

One-Stage Laparoscopic Orchiopexy for the Treatment of Intraabdominal Testis

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ABSTRACT: **Background:** Laparoscopy has gradually become the gold standard for the treatment of non-palpable testicles (NPT), with different success and complication rates.

Objectives: To evaluate outcomes of the one-stage laparoscopic orchiopexy for NPT in our department.

Methods: We retrospectively evaluated the medical files of patients who underwent laparoscopic orchiopexy with the identical technique. Only patients with at least one year follow-up were included. At follow-up we assessed the age (at surgery), follow-up time, laterality of testes, postoperative complications, testicular size and testicular localization.

Results: Thirty-six consecutive patients, median age 16 months, underwent one-stage laparoscopic orchiopexy. Sixteen patients (44.4%) had peeping testis type, in 13 patients (36.1%) the testicle was located within 2 cm from the internal ring and in the remaining 7 patients (19.4%) it was detected > 2 cm from the internal ring. In six children (16.7%) dividing the spermatic vessels was performed in one stage with laparoscopic orchiopexy. In the remaining 30 patients (83.7%) a laparoscopic one-stage procedure was performed with preservation of the spermatic vessels. Testicular atrophy was observed in 2 cases (5.6%), and 6 patients (16%) had a relatively small testicle compared to the contralateral normal testicle at follow-up. Two patients (5.6%) presented with testicle positioning at the entrance area into the scrotum. None of the patients demonstrated hernia recurrence at follow-up. There was no difference in surgical outcome in children who had surgery with preservation of the spermatic vessels versus those who underwent orchiopexy with division of the spermatic vessels in one stage.

Conclusions: Laparoscopic transection of the testicular vessels appeared to be safe in boys with high abdominal testes that did not reach the scrotum after laparoscopic high retroperitoneal dissection.

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Cryptorchidism can reach 3% in full-term neonates, rising to 30% in premature boys [1,2]. About 20% of cryptorchid testicles are non-palpable. In these cases, the laparoscopic technique is a useful alternative method of diagnosis and treatment.

Laparoscopy has attained full acceptance, both diagnostically and therapeutically, in the realm of pediatric urology for the management of a non-palpable testis. Since the earliest reported cases over a quarter of a century ago, there are now several thousand cases in the literature documenting the impact of laparoscopy on the management of a non-palpable testis [3].

The advantages of laparoscopy over a conventional “open” surgical approach to a non-palpable testis include not only better exposure, lighting, and magnification but also accurate anatomic assessment of testicular position and viability and, when necessary, optimal accessibility to the crux of the surgical problem [4].

There is ongoing debate with regard to the type of laparoscopic orchiopexy that should be employed in patients with intraabdominal testis. Some authors advocate a two-stage procedure for patients who present with high intraabdominal testis with division of the testicular artery at the first stage and formal orchiopexy later on. Others stress the fact that division of the spermatic vessels at the first stage does not diminish the risk of testicular atrophy and propose the vessel division and orchiopexy at one stage, thereby avoiding a two-stage procedure [5,6]. The present study assesses our results following one-stage laparoscopic orchiopexy for all cases of intraabdominal testis.

PATIENTS AND METHODS

We retrospectively evaluated the medical files of patients who underwent laparoscopic orchiopexy. Only patients with at least one year of follow-up were included. The follow-up assessed the age (at surgery), follow-up time, laterality of testes, postoperative complications, testicular size and testicular localization.

Our operative technique was identical in all patients. Following induction of general anesthesia the scrotal and inguinal regions were examined again, and once the absence of the testicle was confirmed the decision to proceed with laparoscopy was finally made.

The patient is positioned in the supine position and Folly’s catheter is introduced into the urinary bladder and removed at the end of surgery. Laparoscopy is performed utilizing three VersaStep™ trocars (Covidion Medtronic, USA) (one trocar of 5 mm and two trocars of 3 mm are inserted at the umbilical level laterally to the rectal muscle). Diagnostic laparoscopy is

Figure 1. Gubernaculum detachment

performed first, followed by assessment of the testes location, size, and proximity to the internal inguinal ring.

