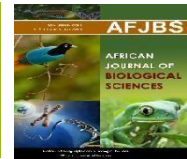


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Outcome of Laparoscopic Artery Preserving Varicocelectomy in Management of Symptomatic Varicocele: Experience at Tertiary Care hospital in Kashmir.

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Abstract

Background: Clinical varicoceles have been associated with impaired semen parameters, male-factor infertility and chronic scrotal pain. Out of different options available in the armamentarium of surgeries for varicocele repair, laparoscopic varicocelectomy has got an edge over others. **Aim of the study:** to determine the role of laparoscopic varicocelectomy (LV) with preservation of the testicular artery (TA) in the management of symptomatic varicocele. **Material & Methods:** It was a prospective study that was conducted in the Department of Minimal Access and General Surgery, GMC Srinagar where we evaluated the feasibility and efficacy of this minimal access approach in alleviating the symptoms of patients suffering from varicocele. Over the period of 2 years from 2021 to 2023, twenty-five patients with symptomatic varicocele underwent laparoscopic varicocelectomy in our department. All patients were followed up post operatively at 2 weeks, 6 weeks and 6 months with a physical examination, visual analogue scale (VAS) score, and ultrasonographic scan. **Results:** The mean age was 30.92 years (range, 19–55 years). Bilateral varicoceles were present in 9 patients (36%), and a unilateral varicocele was present in 16 (64%). The varicocele was grade 3 in 18 patients (72%), grade 2 in 5 (8%), and grade 1 in 2 (4%). The mean preoperative visual analog scale score was 4.69 on a scale from 0 to 10. The mean postoperative visual analog scale score at 6 weeks was 0.49. The average duration of the surgery was 1 hour and 15 minutes for unilateral varicocelectomy. A significant improvement ($p < 0.05$) was found during post operative follow up for the sperm concentration, Total Sperm Count concentration and Total Motile Sperm Count concentration. During follow-up, we observed 4 recurrences (8%) whereas de novo hydrocele formation was identified in 1 individual (4%). **Conclusion:** Laparoscopic varicocelectomy is an effective means of treatment with significant symptomatic improvement and a low complication rate in patients with symptomatic varicocele.

Keywords: Varicocele, Varicocelectomy, Tertiary care Hospital, Kashmir

Introduction:

Varicocele is defined as tortuosity of the pampiniform plexus around the testis and funiculus spermaticus caused by retrograde blood flow through the internal spermatic vein due to incompetent valves. It is one of the correctable causes of male infertility. Varicoceles are common, affecting 10–20% of adult males. Approximately 90% are left-sided. If a left varicocele is identified, there is a 30–40% probability that it is a bilateral condition¹. Reflux of toxic metabolites, increased scrotal temperature and testicular tissue hypoxia can occur that leads to impairment in testicular function. The WHO classification of varicocele is based on the Dubin and Amelar classification² (Table A).

Table A: WHO classification of varicocele.

WHO Classification	
Subclinical	Non Palpable, Visible only on sonography.
Grade 1	Palpable only on Valsalva Manoeuvre.
Grade 2	Palpable on rest but not visible
Grade 3	Palpable and Visible at rest

Pain is the predominant complaint in 2% to 10% of patients with varicoceles.³ Patients describe pain as heaviness or a dull ache, generally after prolonged ambulation, worsening with physical activity and straining.³ For the majority of adolescents with varicocele, observation remains the approach of choice until a surgical indication is present. The main indications for surgical intervention remain significant unilateral or bilateral testicular hypotrophy, pain, or abnormal semen analysis findings.⁴

