Chapter 19
Laparoscopic Varicocelectomy

Joseph M. Gleason and Martin A. Koyle

Abstract The adolescent varicocele remains a controversial issue in pediatric urology. In our institution, the indications for intervention are primarily the findings of a varicocele with ipsilateral testicular hypotrophy and less commonly for symptoms. Therapeutically, the patient and his family are counselled in depth regarding the conflicting data surrounding varicoceles and their management and then offered the options of surveillance (knowing that fertility potential cannot be reliably measured in this age group), radiologic embolization, or open surgical correction using a high Palomo technique or a microscopic subinguinal method. The majority of this author's patients, however, choose the laparoscopic approach to the Palomo high ligation of the spermatic vessels. The primary reasons why patients and families make this choice are due to its high success, minimal morbidity, virtually no scars, and, most importantly, because it allows rapid return to full activity. Success rates are excellent (>99 %) and recurrence rates are very low. De novo ipsilateral hydrocele formation is a potential complication that may require further intervention and must be disclosed during preoperative counselling but, in long-term follow-up, has only been necessary in 2–3 % of adolescents undergoing this technique. Testicular atrophy or loss has not occurred in our hands.

Keywords Varicocele • Varicocelectomy • Laparoscopy • Testicular hypotrophy • Palomo

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Introduction

Varicocele is defined as tortuous and dilated veins of the pampiniform plexus surrounding the testis. Like varicose veins elsewhere in the body, they are caused by incompetent venous valves, which usually serve to protect the spermatic veins from the hydrostatic pressures imposed upon them prior to draining into the larger veins. The left spermatic vein drains into the left renal vein perpendicularly, whereas the right spermatic vein drains directly into the vena cava at a more acute angle, leading to the vast majority of varicoceles being seen on the left. Retroperitoneal processes (i.e., tumors, retroperitoneal fibrosis, "nutcracker syndrome") can be the etiology of secondary varicoceles in a small minority of cases but should always be considered, especially with right-sided varicoceles. Bilateral varicoceles, many of which are subclinical, can often be discovered when ultrasonography is employed. Varicoceles have long been associated with male factor infertility, and varicoceles allow abdominal temperature blood to accumulate in the scrotum leading to increased temperature in the scrotum/testis on the affected side, ultimately impairing spermatogenesis. In children, most will be detected on routine physical or self examination, but a small subset will present with testicular or scrotal pain. Since children and adolescents are not being evaluated for infertility, patients referred to a pediatric urologist are much more likely to harbor high-grade (Grade III) varicoceles, rather than moderate less conspicuous varicoceles (Grade II) or subclinical (Grade I) varicoceles.

The management of asymptomatic varicoceles in children remains a topic of controversy. With an incidence in 15 % of the adult male population, it remains a common surgically correctable urologic problem [1]. Recent evidence suggests they may be more prevalent in adolescents who are taller and heavier than age-matched controls [2]. However, most men with varicoceles are asymptomatic and fertile, as determined by paternity [3]. Therefore, the question of who needs to be operated upon remains at the forefront of discussions among pediatric urologists. Criteria used to make assessment have included testicular size discrepancy, varicocele size or unsightliness, symptoms, and semen parameters. Kolon recently described the management algorithm at the Children's Hospital of Philadelphia, where children are followed annually with examinations using an orchidometer until Tanner stage 5 is reached, at which point semen analyses are offered. Surgical correction is reserved for those with low total testicular volume or semen parameters and rarely for symptoms [4]. Not much data exists on the impact of varicocele ligation on semen parameters in younger patients nor on ultimate fertility and paternity. Pajovic recently reported their findings on semen parameters following varicocelectomy and claimed that testicular volume, sperm counts, abnormal forms, viability, and semen pH were all significantly improved 3 months following laparoscopic varicocelectomy in 23 men with varicoceles and abnormal parameters preoperatively [5]. Others have suggested improvements in spermatogenesis, Sertoli and Leydig cell function following varicocelectomy [6–8]. Kozakowski et al. also suggested that all of the adolescents with peak retrograde flow >38 cm/s

in addition to testicular asymmetry >20 % showed progressive asymmetry on follow-up ultrasounds if not operated upon, recommending these be corrected on initial presentation [9]. In our experience, many families choose repair because of the uncertainty long term regarding their son, even with equal testes size and normal spermiogram.