Following identification of testicular localization the testicular dissection is started from the gubernaculum detachment deep inside the inguinal channel in patients whose inguinal channel is open in order to avoid injury to the collateral vessels between the vas artery and spermatic vessels [Figure 1]. In patients with a closed process vaginalis the gubernaculum detachment is done as far away as possible from the testis. Special care is taken to handle the testis only, sparing the epididymis. Mobilization of the spermatic vessels and vas is performed on the wide peritoneal strip, after which a decision is made regarding the division of spermatic vessels [Figure 2]. In those patients where the testicle does not reach a contralateral inguinal rung the division of spermatic vessels is performed. A 12 mm VersaStep™ trocar is inserted through the scrotum, facilitating delivery of the testis to the scrotum without twisting the cord inside the inguinal channel and avoiding possible injury to the epigastric vessels. A dartos pouch orchiopexy is then performed [Figure 3]. All patients are discharged on the following day and followed at 6 months and 1 year after surgery. If the testis identified in the scrotum is of good size the next follow-up is suggested for age 13 years. If the testis is identified high in the scrotum or of smaller size than expected an annual follow-up is recommended.

For statistical analysis, commercially available software GraphPad Prism Version 6.07 for Windows (GraphPad software, San Diego, CA) was used. The Mann-Whitney and Fisher test were utilized, considering a *P* value of < 0.05 as significant.

RESULTS

Thirty-six consecutive patients, with a median age of 16 months, underwent one-stage laparoscopic orchiopexy. Sixteen patients (44.4%) had peeping testis type, in 13 patients (36.1%) the testicle was located within 2 cm from the internal ring, and in

Figure 2. Mobilization of the spermatic vessels**Figure 3.** Insertion of a 12 mm VersaStep™ trocar through the scrotum into the peritoneum

the remaining 7 patients (19.4%) it was detected > 2 cm from the internal ring. In 6 children (16.7%) division of the spermatic vessels was performed in one stage with laparoscopic orchiopexy. In the remaining 30 patients (83.7%) a laparoscopic one-stage procedure was performed with preservation of the spermatic vessels. Testicular atrophy was observed in 2 cases (5.6%) (one from each group), and 6 patients (16%) (2 from the group without spermatic vessels division and 4 from the group where division of spermatic vessels was performed in one stage with orchiopexy) had a relatively small testicle compared to the contralateral normal testicle at follow-up. Two patients (5.6%) presented with testicle positioning at the entrance area into the scrotum. None of the patients demonstrated hernia recurrence at follow-up. There was no difference in surgical outcome in children who had surgery that preserved the spermatic vessels versus those who underwent orchiopexy with spermatic vessels division in one stage (*P* = 0.121).

DISCUSSION

Laparoscopic orchiopexy is now standard in the urologists' armamentarium of management for an intraabdominal testis [1-6]. A laparoscopic approach to an intraabdominal undescended testis has advantages over open orchiopexy performed through either an extended inguinal incision or a high inguinal incision. Laparoscopy accurately assesses the presence, absence, viability, and entire anatomy of an intraabdominal testis. Success in testicular mobilization may require complete and proximal dissection of the spermatic vessels and redirecting the line of "descent" via the shortest route to the scrotum.