The ideal technique for varicocelectomy is still a matter of debate. Techniques include open surgical ligation of the spermatic vein, retrograde or antegrade sclerotherapy, microsurgery, and laparoscopic varicocelectomy. However, currently, the most frequently used methods for varicocele treatment are microsurgical and laparoscopic varicocelectomy¹⁴ The following criteria for the optimal procedure have been postulated: preservation and improvement of testicular function, elimination of the varicocele with a low recurrence rate and minimal intraoperative and postoperative complications and morbidity, and cost-effectiveness. Laparoscopic varicocelectomy was first introduced by *Sanchez-de-Badajoz et al.* in 1990. This approach utilizes transperitoneal intra-abdominal access, which has several advantages, including increased efficiency for bilateral surgery and a relatively short operating

time. It also offers excellent visualization of the spermatic vessels via a transperitoneal approach, which is especially helpful in obese patients. Spermatic artery preservation is possible in 89% to 100% of cases.¹⁷

Its most common postoperative complication is hydrocele, which is reported in up to 25% of patients.¹⁶ The technique has several advantages in comparison with the more commonly used non-microsurgical inguinal approach. It offers excellent visualization of the spermatic vessels via a transperitoneal approach, which is especially helpful in obese patients. Spermatic artery preservation is possible in 89% to 100% of cases.¹⁷

Material & Methods

Study design: Observational prospective study.

Study setting: Department of Minimal Access and General Surgery of the Government Medical College and associated SMHS Hospital Srinagar, Kashmir.

Study period: This study was conducted over a 2-year period from 2021 to 2023.

Sampling technique: Convenience sampling which is a non-probability sampling technique was used in the study. No apriori sample size was calculated for the study. All the patients who were admitted during study period and fulfilled the inclusion criteria were included in the study.

Study participants: Patients admitted in the department of General surgery with symptoms of varicocele.

Inclusion criteria:

1. Age $\geq$ 18 years
2. Those willing to participate.

Study procedure: Over this period, 40 patients presented with symptoms of scrotal pain, scrotal swelling or infertility (according to a deranged semenogram) were assessed for eligibility in the study. After evaluation, these symptoms were attributed to the underlying varicocele. The varicoceles of these patients were segregated into 3 grades (WHO grading) during physical examination with the patient in a standing position, and the findings were verified by ultrasonography. The visual analogue scale (VAS) pain score was calculated for each patient who complained of scrotal pain. Laparoscopic varicocelectomy was performed in 25 of these patients based on the severity of symptoms and semen analysis.

Surgery was performed under general anesthesia with the patient in the supine position. The surgeon and assistant stood on the side opposite to the affected side, and a monitor was placed

