

Third Prize

Laparoscopic Orchiopexy: Report of 203 Cases with Review of Diagnosis, Operative Technique, and Lessons Learned

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ABSTRACT

Background and Purpose: Proper management of the nonpalpable testicle requires an accurate diagnosis. Laparoscopic orchiopexy (LO) has become the standard for diagnosis and treatment. We classified the location of nonpalpable testicles, reviewed the technique of LO in detail, and report the results of our series, the largest described to date.

Patients and Methods: We compiled the records of all cryptorchid patients seen between 1994 and 2002. Those with testicles located near the internal inguinal ring and those with nonpalpable testicles underwent laparoscopy and LO in the same session. The 173 patients underwent 203 procedures, all performed by the senior authors.

Results: The undescended testicles were right-sided in 33% of patients, left-sided in 53%, and bilateral in 14%. Six testicles were excluded because of hypotrophy (N = 4) or agenesis of the vas deferens (N = 2). At laparoscopy, 58% of the testicles were at the iliac vessels or higher (high intra-abdominal), 22% were between the iliac vessels and the internal ring (low intra-abdominal), 16% were peeping, 3% were intracanicular, and 1% were retrovesical. Standard LO was performed in 70.5% of the patients, with the remainder being treated by laparoscopic Fowler-Stephens orchiopexy. There have been four cases of testicular atrophy, all after Fowler-Stephens procedures. Two were virgin gonads, and the other two had previously been subjected to extensive orchiolysis. Only 3% of the patients required repeat surgery because of an unsatisfactory testicular location.

Conclusion: The reported success rate for LO of intra-abdominal testicles has far exceeded that of open repair (95% v 76%). It is our belief that minimal manipulation of the testicle during dissection, a wider peritoneal window, and sparse use of electrocautery will result in adequate testicular position even for high intra-abdominal gonads with minimal risk of atrophy.

INTRODUCTION

CRYPTORCHIDISM IS CONGENITAL EXTRASCROTAL MISPLACEMENT of the testicle. Normal descent of the testicle depends on an intricate balance between the hormonal milieu and the development of the spermatic cord and gubernacular structures. Other terms used to refer to this condition are *dystopic* (attributable to inadequate cord length) and *ectopic* (descended to a nonscrotal position). The physical lo-

cation of the testicle is described as perineal, femoral, prepenile, retractile, emergent, intracanicular or inguinal, and intra-abdominal.¹

Cryptorchidism continues to be the entity most commonly encountered by pediatric urologists, being seen in approximately 33% of preterm and 3% of term infants.² Nonpalpable testicles account for about 20% of these cases.³ The benefits of diagnosis and treatment are normalization of the physical appearance of the child, easier physical examination (important

because of the higher potential for malignancy), and improvement in fertility.

In this report, we delineate testicular location in order to improve the terminology. We also explain the steps of laparoscopic orchiopexy (LO) in detail. Finally, we review our results, the largest series reported to date.

PATIENTS AND METHODS

Patients

From 1994 to 2002, 173 patients underwent laparoscopic evaluation and repair of nonpalpable testicles in our practice. We performed a retrospective chart review of these cases, with an emphasis on the operative reports. The minimum interval for staged laparoscopic Fowler-Stephens procedures was 6 months. High intra-abdominal testes could be placed in good scrotal position without hypotrophy by a single-stage Fowler-Stephens procedure. Patients with retractile or distal canalicular testicles underwent open inguinal exploration and repair, and these patients, as well as those with vanishing testes or an atrophic nubbin discovered at laparoscopy, were excluded.

A minimum follow-up of 6 months was available.

Operative technique

All procedures were performed in an ambulatory setting with the patient under general anesthesia. The usual laparoscopic precautions (placement of a orogastric tube and Foley catheter, avoidance of nitrous oxide) were observed.

We prefer placement of the 5-mm subumbilical trocar by the Hasson technique to minimize the risk of injury to the abdominal viscera. After pneumoperitoneum had been obtained to 8 to 10 mm Hg, thorough diagnostic laparoscopy was performed. Two 3-mm radially dilating trocars were then inserted under direct vision in the midaxillary lines at the level of the first trocar. In smaller patients, a supraumbilical insertion sometimes was required because of the limited space.

We have adopted the following nomenclature. High intra-abdominal testicles are those located more proximal or cephalad to the iliac vessels. Low intra-abdominal testicles are those between the iliac vessels and the internal inguinal ring. Peeping testicles are those in the proximal portion of the inguinal canal that can easily be seen or retracted into the abdominal cavity.

After the anatomic structures had been identified, the testicle was gently retracted cephalad to locate the most caudal portion of the vas deferens and epididymis. Refraining from grasping

these structures is crucial to minimizing the risk of injury. The gubernaculum was then identified and transected at its most distal limit, creating a "handle" for maneuvering the testicle. This dissection should be performed using the least possible amount of electrocautery.

Next, the peritoneum was dissected lateral to the gonadal vessels in a cephalad direction and as high as possible. This maneuver exposes these vessels, which is helpful if a single-stage Fowler-Stephens procedure proves necessary. Subsequently, the peritoneal coverage between the vas and the bladder was dissected toward the contralateral side. At this point, a wide and intact peritoneal window carrying the collateral blood supply had been preserved.