Laparoscopic orchiopexy allows accessibility to the entire course of the spermatic vessels to their origin, usually the limiting factor in tension-free mobilization of an intraabdominal testis. Dissection close to the origin of the spermatic vessels is possible because the surgeon's range of motion with laparoscopic instrumentation extends across the entire abdominal cavity. Magnification of these delicate vessels aids in dissection and preservation of the main and collateral blood supply. Success rates of laparoscopic orchiopexy were comparable to the published results for laparoscopic orchiopexy and are based on postoperative testicular position and viability. There is still an ongoing debate in the literature regarding how to deal with spermatic vessels in cases where the spermatic vessels are too short and do not allow bringing the testis without tension to the scrotum. Some authors suggest applying the Fowler-Stephens (F-S) principle to these cases [5]. In 1959 Fowler and Stephens [6] described the vascular supply of the testis in children with intraabdominal testis and proposed ligation of the testicular vessels with the hope of preserving function by collateral circulation through the deferential artery, a branch of the inferior vesical artery and the cremasteric artery, a branch of the inferior epigastric artery. In their experience, orchiopexy was performed under the same anesthetic. Ransley et al. [7] introduced the practice of ligating the testicular vessels and waiting 6 to 12 months before performing an orchiopexy to allow the deferential artery to increase its flow. Bloom [8] was the first to describe a laparoscopic approach for the first stage, after which the laparoscopic Fowler-Stephens procedure was introduced, performing both stages laparoscopically, which has gained wide acceptance. Staging the procedure will enable delivery of the testis into the scrotum without tension and a decreased risk of atrophy. Since then many authors have compared their results using this approach in children with intraabdominal testis. Chang et al. [9] published their results in 80 children (101 impalpable testes) who underwent laparoscopic orchiopexy. Of these patients, standard laparoscopic orchiopexy was used in 72 testes, a one-stage F-S in 20 and a two-stage F-S in 9 (first stage in 2 patients, second stage in 7). The overall success rate for all F-S procedures was 85%. However, excluding patients who had previous testicular

surgery or who required extensive dissection near the vas, 96% of the testes were successfully placed into the scrotum with no atrophy [9]. Another study by Baker and co-authors [10] reported a 97.2% success rate for "primary" laparoscopic orchiopexy, 74.1% for one-stage F-S orchiopexy and 87.9% for two-stage F-S orchiopexy, with an overall atrophy rate of 6.1%. Atrophy rates were found to be highest in the single-stage F-S orchiopexy, 22%, whereas atrophy occurred in only 2% of testes after a straightforward laparoscopic orchiopexy [10]. Recently, Ostlie et al. [11] reported on 27 of the 112 patients with intraabdominal testis who required division of spermatic vessels during laparoscopic orchiopexy. Fourteen had one-stage F-S and the remaining 13 had the two-stage procedure. The outcome was similar in both groups [11].

Our results support the previous observations. We did not find any difference in the outcome of one-stage laparoscopic orchiopexy in patients who required spermatic vessels division vs. those who did not require the F-S procedure. We attribute this to our careful handling of the blood supply. The careful dissection of the gubernaculum far from the testis allows the surgeon to preserve the collaterals from the deferential artery to the testicular vessels and reduce the possibility of ischemic injury following division of the spermatic vessels. We avoid any handling of the epididymis during surgery in order to avoid possible crush injury induced by the laparoscopic grasper. It is important to perform the dissection of the spermatic vessels and the vas with the deferential artery on the wide peritoneal strip in order to diminish possible vascular injury. Admittedly, it is difficult to judge the testicular size in a retrospective study since it is not always possible to find the exact testicular size in the surgery report. Another limitation of this study is that we do not conduct follow-up until after puberty, so we cannot report whether our patients have caught up their normal testicular size during adolescence. Finally, since this was not a randomized study it is difficult to report on the efficacy of one-stage laparoscopic orchiopexy with spermatic vessel division. However, our atrophy rate of 5.6% was even lower than reported in many previous studies. We also did not find any difference among patients who left with intact spermatic vessels vs. those who required vessel division during surgery. Finally, we found it useful and safe to deliver the testis to the scrotum after dissection by means of the VersaStep trocar introduced via the scrotal incision. Insertion of the VersaStep trocar allows gradual dilatation of the scrotal incision and safe insertion of the trocar into the abdominal cavity without incidental injury of epigastric vessels and testicular twisting during delivery.

CONCLUSIONS

Our data show that laparoscopic transection of the testicular vessels is safe in boys with high abdominal testes that do not reach the scrotum after laparoscopic high retroperitoneal dis-

section. The magnification and wide mobilization of laparoscopy likely allow better preservation of the collateral vascular supply. The one-stage procedure avoids repeat anesthesia and the extensive, sometimes tedious, dissection that is occasionally required during reoperation. There is no doubt that monitoring the child into adolescence will provide the answer with regard to the long-term effectiveness of this technique.

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