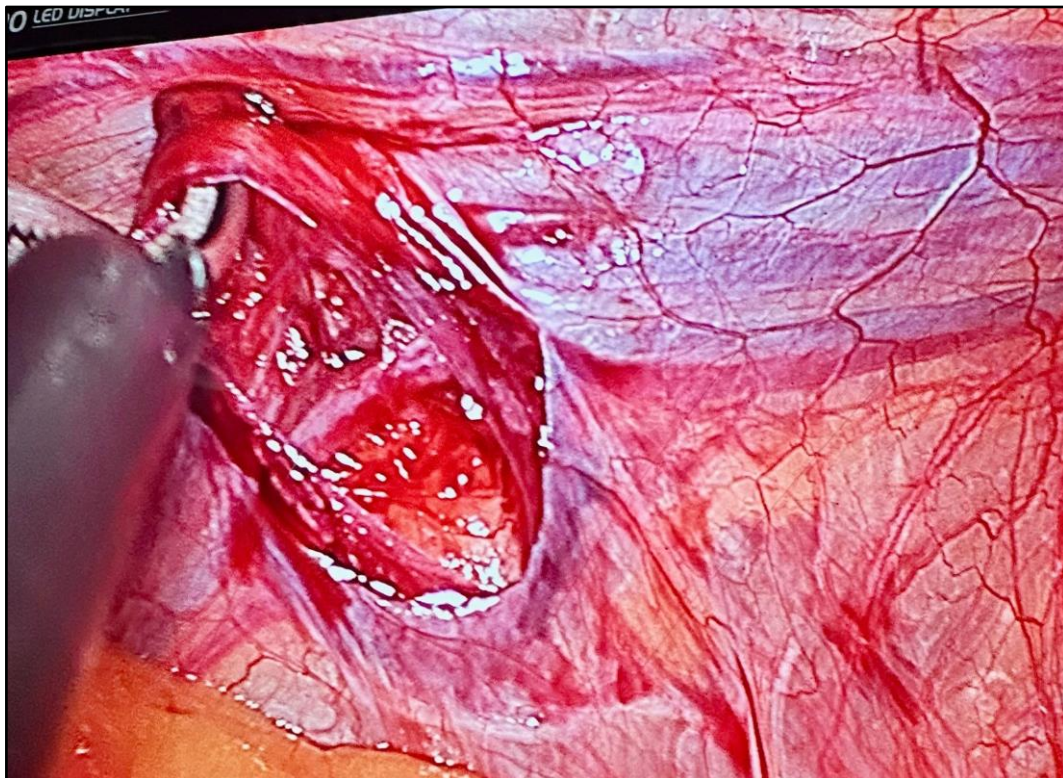
on the side of the varicocele towards the foot end. Once painting and draping is done, pneumoperitoneum is created either by a veress needle (closed technique) or by an open technique. CO₂ gas was used for insufflation, and intra-abdominal pressure was maintained at approximately 13-15 mmHg. The first port, 10 mm (camera port), was placed in the supra-umbilical region 2 cm above and lateral (away from the affected side) to the midline. A 30° laparoscope was then inserted, and the abdominal cavity was evaluated. Two working ports (5 mm each) were placed in the right iliac fossa (for left-sided varicocele) and in the periumbilical region approximately 1 cm above and 3-4 cm lateral (towards the affected side). The patient is then placed in the reverse Trendelenburg position and tilted slightly to the opposite side of the operative field (15–20°). The internal spermatic vessels are then identified, and the overlying peritoneum is lifted and incised using cautery or endoscopic scissors. The gonadal vessels are then mobilised, and the testicular artery, artery-to-vas deferens must be identified and preserved. Veins are dissected using blunt dissectors. Then, the testicular veins are sealed with either a suture/clips/harmonic scalpel (depending upon the surgeon's preference). Hemostasis is secured and confirmed. All patients were followed up at 2 weeks, 6 weeks and 6 months with a physical examination, visual analogue scale (VAS) score, and ultrasonographic scan. The VAS tool uses a progressive numerical scale between 1 and 10 that corresponds to different pain thresholds. Scores of 1 to 3 indicate mild pain; scores of 4 to 7 indicate moderate pain; and scores of 8 to 10 indicate severe pain.⁵

Statistical analysis: Data was entered in Microsoft excel and analyzed using a appropriate statistical software. Categorical variables are expressed as frequency and percentages. T test was used to compare VAS score and sperm characteristics of patients pre and post operatively. Box and whisker plot was used to show pre- and post-operative VAS score and sperm counts.

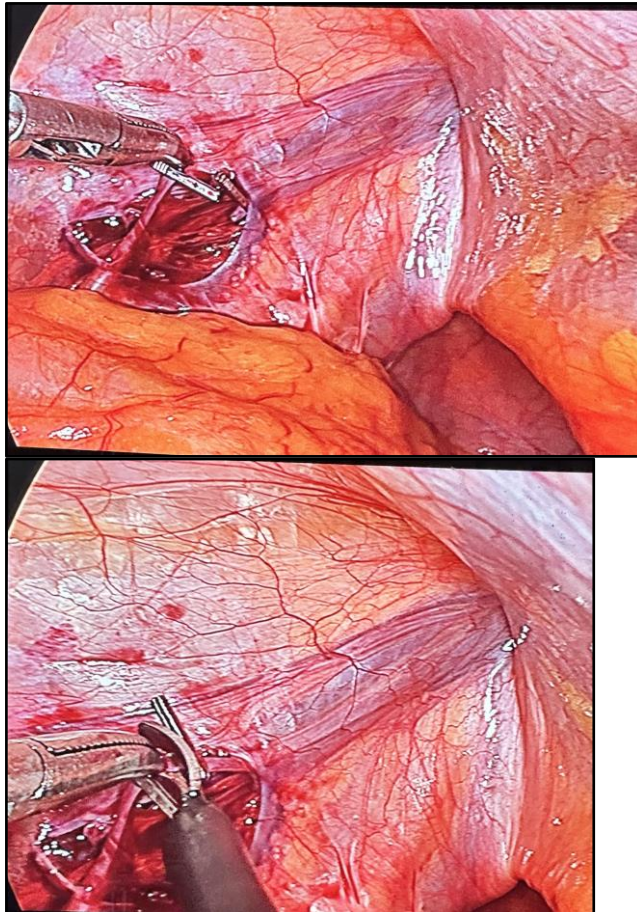
Ethical clearance: The study was approved by Institutional ethical committee Government medical college Srinagar.



