

# Lymphatic-Sparing Laparoscopic Varicocelectomy Versus Microscopic Varicocelectomy: Is There a Difference?

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<b>OBJECTIVES</b>	The ideal operation for the adolescent varicoceles has been debated for many years as new techniques or advances in existing technology develop. It is well acknowledged that the Palomo procedure has a negligible recurrence rate but a very high postoperative hydrocele rate compared with a microscopic varicocelectomy (MV). We sought to determine whether lymphatic-sparing laparoscopic varicocelectomy (LSLV) could provide similar negligible recurrence rates as the Palomo approach with the negligible postoperative hydrocele rate seen with MV.
<b>METHODS</b>	We performed a retrospective chart review of patients who underwent either an MV (n = 31) or LSLV (n = 28). In the MV group, the artery and the lymphatics were spared, whereas in the LSLV group, the artery and veins were taken en masse. Statistical analysis included paired Student <i>t</i> -test and Chi-square test for continuous and categorical variables, respectively.
<b>RESULTS</b>	Preoperative testis volumes were not different nor were the postoperative testis volumes between groups. Mean operating time was significantly longer in the MV than the LSLV group (140 minutes versus 51 minutes, $P < 0.01$ ). With a mean time since surgery of 2 years, we observed only one patient with a recurrent varicocele (MV group); only one patient developed a hydrocele requiring hydrocelectomy (LSLV group).
<b>CONCLUSIONS</b>	Our early data indicate that LSLV and MV are comparable in preventing varicocele recurrence and formation of hydroceles. The primary difference between the procedures is the surgical time, with the LSLV being much faster to perform. UROLOGY 70: 1207–1210, 2007. © 2007 Elsevier Inc.

The management of varicoceles in the adolescent male is a controversial topic. While the indications for intervention can be debated, effective treatment options are available when intervention is deemed appropriate. These options include open surgery (Palomo or Ivanisovich), laparoscopy, and percutaneous transvenous procedures. The Palomo technique first described in 1949 involves en masse transection of the testicular vessels in the retroperitoneum above the internal inguinal ring.<sup>1</sup> The varicocele recurrence rate for the Palomo procedure has been reported to range from 0% to 16% with postoperative hydrocele rates ranging from 7% to 24%.<sup>2–4</sup> Comparatively, using microscopic assistance with an inguinal approach, varicocele recurrence rates and hydrocele rates in the existing literature range from 0% to 2% and 1% to 4%, respectively.<sup>5–7</sup> Universal use of the inguinal approach for varicocelectomy has not been employed owing to the technical challenge of dis-

secting the investing veins that surround the testicular artery at this level.

Donovan and Winfield first described minimally invasive surgical technique using laparoscopy for the treatment of varicoceles in an adolescent in 1992.<sup>8</sup> The site of varix ligation in this technique is similar to that of the open Palomo approach. Postoperative hydroceles using a laparoscopic approach have been observed in up to 28% of cases.<sup>9–11</sup> There are several encouraging reports of attempted lymphatic preservation at the time of laparoscopic varicocelectomy in an effort to reduce the risk of postoperative hydrocele.<sup>12–15</sup> The purpose of this study was to determine whether lymphatic-sparing laparoscopic varicocelectomy (LSLV) can provide the same negligible recurrence rates associated with the Palomo approach and the same negligible postoperative hydrocele rate seen with microscopic varicocelectomy (MV).

