Chapter 20
Laparoscopic Varicocelectomy

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Introduction

Varicoceles occur in approximately 15% of children and adolescent males [1–3]. They can be associated with changes in the ipsilateral testicle's consistency, growth, and function [4, 5], and are identified in up to 40% of infertile men [6]. The literature is conflicted about the necessity of treating the entity as some argue that intervention does not affect fertility rates, sperm quality, or testicular growth [6–8], while others cite evidence supporting the opposite [4, 5, 9, 10]. If one decides to proceed with intervention, the controversy continues, as there are several options for treatment, all based on the technique and principles first described by Palomo in 1949 [11]. The laparoscopic approach was first described by Aaberg et al. in 1991 [12], and Pastuszak et al. found this approach to be most popular among pediatric urologists [6]. It is also the preference of the authors as it has similar complication rates as open and microsurgical techniques with significantly less operative time [7, 13, 14].

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Patient Selection/Indications

Patients are often referred to a pediatric urologist after a routine visit to a pediatrician raises concern for a varicocele either found routinely on physical exam or incidentally on a scrotal ultrasound. Affected boys are generally asymptomatic, and thus, indication for surgery is based on testicular size difference, which is determined most accurately by applying the dimensions measured on ultrasound to the formula $L \times W \times H \times 0.71$ [15]. The percent differential of the testicles can then be determined by (volume of unaffected testis − volume of affected testis) ÷ volume of unaffected testis × 100. A differential of 20% or greater has been found to be associated with potentially abnormal semen parameters; and, thus, this is used routinely as an indication for intervention [16]. However, the difference in volumes can be transient [17, 18], so it is recommended to intervene only if the discrepancy persists over a year of observation [19].

If a varicocele is present without hypotrophy, however, the appropriateness of surgical intervention is less concrete. Mehta and Sigman postulate that in these scenarios, as in adults, abnormal semen analysis should be used an indication for repair [20]. Further, Nork et al. demonstrated in their meta-analysis that adolescent varicoceles significantly negatively affect semen parameters and that intervening can improve sperm density and motility [21]. This modality, therefore, though not common practice for most pediatric urologists [22], can certainly aid in surgical decision-making if the patient and his guardian agree to evaluation. Nevertheless, just as one abnormal ultrasound should not be indicative of repair, neither should one abnormal analysis, as the majority of boys with initial abnormal results will normalize on subsequent studies [8, 23].

Surgical Technique

After induction of anesthesia, the bladder is drained via straight catheterization. Supraumbilical laparoscopic access using a 5 mm trocar is obtained in standard open or closed fashion (steps detailed in Tables 20.1 and 20.2, respectively). A 30-degree lens camera is used to survey the abdomen and to identify the location of the left spermatic cord. (Note: As 90% of varicoceles occur on the left side [19], "left side/testicle" will be synonymous with "affected side/testicle" for ease of description.) The bed is positioned into slight Trendelenburg position and rotated to raise the patient's left side. Two additional 5 mm trocars are placed as detailed in Table 20.3. Figure 20.1 depicts the configuration of the trocars.

The peritoneum overlying the spermatic cord is opened sharply using laparoscopic scissors. Dissection is continued until the spermatic cord is isolated well enough to allow for placement of surgical clips (two distally and two proximally) before the cord is ligated, as depicted in Figs. 20.2 and 20.3. Alternatively, the cord can be cauterized using a bipolar device. Cautery should be used sparingly, and care

Table 20.1 Open camera trocar placement (Hasson technique)

Pass 2-0 Vicryl stay stich through umbilical stalk
Make a supraumbilical curvilinear incision using a #15 blade scalpel
Dissect down to fascia and around umbilical stalk
Grasp umbilical stalk with Kocher clamp
Incise fascia
Pass second 2-0 Vicryl stay stich through fascia
Open peritoneum sharply
Place blunt-ended trocar through the incision
Insufflate abdomen with carbon dioxide to 12 mm Hg
Pass camera with 30-degree lens and inspect to ensure that no injury occurred while gaining access

Table 20.2 Closed camera trocar placement (Veress needle)

Pass 2-0 Vicryl stay stich through umbilical stalk
Make a supraumbilical curvilinear incision using a #15 blade scalpel
Dissect down to fascia and around umbilical stalk
Pass second 2-0 Vicryl stay stich through fascia
Use tenotomy scissors to make a small incision in the fascia and peritoneum
Pass Veress needle into opening
Confirm placement with saline drop test
Insufflate abdomen with carbon dioxide to 12 mm Hg
While holding upward traction on stay stiches, pass 5 mm trocar into abdomen with obturator in place
Pass camera with 30-degree lens and inspect to ensure that no injury occurred while gaining access

Table 20.3 Working port placement (under direct vision)

Infiltrate skin and underlying tissue with 1% lidocaine with 1:100,000 epinephrine
Use a #15 blade to make a 5 mm incision
Dissect down to facia
Use an #11 blade scalpel to pierce the fascia and peritoneum
Pass trocar with obturator in place into abdomen

should be taken to preserve a wide swath of peritoneum over the vas in order to preserve the associated blood supply, as demonstrated in Fig. 20.2. Of note for completeness, variations on this standard procedure exist, including artery- and/or lymphatic-sparing techniques; however, neither are the authors' standard practice, and thus, are not described in detail here, but will be discussed below. Insufflation pressure is then decreased, and hemostasis assessed. Once this is adequate, the instruments are removed, followed by the trocars under direct vision. The fascia at the trocar sites is closed with interrupted or figure-of-eight sutures, and the skin is reapproximated in a subcuticular fashion.