Port placement (left varicocele)



Identifying testicular vessels



Clipping and Cutting of Testicular veins.

Results:

A total of 25 patients were included in the study. Majority of the patients were in the age group of less than 30 years. More than half of the patients (64%) were married. 16 patients (64%) presented with scrotal pain only. Presentation was more commonly reported on left side (40%). Table 2 shows Comparison of Scrotal pain score and sperm characteristics pre and post operatively. The mean of scrotal pain was 4.6 preoperatively and 0.49 post operatively with a significant p value (p value <0.05). A significant difference was found between total sperm count, sperm concentration and total motile sperm count pre and post operatively. Figure 1 represents a Box and whisker plot showing pre- and post-operative scrotal pain scores. Figure 2 represents a Box and whisker plot showing pre- and post-operative sperm counts.

Table 1: Sociodemographic characteristics of study participants

Variable	Frequency (n=25)	Percentage (%)
Age (years)		
≤ 30	12	48
31 - 40	9	36
>40	4	16
Marital Status		
Married	16	64
Unmarried	9	36
Occupational Status		
Student	13	52
Labourer	3	12
Gover Employee	2	8
Shopkeeper	2	8
Driver	2	8
Painter	1	4
Trader	1	4
Street Vendor	1	4
Presentation		
Only Scrotal Pain	16	64
Deranged Seminogram & Infertility	5	20
Scrotal Pain with Deranged Seminogram	4	16
Laterality		
Left	10	40

Right	6	24
Bilateral	9	36

Table 2: Comparison of Scrotal pain score and sperm characteristics pre and post operatively.

Variable	Preoperative (Mean $\pm$ SD)	Post operative (Mean $\pm$ SD)	*P value
Scrotal pain score	4.6 $\pm$ 0.23	0.49 $\pm$ 0.3	<0.05
Total sperm count (TSC) (10^6)	42.8 $\pm$ 1.2	119.5 $\pm$ 4.8	<0.05
Sperm concentration (SC) (10^6 /ml)	10.3 $\pm$ 1.8	51.3 $\pm$ 2.5	<0.05
Total motile sperm count (TMSC, 10^6)	6 $\pm$ 1.7	27 $\pm$ 2.8	<0.05

