Comparing two vascular division techniques in laparoscopic varicocelectomy. A prospective study

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ABSTRACT

Introduction. Varicocele is the abnormal dilatation of the pampiniform plexus. It occurs in 15-20% of pre-adolescent/adult males. Varicocele diagnosis is important since it can induce testicular hypertrophy and fertility issues in adulthood. The objective of this study was to assess whether complications, including varicocele recurrence, depend on the vascular occlusion technique used –clipping + division vs. vascular sealer– in the laparoscopic Palomo technique used in our institution.

Materials and methods. A longitudinal, prospective study was carried out from 2017 to 2021. Two therapeutic groups were created according to the vascular occlusion method used during laparoscopic varicocelectomy –clipping + division vs. vascular sealer. Patients were randomly allocated to the groups in a systematic alternating consecutive manner. Variables –age, varicocele grade according to the Dubin-Amelar classification, postoperative complications, follow-up, and varicocele recurrence– were analyzed according to the method employed.

Results. A total of 37 boys, with a mean age of 12 years (10-15 years) and a mean follow-up of 12 months, were studied. In 20 patients (54.1%), clipping + division was used, and in the remaining 17 (45.9%), the vascular sealer was employed. 24.3% had symptomatic Grade II varicocele and 75.7% had Grade III varicocele. 32.4% of the children had postoperative complications during follow-up. 29.7% of the patients had hydrocele following surgery –8 boys from the sealing group and 3 boys from the clipping group–, with 13.5% requiring re-intervention as a result of this. None of the patients had varicocele recurrence.

Conclusions. The laparoscopic Palomo technique is safe and effective, with good results in pediatric patients and few postoperative complications, regardless of the vascular occlusion device used. In our study, no statistically significant differences regarding the use of clipping or vascular sealer in this laparoscopic technique were found. However, further studies with a larger sample size are required to find potential differences.

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KEY WORDS: Varicocele; Minimally invasive surgical procedures; Surgical instruments; Clips; Surgical; Bipolar vessel sealing system.

COMPARACIÓN DE DOS TÉCNICAS DE SECCIÓN VASCULAR EN LA VARICOCELECTOMÍA LAPAROSCÓPICA. ESTUDIO PROSPECTIVO

RESUMEN

Introducción. El varicocele es la dilatación anormal del plexo pampiniforme. Puede afectar al 15-20% de los varones preadolescentes-adultos. La importancia de su diagnóstico radica en que puede inducir hipotrofia testicular y problemas de fertilidad en la etapa adulta. El objetivo de este estudio es evaluar si existe mayor índice de complicaciones, incluyendo la recurrencia del varicocele, dependiendo de la técnica de oclusión vascular utilizada: clip y sección o sellador vascular, en la técnica de Palomo laparoscópico en nuestro centro.

Material y métodos. Estudio longitudinal prospectivo que se realiza de 2017 a 2021. Se crean dos grupos terapéuticos según el método de oclusión vascular utilizada durante la varicocelectomía laparoscópica: clip y sección o sellador vascular. Los pacientes son incluidos en un grupo mediante asignación sistemática consecutiva alternante. Se realiza el análisis de las variables: edad, grado de varicocele según la clasificación de Dubin-Amelar, complicaciones postquirúrgicas, seguimiento y recurrencia del varicocele, según el método empleado.

Resultados. Se intervinieron un total de 37 niños, con edad media de 12 años (10-15 años) y una media de seguimiento de 12 meses. En 20 pacientes (54,1%), se utilizó clip y sección, y en los 17 restantes (45,9%), sellador vascular. El 24,3% presentaba varicocele Grado II sintomático y el 75,7%, Grado III. El 32,4% de los niños presentó alguna complicación postquirúrgica durante el seguimiento. El 29,7% de los pacientes presentó hidrocele tras la intervención, perteneciendo 8 niños al grupo de sellado y 3 niños al de clipaje. El 13,5% de estos precisó reintervención por este motivo. Ningún paciente presentó recurrencia del varicocele.

Conclusiones. La técnica de Palomo laparoscópica es una técnica segura y efectiva que presenta buenos resultados en pacientes pediátricos, ya que presenta pocas complicaciones postquirúrgicas, independientemente del dispositivo de oclusión vascular que se utilice. En nuestro estudio, no se ha demostrado que existan diferencias estadísticamente significativas en cuanto al uso de clip o sellador vascular en esta técnica laparoscópica. No obstante, es preciso realizar más estudios con mayor tamaño muestral para hallar posibles diferencias.

Palabras Clave: Varicocele; Cirugía mínimamente invasiva; Clip vascular; Sellador vascular.

