Mini review

Management of boys with nonpalpable undescended testes

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ABSTRACT

An undescended testis (UDT) is one of the most common genital anomalies in boys. Complications of a UDT include testicular cancer, infertility, and testicular torsion. Prompt treatment can minimize the risk of these complications. Although there are standardized guidelines for boys with palpable undescended testes, there are no formal guidelines for managing boys with nonpalpable testes. In this mini-review, we look at current trends in diagnosing and treating this disorder as well as surgical procedures. Laparoscopy is both a diagnostic and therapeutic procedure, which is safe when performed by a skilled operator.

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1. Introduction

Cryptorchidism or an undescended testis (UDT) is one of the most common genital anomalies in boys. The definition of cryptorchidism is that a testicle is not within the scrotum and cannot be manipulated into the scrotum.1 In contrast, an ectopic testis descends normally through the external inguinal ring but is diverted to an aberrant position.2 The incidence of cryptorchidism is approximately 2% (0.7–2.8%) in newborns, and 1% in 1-year-olds; 80% of the testes are clinically palpable and 20% of them are non-palpable.34 A testis may be impalpable when it is located in the inguinal canal or abdomen, or when it is dysgenetic or absent. Despite the past 15 years of international research on the topic, the management of boys with nonpalpable testes (NPTs) is still controversial and without established guidelines. In this mini-review, we summarize the current evidence that is available on the topic and provide updated data on managing nonpalpable UDTs.

2. Diagnostic procedures

Determining the preoperative location of the testis aids in planning the surgical approach. Imaging techniques for locating NPTs are important, and computed tomography (CT), magnetic resonance imaging (MRI), and ultrasonography (US) are used at present. A CT scan is noninvasive but unreliable and carries the risk of radiation. MRI is sensitive in obese patients but requires anesthesia. CT scans and MRI have their limitations in routine clinical practice. However, only sonography and laparoscopy have been adopted into routine practice.4–6

2.1. Clinical examination

A careful bimanual examination is necessary for boys with a UDT. One hand is placed near the anterior iliac spine and the other on the scrotum. The first hand is swept from the anterior iliac spine along the inguinal canal to gently express any retained testicular tissue into the scrotum.5 The incidence of cryptorchidism is approximately 2% (0.7–2.8%) in newborns, and 1% in 1-year-olds; 80% of the testes are clinically palpable and 20% of them are non-palpable.3 A testis may be impalpable when it is located in the inguinal canal or abdomen, or when it is dysgenetic or absent. Despite the past 15 years of international research on the topic, the management of boys with nonpalpable testes (NPTs) is still controversial and without established guidelines. In this mini-review, we summarize the current evidence that is available on the topic and provide updated data on managing nonpalpable UDTs.

2.1.1. US

Because US is simple, noninvasive, and readily available, it is heavily used in clinical practice.5 However, intestinal gas represents a barrier for ultrasound. Stefaniu et al10 reported that US helped identify only 45% of NPTs. In 2002, Elder11 suggested that US is unnecessary to assess boys with NPTs, and most recent studies are in agreement with this statement. Reported data with US showed
a sensitivity of 44% and a specificity of 70%. Accurate diagnostic rates are 60% for intrascrotal testes, 20% for intra-abdominal testes (IATs), and 14% for absent testes.¹²

2.1.2. MRI

Both conventional MRI and US are used in boys with an NPT to facilitate a preoperative diagnosis. Kato et al¹³ reported an overall predictive accuracy of 98.4% by fat-suppressed, T2-weighted, and diffusion-weighted MRI that visualizes changes in the translational motion of water molecules to provide tissue contrast. It is not widely used to localize NPTs, because it is sensitive for IATs only in obese patients but not sensitive in lean patients due to a lack of tissue contrast. The need for anesthesia is the main factor limiting the routine use of NPT.⁷