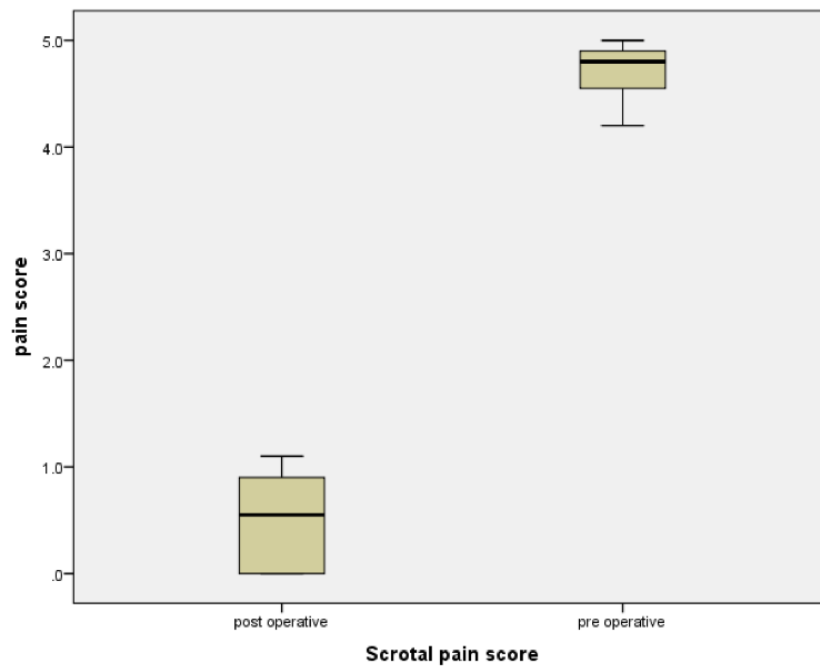


Figure 1: Box and whisker plot showing pre- and post-operative scrotal pain scores.

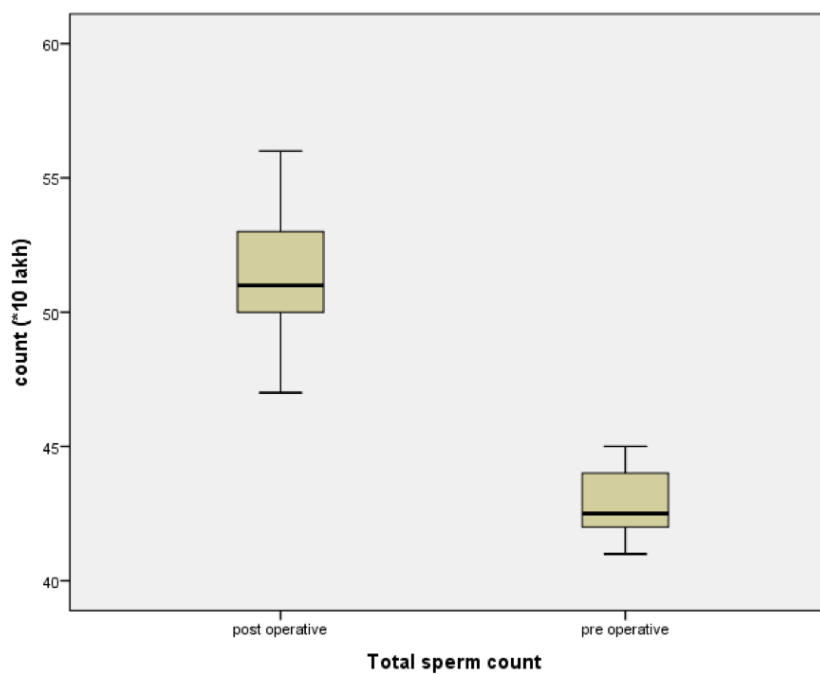


Figure 2: Box and whisker plot showing pre- and post-operative sperm counts.

Discussion:

Varicoceles, a dilation of veins within the pampiniform plexus, are present in ~15% of the general male population. It is also one of the most frequent causes of male factor infertility, with a prevalence of 30–40% among men presenting with primary infertility evaluation and up to 85% among men presenting with secondary infertility.⁶ Varicoceles can cause testicular damage, resulting in loss of testicular volume, spermatogenic dysfunction, disruption of hormone production, and sperm DNA damage.^{7,8} The mechanism of testicular dysfunction secondary to varicocele may be related to the loss of countercurrent temperature exchange between the pampiniform plexus and spermatic artery. Under normal physiological conditions, the testicle has been demonstrated to be 1–2°C cooler than the core body temperature.⁹ When varicoceles develop, venous stasis often occurs, and the pooling of warm venous blood in these varicoceles is thought to lead to a loss of countercurrent heat exchange.¹⁰ Patients with varicocele often complain of testicular pain. Pain is the predominant complaint in 2% to 10% of patients with varicoceles. Patients described pain as heaviness or a dull ache, generally after prolonged ambulation, worsening with physical activity and straining.^{11,12,13}