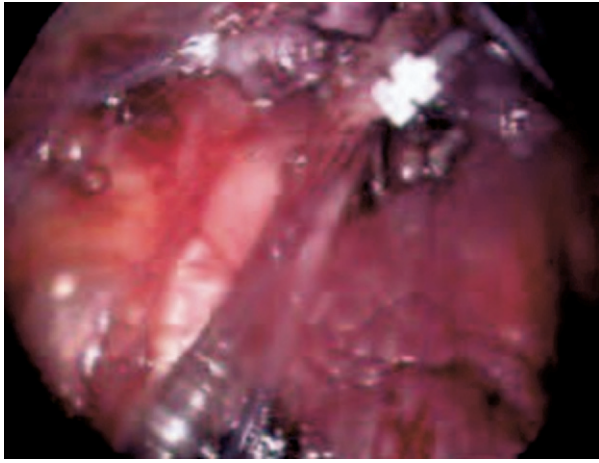
## MATERIAL AND METHODS

We performed a retrospective chart review of patients who underwent either an MV (n = 31) or an LSLV (n = 28) over a 28-month time period. All boys were referred from a general pediatrician for clinical evaluation of a palpable varicocele. An attending physician performed a physical examination and the

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**Figure 1.** Intraoperative appearance of lymphatics preserved after lymphatic-sparing laparoscopic varicocelectomy.

varicocele was graded according to the Dubin grading system (Grade I to III). Testicular volume was measured ultrasonographically using the formula:  $0.71 \times \text{Length} \times \text{Width} \times \text{Height}$ . Indications for varicocelectomy included pain or testicular hypotrophy defined as 20% volume or greater differential between testicles. All boys underwent LSLV by 1 surgeon (IF); the MV patients had surgery performed by 1 of 3 surgeons (JG, SBL, or LSP).

In all MV patients, we used the standard subinguinal approach. After isolation of the spermatic cord, the operating microscope was used to identify and preserve the testicular artery and lymphatics. Varices of the pampiniform plexus were ligated and divided. In all LSLV patients, we employed a standard three-trocar configuration. A 5-mm trocar was placed at the umbilicus with two 5-mm trocars placed lateral to the border of the rectus abdominis at the level of the umbilicus on the right and left side. The spermatic vessels were identified in the retroperitoneum above the internal inguinal ring. Dissection was kept to a minimum to avoid disruption of lymphatics. Lymphatics were dissected free from the spermatic artery and veins based on laparoscopic appearance (Fig. 1). The spermatic artery and veins were divided between plastic locking clips.

We saw patients approximately 1 week postoperatively for surgical wound check. Repeat history and physical examination were performed at 6 months assessing for varicocele persistence or recurrence or development of new onset hydrocele. We obtained repeat testicular sonogram when possible. Follow-up examinations occurred every 6 to 12 months thereafter. We noted the change in testicular volume after varicocelectomy, incidence of varicocele recurrence, and hydrocele after varicocelectomy. Comparisons of these parameters for each patient before and after varicocelectomy as well as between surgical approaches were performed. Statistical analysis included paired Student *t*-test and Chi-square test for continuous and categorical variables, respectively. A *P* value less than 0.05 was considered statistically significant.

## RESULTS

The average age of the MV group was  $14.5 \pm 3.6$  years and the LSLV group was  $15.0 \pm 2.7$  years old (Table 1). All 31 patients had Grade III varicoceles in the MV

group compared with 2 patients with Grade II and 26 patients with Grade III varicoceles in the LSLV group. Three boys had bilateral MV in the microscopic group whereas 2 boys underwent bilateral LSLV for patients with a total of 34 testicles that underwent varicocelectomy in the MV group and 30 in the LSLV group. All children had testicular size hypotrophy as the indication for surgery in the MV group. Four children had pain as the indication for their LSLV; the remainder demonstrated testicular hypotrophy on sonography.

The mean preoperative testis volumes were not different between groups; however, the preoperative mean left testicular volume was significantly less than the right side in the microscopic group ( $13.6 \pm 5.6$  mL versus  $17.1 \pm 6.5$  mL,  $P < 0.001$ ). All surgeries were performed on an ambulatory same-day surgery basis. Mean operative times were shorter in the laparoscopic group compared with the microscopic group ( $51 \pm 26$  minutes and  $140 \pm 65$  minutes for the MV and LSLV groups, respectively,  $P < 0.001$ ). All surgeries in both groups were completed successfully without immediate complication.

