ultrasonography and laparoscopy have been adopted into routine use. Although ultrasonography is simple, noninvasive and readily available in every hospital, its use as a test to ascertain the presence or absence of NPT is extremely controversial because intestinal loops full of gas represent a barrier for ultrasound.[11] Then, laparoscopy was used for localization of NPT and in diagnosis of vanishing testis syndrome without an abdominal incision.[12]

In the present study, More than one third of testes (15 testes, 37.5%) were located below the internal ring which were treated by standard orchidopexy in 13 testes (32.5%) and orchidectomy in 2 testes (5%). This is quite astonishing because all testes located in the inguinal canal distal to the internal inguinal ring should be detected either by clinical examination or ultrasonographic examination or both. The only exception is presence of canalicular atrophic or vanishing testis, which was the case in 2 of the 15 testes. This raises a critical question whether laparoscopy was needed in 13 of the 15 cases. The explanation is that both clinical and ultrsongraphic examination are not sensitive enough to locate some cases of impalpable testes which are below the internal ring. The future development in the ultrasonic equipments may help to solve this problem.

In 1986, Weiss[13] reported a series of 21 patients with NPT, in which the reliability of ultrasonography was as low as 12%. About 20 years later, Stéfaniu[14] reported that ultrasonography helped to identify only 45% of NPT. There has been no improvement in ultrasonography for patients with NPT in the past few years; in fact, this examination does not provide surgeons with additional information compared with palpation in a cooperative child.[1]

On the other hand, some researchers advocate inguinal exploration first, proceeding to laparoscopic exploration only in cases of absent inguinal structure.[15]

The three main laparoscopic findings in patients with a nonpalpable testis include: intra-abdominal testis, or vas deference and spermatic vessels entering the internal inguinal ring, and the vanishing testis syndrome (the vessels and vas terminating blindly before reaching the internal inguinal ring).[16] Based upon these criteria, more than 90 % of the laparoscopic examinations in our study were successful. Surgical exploration was avoided in 6 patients (with 9 nonpalpable testes) by the laparoscopic identification of the blind-ending spermatic vessels and vas deference.

Laparoscopic observation of the spermatic vessels and vas deference entering a closed internal inguinal ring was most often associated with an atrophic testicular or epididymal remnant that was removed during inguinal exploration.[17] This was detected in 7 of 12 (58.3%) testes in our study. Inguinal exploration is done to look for an ectopic testis or an intracanalicular atrophic testis, which can be a risk factor for testicular cancer.[18] In contrast, when the vas and vessels entered a patent inguinal ring a viable gonad could usually be placed successfully in the scrotum.[19] This was detected in 13 of 15 testes (86.6%) in our study.

Laparoscopy can accurately identify the intra-abdominal testis,[20] localize the testis to a site below the internal ring before formal exploration or definitely prove its absence, which allows optimal placement of incisions, more rapid surgical identification of the gonad and accurate selection of orchiopexy technique.[21] The extensive inguinal dissection performed in search of intra-abdominal testis may decrease the success of Flower-Stephens orchiopexy. Unlike other diagnostic modalities, laparoscopy can be performed without difficulty in young children.[22] In addition, laparoscopic visualization of blind-ending spermatic vessels and vas deference (9 nonpalpable gonads; 22.5% in our series) can accurately identify patients with the intra-abdominal vanishing testis syndrome and spare them further operative intervention beyond laparoscopy.[23]

Laparoscopy has proved to be successful to do 1-stage laparoscopic orchiopexy.[24] In 3 of our cases; the main advantage is the higher dissection of the spermatic vessels. Open surgery may not easily permit this high dissection of vessels. In addition; the magnification of the laparoscope

may prevent the injury of spermatic vessels.[25] Cryptorchidism is best diagnosed clinically and treated by surgical orchiopexy at age of 12 months.[26] In our study, the mean age was 18±4 years which are older than the optimum age for surgery. This is explained by refusal of the parents to address this issue early for fear of social considerations. Some families may find this is shameful for the future of their son. Others may delay the time of surgery for fear of its complications. Still some patients are detected only on medical examination before military registration. Our results support that laparoscopy is safe and effective for NPT.

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