Palomo initially described an open retroperitoneal approach to varicocele ligation in 1949 with a muscle splitting incision and ligation of the entire vascular package medial to the ureter [10]. No attempt to preserve lymphatics or the spermatic artery was made. This approach can be reproduced laparoscopically with minimal morbidity, faster operating times, and immediate return to full activities. No strong data support sparing the artery and lymphatics. Certainly hypothetically preserving the lymphatics in an attempt to prevent secondary hydroceles seems logical; in our hands, the risk of hydrocele requiring surgery has been <3 %. Moreover, even with mass ligation of the cord, no testes have been lost in our experience, so again we follow the initial Palomo technique and make no attempt to identify the artery either. In addition, a laparoscopic approach allows for quick and easy assessment of the contralateral side and is safe to perform, even after ipsilateral inguinal surgery [11]. Although the veins can be interrupted in many ways, we have used a bipolar sealing device, both to dissect and to seal the vessels, and do not routinely divide the vessels after application of the instrument. This also allows us to avoid placing any laparoscopic ports, other than the umbilical site where the scope and camera are placed. Herein, that technique is described in detail.

Indications for Intervention of Known Varicocele

- Informed consent from both the patient (if of appropriate age) and parent(s)
- Younger children with relative testicular hypotrophy (>20 % volume loss compared to the contralateral testis)
- Older children with abnormal semen parameters (data lacking)
- Pain or discomfort of the ipsilateral testis (uncommon)
- Large and unsightly hemiscrotum causing psychological distress or anxiety (most common!)

Contraindications

- Hostile abdomen from previous surgery, precluding safe laparoscopic access (rare and has yet to occur in our practice)

Surgical Technique

Preoperative Preparation

- Have the patient void on call to the operating room
- No shaving of hair, as we prefer to make the suprapubic “working puncture” through pubic hair (if present) to conceal the scarMinimal Equipment Needed
- Scalpel

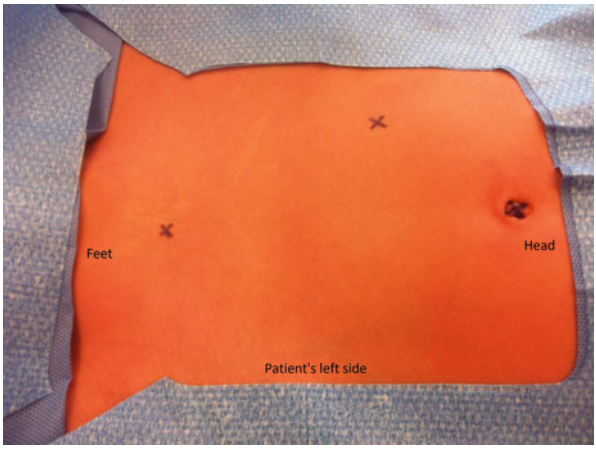

Fig. 19.1 Abdominal skin marking for instrument placement

- A single 3 or 5 mm trocar and insufflation tubing (umbilical port)
- 3 or 5 mm laparoscope with a 30° lens and light source
- Video tower with insufflation device
- 3 or 5 mm laparoscopic Maryland grasper (right lower quadrant puncture site)
- 5 mm laparoscopic bipolar vessel-sealing device (LigaSure, Thunderbeat, etc.) (suprapubic puncture site)
- A single suture (absorbable 3-0 or 4-0 of choice) with needle driver (to close umbilicus only)
- Local anesthetic
- Skin glue (Dermabond/cyanoacrylate) (for all incisions and puncture sites)

Laparoscopic varicocele ligation thus requires a minimal amount of instrumentation. Although a 3 or 5 mm trocar is used for the camera, the other instruments are placed through small "stab" incisions. The patient is asked to void on call to the operating room (avoiding the need for urethral catheterization) and is placed supine and general anesthesia is induced. No antibiotic prophylaxis is administered. Because the operation takes <15 min in most cases, many anesthesiologists are comfortable utilizing a laryngeal mask airway. That being said, the majority prefer to intubate due to the potential physiological consequences of pneumoperitoneum.