2.1.3. Laparoscopy

Laparoscopy is both a diagnostic and therapeutic procedure; it was initiated in Europe at the beginning of the 20th century, and there were further improvements after 1952¹⁴ with the introduction of a rod lens system and advances in fiber optics. The first case of IATs identified by laparoscopy was published by Cortesi et al¹⁴ in 1976. Castilho¹⁵ and Castilho and Ferrari¹⁶ extended their experience to therapeutic interventions. The examination requires general anesthesia and CO₂ insufflation into all of the abdominal cavity, which allows the surgeon view the entire abdominal cavity. The accurate diagnostic rate is 97–100%. There are three main findings possible: an IAT (40%), a cord structure with a blind ending (15%), and a cord that enters the internal inguinal ring (45%).¹⁷ With laparoscopic findings, further treatment procedures can be performed, such as a laparoscopic orchiopexy or orchiectomy, or it can be changed to an open inguinal orchiopexy. No further procedure is necessary if the testis is absent with a blind end cord.

3. Treatment

3.1. Hormone therapy for IATs

There are two current protocols for hormone treatment of UDTs. The first hormone treatment with gonadotropin (HCG) was introduced in 1930, and the other intranasal treatment with gonadotropin-releasing hormone (GnRH) was introduced in 1975.¹⁸ Reports of its efficacy and safety are briefly summarized here.

(1) No significant difference in the efficacy was found between patients older and those less than 4 years of age.¹⁹
(2) When the testis is in a lower position, age is not an important determinant of success. However, hormone therapy is more effective in bilateral cases.¹⁹
(3) A meta-analysis on two randomized controlled trials comparing HCG versus GnRH reported respective success rates of 25% and 18%.²⁰
(4) Hormone therapy generally shows poor results for treating NPTs. Schwentner et al²¹ reported that after hormone therapy for bilateral NPTs, one or both testes became palpable in approximately 15% of cases.
(5) Adverse effects of hormone therapy include an erection, growth of the penis, pain in the region and at the injection site, and psychological changes.²² However, apoptotic changes in germ cells and inflammatory changes in the testes were reported in prepubertal boys before an orchiopexy.²³,²⁴

In conclusion, the anatomic success rate of hormone therapy is <15% for NPTs, and this treatment might have deleterious effects on the testes. Considering the poor efficacy and the possible side effects of hormonal treatment, we cannot recommend the general use of HCG or GnRH for treating NPTs.²⁵

![Fig. 1. Approach to managing boys with nonpalpable testes (NPTs).](image-url)
3.2. Surgical treatment

There are two surgical approaches for IATs: laparoscopy and an inguinal incision. The current algorithm for managing NPTs is shown in Fig. 1. Only a surgeon who has mastered a laparoscopic orchiopexy can freely choose whether to perform an orchiopexy by laparoscopy or open surgery. However, for the past 10 years, laparoscopy has been considered the gold standard procedure for assessing boys with NPTs.

3.3. Standard open orchiopexy

The key procedures include: (1) complete mobilization of the testis and spermatic cord; (2) repair of the patent process vaginalis by high ligation of the patent process vaginalis; (3) skeletonization of the spermatic cord without injuring the vascularity to achieve tension-free placement of the testis in a dependent position to the scrotum; and (4) creation of a superficial dartos pouch of the hemiscrotum.29

3.4. One-step Fowler–Stephens procedure

The indication for a Fowler–Stephens procedure is a testis located >3 cm away from the ipsilateral internal inguinal ring. The procedure involves clipping and transecting the testicular vessels. There is sufficient collateral arterial flow through the deferential artery to allow the testis to survive.27 The procedure can be done in one or two stages.28

3.5. Two-step Fowler–Stephens procedure

Most pediatric surgeons choose to perform the Fowler–Stephens procedure in two steps to reduce the risk of vasospasms of the spermatic vessels. During the first step, the spermatic vessels are clipped 3–4 cm proximal to the testis. The second step of the Fowler–Stephens procedure is performed 3–6 months later. During the second step, the spermatic vessels are divided between the clips, and the testis is brought down into the scrotum.29,30

3.6. Microvascular orchiopexy

Since Silber and Kelly’s first description in 1976, microvascular autotransplantation has not been adopted by many surgeons for several reasons, including the long duration of the operation and the need for microsurgical skill and special instruments. However in experienced hands, there is a success rate of approximately 80%.31,32

3.7. Laparoscopic orchiectomy

When a surgeon finds a hypotrophic or atrophic IAT during laparoscopic exploration, the best choice is to perform a laparoscopic orchiectomy.13 This procedure must be done in postpubertal boys with an IAT and a normal contralateral descended testis.