A neo-ring is developed lateral to the bladder and medial to the median umbilical ligament. A blunt-tip instrument could easily be passed into the ipsilateral hemiscrotum. These landmarks are of the utmost importance in preventing injury to the bladder, femoral vessels, and corporal bodies. A dependent subdartos pouch was then developed, and the blunt-tip instrument was delivered. A radially dilating 5-mm trocar was tracked over the endoscopic instrument into the abdominal cavity. The gubernacular handle was grasped firmly with toothed forceps, and the testis was gently delivered into the subdartos pouch. The pneumoperitoneum was then released, allowing assessment of the maximum length achievable. If the length was not sufficient, the abdomen was insufflated, and a single-stage laparoscopic Fowler-Stephens procedure could be performed easily.

After the testicle had been secured in its scrotal position, a final laparoscopic examination was performed. Because of the delicate nature of the omentum in children, we recommend closure of all port sites. The working port sites were closed under direct laparoscopic vision with full pneumoperitoneum to minimize the risk of injury to the abdominal viscera. The abdomen was then completely deflated, the umbilical port removed, and the site closed.

RESULTS

A total of 203 LO procedures were performed in the 173 patients: 67 (33%) right sided, 108 (53%) left sided, and 28 (14%) bilateral. The sites were high intra-abdominal for 58% of the testicles, low intra-abdominal for 22%, peeping for 19%, and retrovesical for 1%. Six testicles were excluded from relocation because of hypotrophy ($N = 4$) or agenesis of the vas deferens ($N = 2$). Standard LO was performed in 139 of the 197

TABLE 1. SUMMARY OF RESULTS ACCORDING TO PROCEDURE

	Lap Fowler-Stephens (N = 58)	Lap orchiopexy (N = 139)
Atrophy	4	0
Unsatisfactory position	2	4 ^a

^aAll of these were high intra-abdominal testicles; three of the procedures were performed before 1999.

Note: Six testicles were excluded from the data analysis (see text).

procedures (70.5%), while 58 (29.5%) were treated by single-stage or multistage Fowler-Stephens orchiopexy.

There have been four cases of testicular atrophy, all in the patients having a Fowler-Stephens procedure. Two of these gonads had not previously been operated on and required extensive mobilization because of dense adhesions to the adjacent peritoneum. One patient had undergone an open first-stage Fowler-Stephens procedure elsewhere, and the final patient had undergone the same procedure at our institution with extensive orchiolysis being performed.

In only 3% of the procedures was repeat surgery required because of an unsatisfactory testicular position (Table 1).

DISCUSSION

The most effective strategy for an undescended testicle remains controversial. The lack of a uniform classification for the preoperative location has inhibited understanding and selection of treatment modalities. However, it is clear that an adequate intra-scrotal location is unlikely to be achieved by pharmacologic stimulation if the testis is intra-abdominal.⁴

Many modalities for locating the testicle have been tested over the years: pneumoperitoneography, aortography, selective gonadal arteriography or venography, sonography,⁵ CT,⁶ and MRI.⁷ However, the results have been suboptimal, invariably requiring the patient to undergo further investigative procedures prior to definitive treatment.¹

The need for better management of the nonpalpable testicle has been underscored by the significant failure rate of all conventional techniques.⁸⁻¹⁰ In a retrospective review of the literature in 1995, the overall success rate was reported to be 77.3% for abdominal, 100% for peeping, and 95.7% for canalicular testicles.¹ In the same report, the surgical success rates were 68.5% for the Fowler-Stephens operation, 76.8% for the staged Fowler-Stephens procedure, 91.3% for the transabdominal approach, and 80.3% for microvascular repair.¹

The initial reports of the use of laparoscopy to locate the undescended testicle appeared in the late 1970s.¹² After demonstration of the high diagnostic accuracy of laparoscopy compared with the various imaging modalities,¹³ a completely endoscopic approach to orchiopexy was developed by Jordan and associates.¹⁴ Since then, LO has flourished, with the results exceeding those of conventional orchiopexy. Many reports have been published highlighting the significant advantages of this procedure.^{10,15-21}

By following the principles of laparoscopy, we have been able to achieve excellent results. Conservation of a wide peritoneal window, in addition to high ligation of the testicular vessel when necessary, improves the chance the testicle will survive. Minimal and gentle handling of the gonad also contributes to preservation of its delicate blood supply. We advise against extensive dissection of the testicle during the first stage of a multistage Fowler-Stephens procedure in order to minimize local scar formation and enable easier dissection during the later stage. However, we have been able to obtain excellent results with single-stage Fowler-Stephens orchiopexy even for high intra-abdominal testicles using the technique described here.

CONCLUSION

It is apparent from our data that LO is superior to any other modality for the correction of nonpalpable testicles. As with other novel techniques, the success rate will begin to plateau with increasing experience. A thorough understanding of the anatomy, as well as sparse use of electrocautery, is crucial for a superior outcome. Advances in instrumentation and techniques have made LO a feasible, practical, and effective choice for the diagnosis and treatment of nonpalpable testicles located intra-abdominally or near the internal inguinal ring.

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