After prepping and draping in a standard fashion, the instrument entry sites are marked (Fig. 19.1). Pneumoperitoneum is achieved in a standard manner via an umbilical 3 or 5 mm trocar. Laparoscopic guidance is used to allow for direct visualization of placement of local anesthetic and to confirm safe locations for the stab incisions (Fig. 19.2). The Maryland dissector is then passed directly through the right lower quadrant stab incision under direct visualization (Fig. 19.3). A laparoscopic bipolar device is similarly passed through another stab incision just above the pubis in the midline.

Once all instruments are inserted satisfactorily, the left spermatic vessels are identified, and a site for incision of the posterior peritoneum above the spermatic vessels is identified as far cephalad from the internal ring as possible to avoid injury

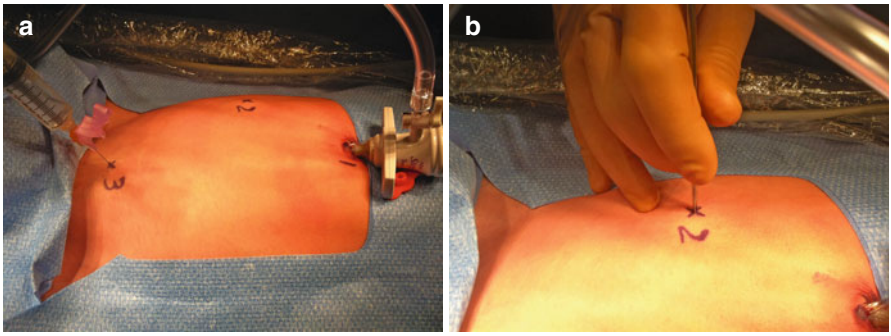

Fig. 19.2 (**a**, **b**) Local anesthetic and stab incisions made under direct visualization after placement of umbilical trocar

Fig. 19.3 Maryland dissector and bipolar device passed directly through stab incisions

to the vas deferens and collateral blood supply from the deferential vessels (Fig. 19.4). Trendelenburg positioning is often helpful during this step. Occasionally there are adhesions, especially of the sigmoid in this area. They can usually be lysed with the Maryland and bipolar device, and rarely will another working port or other instrumentation be required. Still the surgeon should be prepared for any eventuality, especially in a patient with prior abdominal, pelvic, or inguinal surgery.

The left-handed Maryland dissector is used to grasp the posterior peritoneum overlying the spermatic vessels, and the right-handed bipolar device pierces through the peritoneum, creating a window through which the vessels can be dissected free and isolated (Fig. 19.5). Once this maneuver has been accomplished, the vessels are grasped completely with the Maryland, and the bipolar is used to create a window behind the vessels, and the window is extending cephalad and caudad bluntly until an adequate area is visible for ligation. No attempt is made to separate the artery from the veins or to identify lymphatics as noted above (Fig. 19.6).