3.8. Bilateral IATs

In patients with bilateral NPTs, the karyotype and hormones need to be checked to confirm the presence or absence of a testicular structure. If this study confirms the absence of testes, no laparoscopic or surgical exploration is needed. If the workup confirms the presence of testicular tissue, then laparoscopic surgery should be continued for further management. In the case of bilateral viable testes located in the abdominal cavity, the most popular approach is a unilateral orchiopexy during the first operation, with the contralateral orchiopexy performed 6–12 months later.34 The solution allows the possibility to check the outcome of the first side before proceeding to the other side.35 If no testicular structures are found by laparoscopy, the patient should be referred to a pediatric endocrinologist for hormone replacement therapy.17

3.9. Clinical outcomes of surgery

Outcomes of surgery are mainly assessed by the testicular position and size. Docimo31 reported an 81.3% success rate for an open orchiopexy in patients with IATs. By contrast, an open-staged orchiopexy has success rates of 64–71%.36 Success rates were recently reported to be 95–100% for a laparoscopic orchiopexy32,34,37 and 83–96% for microvascular orchiopexy in patients with IATs.38

3.10. Complications of an orchiopexy

Complications of an orchiopexy include testicular retraction, hematoma formation, spermatic cord torsion, damage to the vas deferens, and testicular atrophy. Devascularization with atrophy of the testis can result from skeletonization of the cord, overuse of electrocauterization, torsion of the spermatic cord during passage of the testis into the scrotum, or ligation or division of the spermatic vessels, particularly if the collateral circulation is poor.39

3.11. Risk of cancer

Elder reviewed published data and MEDLINE back to 1950 and summarized the data into seven conclusions of the risks associated with UDTs and cancer. We used the data to establish guidelines for treating patients with a UDT, including when an orchiopexy is appropriate, when an orchiectomy is necessary, and when a testicular biopsy plays a role.40

(1) The relative risk (RR) of testicular cancer in all patients with UDTs is 2.75–8 with a lower risk of cancer (RR = 2–3) in patients undergoing a prepubertal orchiopexy.

(2) There is a high risk in patients with bilateral UDTs, associated genitourinary anomalies, or a late (after 10–12 years of age) or uncorrected UDTs.

(3) An orchiectomy by the age of 10–12 years results in a 2- to 6-fold decrease in the RR compared with an orchiopexy after age 12 years or no orchiopexy.

(4) The contralateral, normally descended testis has no increased risk of testicular cancer.

(5) The risk of testicular cancer in men with a persistent UDT after the age of 50 years is undefined; an orchiectomy should be discussed with a healthy postpubertal patient.

(6) A testicular biopsy may play a role in determining whether an orchiectomy should be performed in children ≥10 years with bilateral UDTs or a solitary unilateral UDT.

(7) Among testicular nubbins, 5–15% contain seminiferous material, but few have viable germ cells; the nubbin is almost always scrotal, and the risk of malignant degeneration is minimal.

4. Conclusions

Approximately 20% of UDTs are nonpalpable, and they may be undescended or absent. An imaging study is not warranted in evaluating boys with NPTs. If a testis examined bimanually under anesthesia is still nonpalpable, diagnostic laparoscopy should be used to identify its size, location, and structure. There are three
major findings of laparoscopy: an IAT (40%), an intra-abdominal blind end cord (15%), and a cord structure entering the internal inguinal ring (45%). An orchiopexy can be done by laparoscopy or through an inguinal incision if the testicle is viable. No further management is done with a blind end of the vas and of spermatic vessels. Hormone therapy with HCG and GnRH is not recommended in the general treatment of NPTs due to poor efficacy and possible side effects.

Conflicts of interest statement

The author declares that he has no financial or non-financial conflicts of interest related to the subject matter or materials discussed in the manuscript.

References