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Outcome of Microsurgical Varicocelectomy: A One-Year Single-Center Study in a Secondary Hospital in West Java, Indonesia

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Abstract

Varicoceles, characterized by the dilation of the pampiniform plexus veins, are a common cause of male infertility. While various treatment modalities exist, the optimal management approach remains debated. Microsurgical varicocelectomy is considered the gold standard; however, data on its outcomes in secondary care hospitals in Indonesia are still limited. This research aims to evaluate the clinical characteristics and outcomes of microsurgical varicocelectomy in a regional general hospital. This retrospective study included 53 patients diagnosed with symptomatic varicoceles who underwent microsurgical varicocelectomy at Ciawi Regional General Hospital, West Java, Indonesia, between April 2022 and April 2023. Demographic data, presenting complaints, laboratory findings (semen analysis), varicocele laterality, and postoperative outcomes were descriptively analyzed. A total of 53 patients with a mean age of 35.74 ± 7.27 years were included. Testicular pain was the primary complaint in 73.6% of cases, while 26.4% presented with infertility. Bilateral varicoceles were found in 64.2% of cases. Preoperative semen analysis (in 24 patients) revealed *oligoasthenoteratozoospermia* as the most common finding (50.0%), with only 8.3% of samples being normal. Postoperative semen analysis in 16 patients showed normal results in 31.3%. All patients who presented with pain reported complete resolution of symptoms. Among the 14 infertile patients, 5 (35.7%) successfully achieved pregnancy with their partners within the 3-month follow-up period. Microsurgical varicocelectomy proves to be an effective intervention for symptomatic varicoceles, leading to significantly improved fertility outcomes and complete pain resolution in a secondary hospital setting. This technique should be considered a primary treatment option.

Keywords *: Male Infertility; Microsurgery; Testicular Pain; Varicocele; Varicocelectomy.*

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INTRODUCTION

The testes, essential male reproductive glands, reside within the scrotum as oval-shaped organs. Venous drainage of the testis occurs through the pampiniform plexus, primarily drained by the testicular and external pudendal veins. Varicocele, a vascular anomaly of this drainage system, manifests as abnormal venous dilation and/or tortuosity within the pampiniform plexus of the scrotum. It stands as the leading cause of both primary and secondary infertility in men, affecting 19% to 41% of infertile males. Around 15% of couples worldwide experience infertility, with male factors contributing to approximately half of these cases. Globally, varicocele prevalence extends to 15% of the general male population, 35% of men with primary infertility, and 81% of those with secondary infertility. Clinically, varicoceles can be identified by enlargement of the affected testis and palpable dilatation within the pampiniform plexus, often detectable with or without the assistance of the Valsalva maneuver. Despite various available treatment modalities, the optimal approach for varicocele management remains a

subject of debate (Ali et al., 2023). Varicoceles can be addressed through different treatment modalities, including open varicocelectomy at different anatomical levels, laparoscopic varicocelectomy, robotic surgery, and microsurgical varicocelectomy. Among these options, microsurgical varicocelectomy has emerged as the preferred choice among specialists in male reproductive medicine due to its superior surgical outcomes (Pajovic et al., 2015). Despite its effectiveness, this procedure remains relatively uncommon in Indonesia. In this manuscript, we outline our preliminary findings regarding microsurgical varicocelectomy, focusing on clinical aspects such as varicocele-associated pain and its impact on sperm quality and fertility. We evaluate the outcomes of this surgical intervention at a secondary hospital in West Java, Indonesia (Johnson dan Sandlow, 2017).

Various treatment modalities exist, including open varicocelectomy at different anatomical levels, laparoscopic varicocelectomy, robotic surgery, and microsurgical varicocelectomy Nork et al., 2014). Among these, microsurgical varicocelectomy has emerged as the gold standard in many developed countries due to its superior outcomes, including higher spontaneous pregnancy rates, significantly lower recurrence rates (1–2%), and minimal postoperative complications compared to other techniques. However, the majority of evidence supporting its efficacy originates from studies conducted in tertiary care centers in high-income countries. There is a notable scarcity of data on the application and outcomes of this technique in secondary healthcare settings within low- and middle-income countries (LMICs) like Indonesia. This gap in the literature makes it difficult for local surgeons and policymakers to advocate for and implement this technique effectively.