INTRODUCTION

Varicocele is the varicose dilatation of the pampiniform plexus veins as a result of venous reflux. This abnormality occurs in up to 15-20% of preadolescent/adult males, and is typically present on the left side (78-90% of the cases), but it can also emerge on the right side (5%) and on both (20%).

The fact varicocele is predominantly present on the left side usually stems from the fact the testicular vein –also known as gonadal or spermatic vein– drains perpendicularly onto the left renal vein. This makes venous return more difficult than on the right side, since the right testicular vein drains directly onto the inferior vena cava, with venous pressure being lower. Such pressure increase in the left testicular vein produces dilatation and incompetency of the venous valves. In addition, there are other factors to be considered, such as the longer trajectory of the left testicular vein, or the potential compression of the left renal vein in the angle between the abdominal aorta and the superior mesenteric artery (aortomesenteric clamp).

Even though this pathology is typically asymptomatic, venous reflux can increase testicular temperature, which may lead to testicular atrophy and infertility –hence the importance of early diagnosis and treatment.

Laparoscopic surgery is the most widely used technique in the treatment of varicocele today, with laparoscopic Palomo technique –which was first described in 1949– being one of the most frequently employed given its high success rates[1]. It involves a high retroperitoneal ligation of the spermatic vessels –artery and vein– by opening a peritoneal window, followed by dissection and en-bloc ligation. One could wonder why the viability of the ipsilateral testicle is not compromised when dividing these vessels. This is due to the fact various vessels irrigate the testicle and are anastomosized with one another:

- Arterial irrigation: the testicular or internal spermatic artery, the deferential artery, and the external spermatic artery –funicular or cremasteric.
- Venous return: the pampiniform plexus consists of the union of various veins –the internal, cremasteric, and deferential veins.

The objective of this study was to assess whether complications, including varicocele recurrence, depend on the vascular occlusion technique used –clipping + division vs. vascular sealer– in the laparoscopic Palomo technique used in our institution.

MATERIALS AND METHODS

A longitudinal, prospective study was carried out in our institution from 2017 to 2021. Two therapy groups were created according to the vascular occlusion method used at laparoscopic varicocelectomy (Palomo technique) –clipping (metallic clips) and division vs. vascular sealer. Patients were randomly allocated to the groups in a systematic alternating consecutive manner.

Table 1. Dubin-Amelar classification for varicocele grading.

Varicocele grades	
Grade 0 (subclinical)	Ultrasound-detected. Imperceptible at exploration
Grade I	Palpable at Valsalva only
Grade II	Palpable when standing
Grade III	Visible to the naked eye, through the scrotal sac

The variables analyzed included patient age, varicocele grading according to the Dubin-Amelar classification (Table 1), postoperative complications (such as wound complications, edema, and postoperative hydrocele), follow-up time to discharge, varicocele recurrence, and need for re-intervention according to the vascular occlusion method employed.

The statistical analysis of the aforementioned variables was carried out using the IBM SPSS Statistics statistical software, V23.0. For qualitative variables, the χ^2 test with frequency and contingency tables was used. Statistical significance was established at $p<0.05$.

RESULTS

A total of 37 boys underwent surgery. Mean patient age was 12 years, with a standard deviation (SD) of 1.41.

Consultation follow-up from surgery to discharge was 6-48 months, with a mean follow-up of 12 months.

In 20 patients (54.1%), metallic clip + division was used, and in the remaining 17 patients (45.9%), the vascular sealer was employed.

9 patients (24.3%) had symptomatic grade II varicocele. 4 of them were treated with varicocelectomy with clipping + division, and the other 5 were treated with the sealer. The remaining 28 patients (75.7%) had grade III varicocele. 16 underwent surgery with clipping + division, and the other 12 were treated with the vascular sealer. No significant differences ($p=0.506$) were found regarding the vascular occlusion method used, irrespective of varicocele grade.

Of the 37 study patients, 12 (32.4%) had postoperative complications –8 patients in the clipping + division group, and 4 patients in the vascular sealing group ($p=0.286$).

4 patients (10.8%) had scrotal edema following surgery –2 from the clipping + division group and 2 from the vascular sealing group. Only 1 patient –from the clipping + division group– had surgical wound complications. There were no statistically significant differences regarding either of the

Table 2. Patients undergoing varicocele surgery in our institution.

Total n	*37 patients*
Mean age	12 years ± 1.41
Mean follow-up time	12 months (6-48 months)

complications according to the method used (scrotal edema: p=0.863; wound complication: p=0.35).

11 patients (29.7%) had hydrocele following surgery –8 patients from the clipping + division group, and 3 from the sealing group (p=0.138, 95%CI). 5 of them (13.5%) required re-intervention as a result of persistent hydrocele –3 from the clipping + division group, and 2 from the sealing group. This difference was not statistically significant either (p=0.774, 95%CI). None of the patients had varicocele recurrence (Tables 2 and 3).