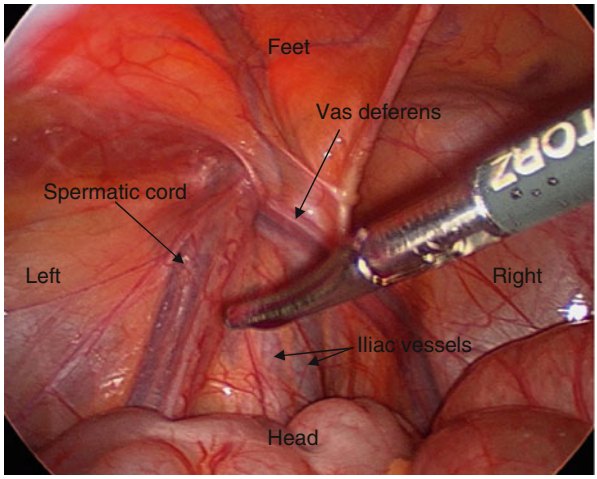

Fig. 19.4 Anatomy of relevant structures

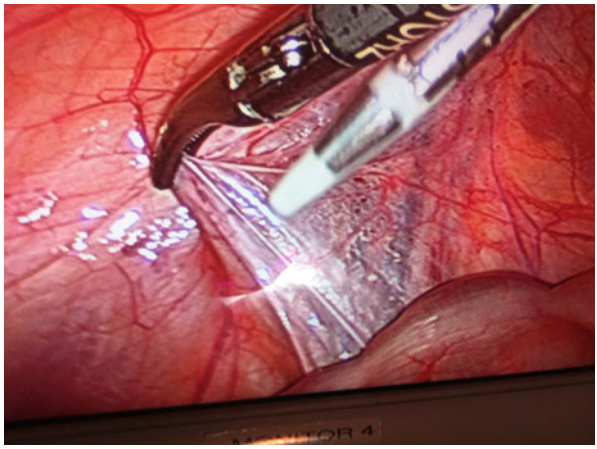

Fig. 19.5 Creation of peritoneal window

The bipolar device is applied to the entire vascular package 2–3 times to completely seal all vessels (Fig. 19.7). Intermittent traction on the ipsilateral testis can be applied to identify any additional vessels missed initially. The vessels are not routinely divided. Final inspection confirms no additional venous collaterals are present, hemostasis is achieved, the vas deferens and deferential vessels are undisturbed, and no overt complications have occurred (Fig. 19.8).

The abdomen is desufflated, and all instruments and the trocar are removed. A single 3-0 or 4-0 absorbable suture is used to close the umbilical fascia in a figure of eight fashion, to prevent herniation. No suture closure of the stab incisions is necessary. Additional local anesthetic is infiltrated, and the skin at the incision sites are all reapproximated with skin glue. Ketorolac 0.5 mg/kg IV is administered in the operating room, and the patient is discharged the same day with minimal oral analgesic requirements (NSAIDs and acetaminophen). We do not routinely

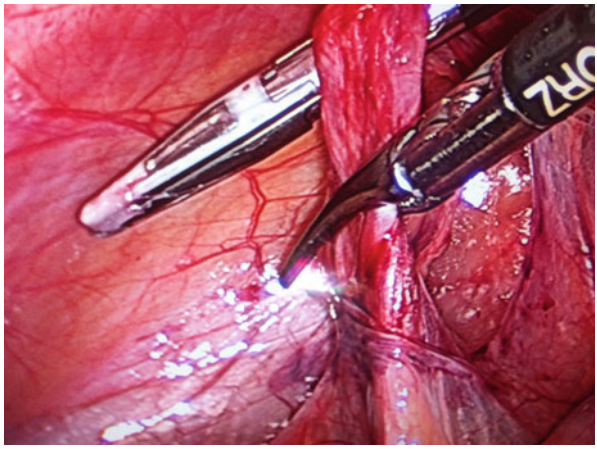

Fig. 19.6 Isolation of the spermatic cord using the bipolar device as dissector while grasping the cord with the Maryland dissector

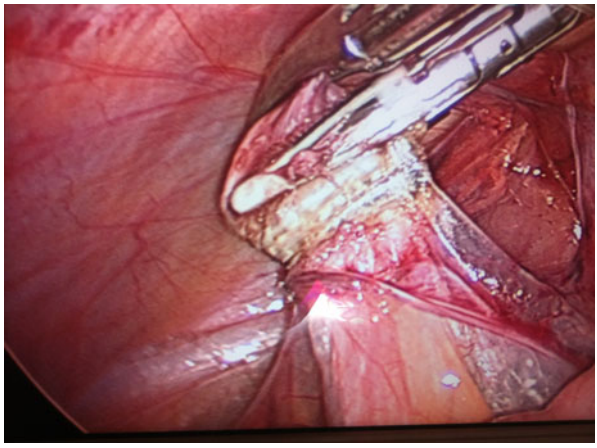

Fig. 19.7 Bipolar sealing performed 2–3 times without dividing the vascular package

prescribe narcotics postoperatively. Patients are allowed to resume full activities and bathe normally immediately. The average surgical time from skin to skin is 15–20 min.