This study aims to address this critical gap by presenting the initial experience and outcomes of microsurgical varicocelectomy from a secondary hospital in West Java, Indonesia. The *novelty* of this research lies in its focus on evaluating the feasibility and effectiveness of this advanced technique in a resource-limited secondary care setting, which is underrepresented in the current urological literature. The *primary objective* of this study is to delineate the clinical characteristics of patients undergoing microsurgical varicocelectomy and to assess its one-year outcomes, specifically focusing on postoperative pain resolution and improvements in semen parameters and natural pregnancy rates.

The findings of this study are anticipated to provide valuable local evidence regarding the efficacy of microsurgical varicocelectomy. Demonstrating successful outcomes in a secondary hospital setting can serve as a catalyst for wider adoption of this technique across similar healthcare facilities in Indonesia and other LMICs. This could significantly improve the standard of care for men with symptomatic varicoceles, leading to enhanced fertility outcomes, effective pain relief, and, ultimately, addressing a major contributor to male infertility in the region. Furthermore, it can guide surgical training programs and resource allocation to make this beneficial procedure more accessible to the broader population.

METHOD

Case Report

This retrospective study was conducted at Ciawi Regional General Hospital, West Java, Indonesia. Clinical records of male patients diagnosed with symptomatic varicoceles who underwent microsurgical varicocelectomy at our center between April 2022 and April 2023 were reviewed for data collection. The microsurgical varicocelectomy was performed under general or spinal anesthesia by a single experienced surgeon using a similar technique previously described. Collected data included

patients' age, initial clinical presentation (testicular pain or infertility), laterality (left, right, or bilateral), and results of preoperative and postoperative semen analyses. For patients presenting with testicular pain, the intervention outcome was assessed after one month using the visual analog scale to evaluate pain relief. For patients consulting for primary infertility, outcomes were evaluated after three months using semen analysis and pregnancy results. Data were entered into Microsoft Excel 2019 and analyzed using SPSS version . Continuous variables were expressed as mean ± standard deviation for normally distributed data and as median values with interquartile ranges for skewed data distributions. Categorical variables were presented as frequencies and percentages.

RESULTS AND DISCUSSION

RESULTS

A total of 53 participants were included in the study, with a mean age of 35.74 ± 7.27 years (range: 15 to 55 years). The most represented age group was 31 - 40 years, comprising 30 (56.6%) participants. Testicular pain was the primary presenting complaint in 39 out of 53 cases (73.6%), while 14 out of 53 patients (26.4%) presented with infertility. Varicoceles were predominantly bilateral, observed in 34 cases (64.2%), left-sided in 18 cases (34.0%), and right-sided in 1 case (1.9%). Pre-intervention semen analysis was conducted in 24 patients, revealing oligoasthenoteratozoospermia in the majority (12/24, 50.0%), followed by asthenozoospermia in 3 patients (12.5%), oligoasthenozoospermia in 2 patients (8.3%), teratozoospermia in 2 patients (8.3%), and 1 patient (4.2%) each had azoospermia, oligospermia, and asthenoteratozoospermia. Only 2 samples (8.3%) exhibited normal parameters preoperatively. Following surgery, semen analysis was repeated in 16 patients, with 5 (31.3%) showing normal results. Other samples showed oligoasthenoteratozoospermia in 5 patients (31.3%), asthenozoospermia in 4 patients (25.0%), asthenoteratozoospermia in 1 patient (6.3%), and oligoasthenozoospermia in 1 patient (6.3%). Regarding the outcome of the intervention, all patients who presented with testicular pain experienced complete resolution (VAS score of 0). Among the 14 patients consulting for infertility, 5 (35.7%) successfully impregnated their partners by the end of the 3-month follow-up period.