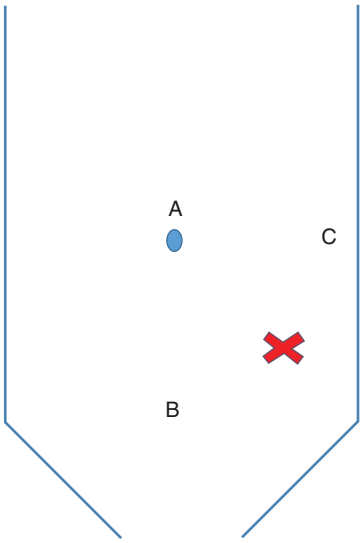

Fig. 20.1 Placement of 5 mm trocars. A = supraumbilical camera site; B = scissors, bipolar cautery device, clip applier; C = Maryland dissecting forceps; X = location of spermatic cord

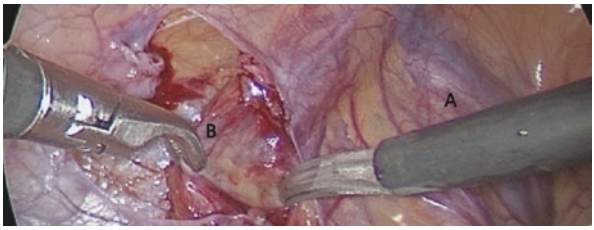

Fig. 20.2 Spermatic cord (B) is well isolated while maintaining a wide swath of peritoneum around the vas (A)

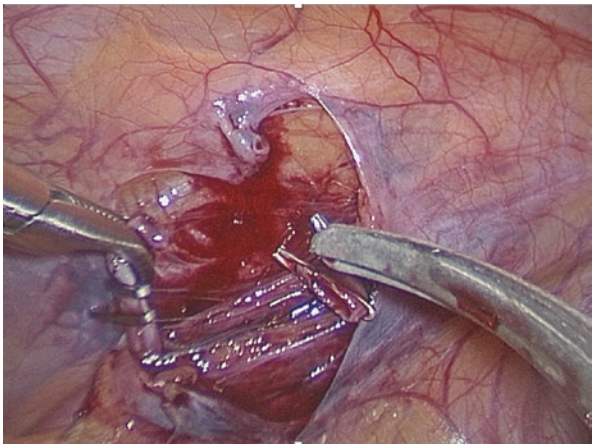

Fig. 20.3 Ligated cord vessels with two proximal and two distal clips in place

Outcomes/Complications/Follow-Up

For all varicocelectomy approaches, the main complications are recurrence and hydrocele formation. In their meta-analysis of 11 studies published between 2000 and 2009, Borruto et al. found these to occur at rates of 5% and 10%, respectively [24]. Comparing laparoscopic and open approaches, hydrocele is slightly more common with the former technique while the reverse is true for recurrence; however, the differences in rates have not been shown to be statistically significant [13, 24]. Specific to laparoscopy, injury to the genitofemoral nerve is cited in some studies as occurring in approximately 2% of patients [13, 25]. This, however, can easily be avoided with careful attention during dissection, as rates have been shown to decrease as surgeons gain experience [13].

The artery-sparing technique was first compared to the standard procedure by Kass and Marcol in 1992 [5]. They found this method to have a significantly higher rate of persistent/recurrent varicocele when compared to high retroperitoneal ligation of the spermatic vessels. This finding has been echoed in several other studies [26, 27], but the appropriateness and efficacy of this modification continues to be a topic of discussion due to concern for testicular atrophy or hypotrophy without it.

This concern, however, is not supported by data in the literature nor by understanding of the anatomy. In a study by Esposito et al., none of the 189 boys who underwent ligation of the testicular veins and artery during varicocelectomy suffered testicular hypotrophy postoperatively. The authors explain that this is to be expected because of the existing collateral blood supply to the testis from the gubernaculum, the anterior and posterior scrotal vessels, and the deferential vessels [26]. Further, in their review of pathologic specimens of vessels ligated during open varicocelectomy, Cuda et al. found that men who had inadvertently had arterial segments ligated during their procedures had no clinical testicular hypotrophy [28]. Lastly, in their separate series comparing patients treated with and without artery-sparing varicocelectomies, McManus et al. and Atassi et al. both concluded that the former approach increased surgical time without providing any clinical benefit [27, 29].

With regards to hydrocele formation, the slightly higher occurrence associated with laparoscopic intervention can be decreased with application of the lymphatic-sparing technique first described by Oswald et al. in 2001 [30]. In their series of 28 boys, isosulphan blue injected “under the tunica dartos near to the parietal wall of the tunica vaginalis” 15 minutes prior to starting the operation was used to identify and spare the lymphatic channels. None of their 28 patients developed reactive hydroceles, but four underwent traditional Palomo varicocelectomy due to failure of mapping [30]. Several published series have echoed the success of this method, and its applicability to both open and laparoscopic approaches [31–33].

Nevertheless, Esposito et al. were dismayed that mapping was unsuccessful in up to 30% of cases, and sought to standardize the technique in order to delineate the lymphatics in every patient [34]. In 2014, they described their approach of injecting 2 ml of 2.5% isosulfan blue into the intra-dartos space and 0.5 ml into the testicular

parenchyma 5 minutes prior to surgical start. This provided effective mapping in all cases, and none of the patients developed reactive hydroceles. This modification, therefore, can be reproducibly applied to decrease hydroceles formation when using a laparoscopic approach.

Summary

Laparoscopic varicocelectomy is a safe and cost-effective procedure for treating pediatric varicoceles. Use of an artery-sparing modification is not advised as it increases operative time and risk of recurrence without any clear benefit. Though not significantly different from the rate associated with an approach, hydrocele formation is the main complication during laparoscopic intervention. This commonly does not require intervention [27]; however, it can potentially be avoided by sparing the lymphatic vessels.

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