Postoperative testicular sonograms were available in 37 of the total 59 patients (18 of 28 [64%] patients and 19 of 31 [61%] in the LSLV and MV groups, respectively). Mean time after surgery in the MV group was  $27.8 \pm 7.6$  months compared with  $28.9 \pm 7.7$  months in the LSLV group ( $P =$  not significant). The mean postoperative testis volumes were not different between surgical approaches; however, differences did exist between preoperative and postoperative testicular volumes within each group. In the LSLV group, postoperative mean left testicular volume was  $18.9 \pm 7.2$  mL compared with  $14.6 \pm 7.5$  mL preoperative left testicular volume ( $P < 0.001$ ). Postoperative right testicular volume increased to  $19.1 \pm 7.1$  mL from a preoperative value of  $17.6 \pm 7.4$  mL in the LSLV group ( $P = 0.03$ ). There were similar significant increases in testicular volumes for both the right and left testicles in the MV group.

One patient in the MV group (1 of 31 patients, 3.2%) had a clinically palpable recurrent varicocele diagnosed 4 months postoperatively. However, no testicular hypotrophy was present and we are observing this child with serial ultrasound before repeat intervention. No recurrent varicocele was observed in the LSLV group. One patient in the LSLV group (1 of 28 patients, 3.5%) had a small hydrocele detected on physical exam at 6 months' follow-up that grew in size. He subsequently underwent hydrocelectomy 13 months after LSLV. No hydroceles were observed after MV.

## DISCUSSION

Few clinical diagnoses in pediatric urology have the multitude of possible therapeutic interventions of the adolescent varicocele. Although this observation typically signifies that no one technique is superior to any other, some may argue against this proposition. May *et al.* compared laparoscopic varicocelectomy with antegrade scler-

**Table 1.** Patient characteristics and operative results

Characteristic	MV	LSLV	P Value*
Age (yr)	14.5 ± 3.6	15.0 ± 2.7	0.28
Varicocele grade	All Grade III	26 Grade III, 2 Grade II	
No. bilateral varicoceles	3	2	0.68
Preop left testis vol (mL)	13.6 ± 5.6 <sup>†</sup>	14.6 ± 7.5	0.23
Preop right testis vol (mL)	17.1 ± 6.5	17.6 ± 7.4	0.38
Postop left testis vol (mL)	17.5 ± 6.4 <sup>†</sup>	18.9 ± 7.2 <sup>†</sup>	0.28
Postop right testis vol (mL)	20.1 ± 7.3 <sup>†</sup>	19.1 ± 7.1 <sup>†</sup>	0.34
Operative time (min)	140.2 ± 65.7	51.5 ± 26.2	<0.01
Time since surgery (mo)	27.8 ± 7.6	28.9 ± 7.7	0.35
Recurrence	1	0	0.55
Hydrocele	0	1	0.44

LSLV = lymphatic-sparing laparoscopic varicocelectomy; MV = microscopic varicocelectomy; Preop = preoperative; Postop = postoperative.

All patients had preoperative testicular sonograms. However, postoperative testicular sonograms were available in 18 of 28 and 19 of 31 patients in the LSLV and MV groups, respectively.

\* P values for comparison between MV and LSLV groups.

<sup>†</sup> P < 0.01 for comparison between preoperative left testicular volumes and right preoperative testicular volumes in MV group.

<sup>‡</sup> P < 0.05 for comparison between preoperative testicular volumes and postoperative testicular volumes within MV and LSLV groups.

rotherapy over a 10-year period and found recurrence rates of 4.9% and 15.7%, respectively.<sup>16</sup> However, this was offset by a higher complication and hydrocele rate for the laparoscopic group. Similarly significant postoperative hydrocele rates have been reported by others and serve as the major disadvantage of the Palomo approach performed either open or laparoscopically.<sup>2-4,9-11</sup>

The microsurgical inguinal approach has excellent efficacy rates accompanied by low morbidity. It is a technically more challenging procedure because in children, the testicular artery is small and systemic blood pressure is low, making identification of the artery difficult in a subinguinal or inguinal approach. Thirty-five percent of urologists treating varicoceles employ techniques other than the inguinal or subinguinal approach to varicocelectomy partly because of these considerations and other available surgical techniques.<sup>17</sup>