Additional Comments

- A patent processus vaginalis might be encountered on either side during laparoscopic exploration. Repair is not indicated unless it is thought to be "clinically significant," but this is beyond the scope of this chapter.
- This technique is safe and effective in cases where there has been previous ipsilateral inguinal surgery performed [11]. More extensive dissection of the left colon made be required, as well as adhesiolysis to find a safe window for the

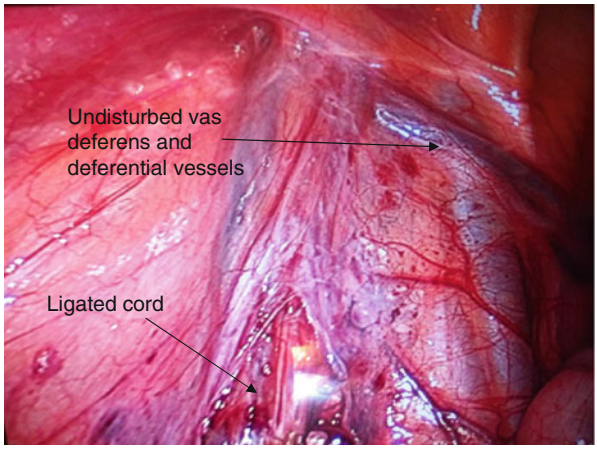

Fig. 19.8 Final inspection, ensuring no complications have occurred, and the varicocele is completely ligated

dissection. Additional ports may need to be placed in these cases to allow for exchange of instrumentation.

Outcomes and Complications

Intraoperative issues are rare, and all children are discharged the same day. In follow-up, no studies which measured testes pre- and postoperatively via orchidometer or ultrasound showed any evidence of loss of testicular size. Atassi et al. showed that the average relative left testicular volume increased by 20 % in the Palomo group, and this was not different from the group that underwent an artery-sparing procedure [12]. This is consistent with earlier work published by Kass et al. [13]. The majority of patients in the published literature demonstrated catch-up growth of the left testicle following laparoscopic varicocelectomy [14, 15]. Poon et al. compared catch-up growth between those who underwent a lymphatic sparing procedure to those who had a non-lymphatic-sparing operation and found that most demonstrated catch-up growth, regardless of the choice of procedure [16].

Laparoscopic varicocelectomy is a safe procedure, with minimal morbidity and few complications. The major complication that must be discussed preoperatively is the development of a de novo ipsilateral hydrocele. This has been reported to occur in 7–23 % of boys after left laparoscopic varicocelectomy, with 5–11 % requiring hydrocelectomy [17–22]. Patients should be followed long term following varicocelectomy to assess for hydrocele formation, as delayed presentation has been reported [18]. Varicocele recurrence rates are quite low, with reported failure rates of 0–4.7 % [14, 15, 21, 22]. Testicular loss or atrophy is a fortunately rare occurrence, despite intentional ligation of the spermatic artery.

Conclusion

Success rates following laparoscopic varicocelectomy are excellent, and serious complications are uncommon. Catch-up growth of the affected testicle is seen in the majority of patients. De novo hydrocele formation is a concern and is seen in a minority of patients but has required surgical treatment in a small subset of those following varicocelectomy. No convincing data exists to support the need for more meticulous procedures to spare the spermatic artery or lymphatics encountered during varicocele ligation. Overall, this is a safe and efficacious operation, which can be performed as an outpatient procedure with minimal morbidity and immediate return to normal activities.

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