In our study, we included 25 patients who were diagnosed with varicocele with significant signs and symptoms. The mean age of our patients was 30.92 years. Students were the most affected profession in our study. After a full workup and the elimination of other possible diagnoses, patients underwent laparoscopic surgery for the management of varicocele. The duration of the surgery varied between 1 and 2 hours; however, the average duration of the surgery was 1 hour and 15 minutes for unilateral varicocelectomy. These results of our study are well supported by the results documented in literature as in one of the study done by **Christopher Chen** in 2016, in which he reported a case series of over 4000 cases of varicocele that were managed by laparoscopic varicocelectomy.¹⁵

The mean seminal parameters were compared before and 6 months after surgery (Table 3). A significant improvement was found for the sperm concentration ($p < 0.05$), TSC concentration ($p < 0.05$) and TMSC concentration ($p < 0.05$). Our results correspond well with the study conducted by **F. Seiler et al.** in 2022 at the Department of Urology, University Medical Center Schleswig Holstein, Campus Kiel, Germany.²¹ The mean preoperative VAS score in our study was 4.695 on a scale from 0 to 10. The mean postoperative VAS score at 3

months was 0.49. This finding corresponds well with the study conducted by **Stefanos Kachrilas et al.** in 2014 at the Urology Department, Endourology and Stones Services, Barts Health NHS Trust, London, England.¹⁹

The average postoperative stay in the hospital was 1 day, and the average time to return to work after 3 to 4 days, which corresponds well with the study conducted by **Christopher Chen** in 2016, in which he reported a case series of over 4000 cases of varicocele that were managed by laparoscopic varicocelectomy.¹⁵ The surgery time and length of hospital stay are usually less than as seen in open varicocelectomy, which is in agreement with the findings of a prospective comparative study between laparoscopic and open techniques.¹⁸

We observed recurrence in 4 patients (16%). Clinically detectable varicoceles of a lower degree than the initial varicoceles were present in two of these patients (8%). Two recurrences (8%) were subclinical varicoceles diagnosed with ultrasonography only. In three (12%) of these recurrences, the improvement in pain symptoms was significant, and in one case, the level of pain remained unchanged even after a repeat varicocelectomy. Our results closely resemble those of the study done by **Kachrilas S et al.** in 2014 at Endourology and Stone Services, Barts Health NHS Trust, London, England. In his study, he reported recurrence in 10.6% of patients.²²

The classical Palomo procedure has a relatively high rate of hydrocele formation.²⁰ Sparing of the testicular artery, as with the modified (laparoscopic) Palomo procedure, decreases the rate of hydrocele.²¹ This was confirmed in our series with a postoperative hydrocele rate of 4% (n=1), which was managed conservatively.

Study limitations: the study had few limitations. Firstly the study had small sample size. Secondly, the utilization of the Visual Analog Scale (VAS) as an evaluation tool could introduce observational bias and involves a subjective aspect of interpretation. For forthcoming investigations, integrating supplementary questionnaires to gauge the influence on quality of life may yield a more objective assessment of the repercussions of testicular pain stemming from varicoceles. Additionally, tracking the duration of discomfort was not conducted, which could enhance the robustness of our conclusions.

Conclusion:

Laparoscopic varicocelectomy is an effective means of treatment with significant symptomatic improvement and a low complication rate in patients with symptomatic varicocele. Careful patient selection is necessary. Low-grade varicoceles are less likely to benefit from this procedure. It is also important to make patients aware of the uncommon yet potential risk of postoperative de novo hydrocele formation, albeit small. This technique requires skills and experience. It is a same-day surgical procedure that results in rapid recovery and cost savings and is well accepted by patients. An important feature of this surgical procedure is the degree of magnification obtained through video laparoscopy, which enables complete and thorough bilateral ligation of the testicular veins without the risk of injury to the testicular artery. We emphasise the use of this approach in the surgical management of patients with varicocele.

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