DISCUSSION

The primary objective of varicocelectomy is to stop venous return at the internal spermatic vein by occluding or ligating it.

The most widely used techniques include high retroperitoneal ligation of the spermatic vein and artery above the inguinal ring (Palomo technique), high ligation of the spermatic veins while preserving the artery (Bernardi technique), and ligation of the cremasteric and internal spermatic veins at the level of the inguinal canal (Ivenissevich technique). Some of these techniques can be performed laparoscopically, with lower morbidity rates[2].

The benefits and drawbacks of varicocele surgery vs. the wait-and-see approach are controversial in children and adolescents. In general, there is moderate evidence available regarding the benefits of varicocele repair in these patients.

Silay et al.[3] reported success rates of above 85% throughout all studies included. Their meta-analysis, which was based on randomized comparative studies, revealed an improvement in testicular volume and an increase in the total spermatozoid concentration in children undergoing surgery vs. children where the wait-and-see approach was decided upon.

Cannarella et al.[4] compared testicular volume and spermatic parameters in varicocele children and adolescents undergoing surgical or radiological intervention vs. those who received no treatment at all. They found an improvement in testicular volume and spermatozoid count in patients undergoing treatment vs. patients where the wait-and-see approach was decided upon. This suggests varicocele repair can prove beneficial in childhood and adolescence.

In addition, Calderón et al.[2] studied testicular volume alterations in varicocele adolescents. They revealed that in the case of patients undergoing surgery with a relative difference of testicular volume > 20% prior to surgery (40.5%), up to 39.2% had their testicular volume normalized.

An improvement in testicular growth and seminal parameters has been noted in the adult population. However, this has not been fully demonstrated in pediatric and adolescent patients. Therefore, in adolescents, the indication of surgical treatment remains an issue of discussion today. It is necessary to identify which patients would benefit from treatment considering potential postoperative complications in the future, such as hydrocele or testicular injury following varicocelectomy, as well as the possibility of varicocele recurrence, which may impact fertility.

Consequently, one of the primary challenges in the management of varicocele in adolescents is to determine which patients would benefit from varicocelectomy most and at what age.

Recommended indication criteria[5] for varicocele repair in children and adolescents include varicocele associated with >20% persistent testicular size discrepancy, bilateral palpable varicocele, symptomatic varicocele, and varicocele associated with abnormal semen analysis. Macey et al.[6] suggest that the most important indications for varicocelectomy are reduced ipsilateral testicular size (78%), scrotal pain (11%), and high-grade varicocele (11%).

However, varicocele treatment in children and adolescents is not exempt from risks, such as persistent or recurrent varicocele, hydrocele formation, and potential secondary testicular atrophy as a result of the occlusion of the ipsilateral testicle's spermatic artery.

In general, the complication most commonly reported in non-selective varicocelectomy is hydrocele, with a significant reduction in surgeries where lymph nodes are preserved[3].

Table 3. Comparison of results between the "clipping + division" and the "vascular sealer" groups.

		Metallic clip + division	*Vascular sealer*	*p*
No. of patients		20 (54.1%)	17 (45.9%)	
Varicocele grade	Symptomatic grade II Grade III	4 (20%) 16 (80%)	5 (29.4%) 12 (70.6%)	p=0.506
Hydrocele		8 (21.6%)	3 (8%)	p=0.138
Adult-type hydrocelectomy		3 (8%)	2 (5.4%)	p=0.774
Varicocele recurrence		0	0	

Ulusoy et al.[7] claim that, according to the literature reviewed, the hydrocele rate following non-selective varicocelectomy is 3-13%. However, some studies point it may occur in up to 29% of patients undergoing surgery.

In a study published in 2009, Diamond et al.[8] detected the presence of hydrocele in 32% of the patients undergoing surgery using the Palomo technique, whereas Esposito et al.[9] reported a 20% rate. In our study, hydrocele was present in 29.7% of patients postoperatively.

Regarding recurrence, it is defined as the re-emergence of the pathology as a result of not having divided the whole vascular package and having left in place some venous vessels that ingurgitate after surgery.

Keys et al.[10] reported a recurrence rate of 8.3%. In the literature, a recurrence rate of up to 18% has been described. In our study, there were no recurrences.

As for the vascular division method used –metallic clip + division in one group vs. vascular sealing in the other–, no further comparative studies were found in the literature, which makes our prospective study even more interesting.

In conclusion, the laparoscopic Palomo technique is safe and effective. It offers good results in pediatric patients, with few postoperative complications, regardless of the vascular occlusion device used. In our study, no statistically significant differences were found regarding the use of clips vs. the vascular sealer in this laparoscopic technique. However, further studies with a larger sample size are required to find potential differences.

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