We observed no hydrocele and a single varicocele recurrence in the MV group, which is consistent with other reported series.<sup>5-7</sup> Extended follow-up when evaluating the outcomes of varicocelectomy is important. Misseri *et al.* in a series of 77 boys undergoing 95 varicocelectomies observed development of hydroceles in 23 at a mean follow-up of 25 months. The authors noted that of the hydroceles, two were detected in the first 6 months after surgery, nine at 6 to 12 months, three at 13 to 18 months, five at 19 to 24 months, and four at more than 2 years after surgery. Thus, the time elapsed since surgery in our patient population is long enough to evaluate if hydroceles were to develop and only one of the patients (1 of 59, 1.7%) did in the entire cohort. Our patients will continue to be monitored for potential recurrence of varicocele and development of hydrocele.

The pathogenesis of postoperative hydrocele after Palomo varicocelectomy results from lymphatic obstruction as shown by Szabo and Kessler.<sup>3</sup> Therefore, attempts to visualize and preserve retroperitoneal lymphatics in close association with spermatic vessels should minimize the risk of hydrocele formation. Precise identification of

lymphatics with the open Palomo technique is especially difficult in patients with a high body mass index because at this level the internal spermatic vessels cannot be delivered into the wound and the operation involves working in a deep hole to dissect and ligate the vessels in situ in the retroperitoneum. The power of the laparoscope to visualize and magnify intracorporeal structures is realized when a laparoscopic technique is used.

Meticulous dissection of the retroperitoneal structures with the aid of the laparoscopic magnification assisted in identification and preservation of lymphatics in the LSLV group. However, the discrimination between lymphatics and small veins seems to be delicate, and it is not proven to discriminate microscopically between isolated lymphatic vessels and very small veins in view of anatomic distal lymphovenous anastomoses. We employed the previously published technique reported by Kocvara *et al.* and were able to identify lymphatics in every patient using solely the laparoscope, and used no specific dyes such as methylene blue or isosulphan blue injected into the scrotum to assist in the visualization of the lymphatics.<sup>13</sup> It is possible that using these adjuncts to identify lymphatics may have prevented the single hydrocele observed in the LSLV group. However, reports of scrotal staining up to 3 months postoperatively have been described with the use of isosulphan blue injected into the scrotum. Before adopting a lymphatic sparing approach, while employing a laparoscopic nonselective testicular ligation technique, we observed a 7% hydrocele rate over a 6-year period.<sup>18</sup> Although the frequency of hydrocele formation may not dramatically differ between the current cohort and this prior series since adopting the LSLV, we believe it merits performing. It does not add significant time to the procedure, and Kocvara *et al.* reported that division of lymphatic vessels at varicocelectomy is associated with a reduced testicular function according to higher LH and FSH stimulated values.<sup>19</sup>

Operative time was significantly shorter in the LSLV group than in the MV group. This difference is because of

the need for microscope setup time in the MV group, dissecting and ligating more veins with the inguinal approach, relatively more dissection in bilateral cases than with the LSLV approach, and the need to discriminate between the small vessels that are lymphatics, veins, and artery at this level. A dense complex of adherent veins surrounding the artery is found in 95% of patients using a subinguinal approach and in 30% using the inguinal approach.<sup>20</sup>

The comparable outcome between LSLV and MV combined with advantages of laparoscopic varicocelectomy such as short convalescence, excellent visualization with the laparoscopic optics, and the ability to address bilateral disease through a single operative site argues for an LSLV to be strongly considered as primary therapy for varicocele.

## CONCLUSIONS

These early data indicate that both LSLV and MV are comparable in preventing varicocele recurrence and formation of hydroceles. The primary difference between the procedures is the surgical time, with the LSLV being much faster to perform. It is apparent from this small series that lymphatic preservation is feasible without the use of dyes to identify the vessels. Laparoscopic magnification appears to be comparable to the microscopic when it comes to lymphatic preservation.

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