Table 1. Clinical characteristics and outcomes of the study participants

Variables	Frequency (%)
Age (years)	
10 – 20	2 (3.8%)
21 – 30	8 (15.1%)
31 – 40	30 (56.6%)
41 – 50	11 (20.8%)
51 – 60	2 (3.8%)
Presenting Complaint	
Testicular pain	39 (73.6%)
Infertility	14 (26.4%)
Laterality	
Left	18 (34.0%)
Right	1 (1.9%)
Bilateral	34 (64.2%)
Pre-intervention semen analysis (n=24)	
Normal	2 (8.3%)

Azoospermia	1 (4.2%)
Teratozoospermia	2 (8.3%)
Oligospermia	1 (4.2%)
Asthenozoospermia	3 (12.5%)
Asthenoteratozoospermia	1 (4.2%)
Oligoasthenozoospermia	2 (8.3%)
Oligoasthenoteratozoospermia	12 (50.0%)
Post-intervention semen analysis (n=16)	
Normal	5 (31.3%)
Asthenozoospermia	4 (25.0%)
Asthenoteratozoospermia	1 (6.3%)
Oligoasthenozoospermia	1 (6.3%)
Oligoasthenoteratozoospermia	5 (31.3%)
Outcomes of patients with infertility (n=14)	
Pregnancy	5 (35.7%)
Outcomes of patients with testicular pain (n-39)	
Pain relieved	39 (100%)

Source: Primary data analysis, 2023

DISCUSSION

This retrospective study aimed to present our initial experience with microsurgical varicocelectomy by delineating its clinical aspects and assessing outcomes at a secondary hospital in West Java, Indonesia. The mean age of our participants was 35.74 ± 7.27 years, with a range from 15 to 55 years. This aligns with findings from previous studies. For instance, Kamadjou et al. assessed laparoscopic varicocelectomy outcomes in Cameroon, where patients had a mean age of 36.11 ± 8.45 years, ranged from 16 to 55 years.1 Similarly, El Bardisi et al. in Qatar, 2017, also reported a mean age of 36.3 ± 7.6 years among male varicocele patients. Previously, Gat et al. also included 286 varicocele patients with a mean age of 34.6 ± 7.23 years (Pagani et al., 2019; Belay et al., 2016;Goldstein, 2020). In contrast, Hosseini et al. studied a population with a mean age of 25.97 ± 5.7 years, which might be attributed to their comparison of different surgical techniques, including open surgery (Palomo and Ivanissevich), unlike our study focusing solely on one technique (ElBardisi et al., 2017). Afterall, it's crucial to recognize that varicocele is a progressive condition, with its prevalence rising as individuals age.11 Levinger et al. established that the prevalence increases by approximately 10% for each decade of life, with 18% of men aged 30–39 years having varicocele (Hamada et al., 2016).

In our cohort, varicoceles were bilateral in 34 patients (64.2%). This observation mirrors findings from Kamadjou et al., where varicoceles were unilateral in 12 patients (34.29%) and bilateral in 23 patients (65.71%). Yigal et al. also noted bilateral varicoceles in 80.7% of cases in their prospective study, corroborating our results and reinforcing the bilateral nature of varicoceles. Gat et al. found that 17.6% of patients had left-sided varicocele, while 80.8% had bilateral varicocele. In a separate study conducted by the same researchers, involving a small sample of adolescents (n = 28, mean age 17.2 years), a similar finding of 85.5% bilateral varicocele was observed. This contrasts with the traditional findings reported in urologic studies focusing on infertile men, where the rate of left spermatic vein varicocele is typically 35% to 40% compared to 10% for bilateral varicocele (Tatem & Brannigan, 2017). This discrepancy may arise because many of the early reports on varicocele prevalence in the urologic literature often relied solely on physical examination. Physical examination has limitations, including its restricted ability to detect blood flow changes, subjectivity, and the risk of

significant interphysician variability. Moreover, physical examination alone may not suffice to diagnose small or subclinical varicoceles. This underscores the importance of employing more sensitive diagnostic modalities for evaluating varicoceles, such as thermography, color flow Doppler sonography, and venography. In order to restore fertility potential in affected patients, it is also essential that clinicians be alerted to this bilateral nature of varicocele (Mehta & Goldstein, 2013).

Specifically, we found 19 cases (35.8%) of unilateral varicocele, with only one (1.9%) case on the right side. This is also in line with the findings in the study by Gat et al. who reported a prevalence of right-sided varicocele in 1.5% of their patients.9 Consistent with existing literature, varicoceles more commonly manifest on the left side (in 78% - 93% of cases) due to anatomical disparities in venous drainage. The left testicular vein's longer course, typically 8 - 10 cm lengthier than its right counterpart, so the hydrostatic pressure in the distal region of the left spermatic vein is usually high, predominantly contributes to left-sided varicoceles. Another prevalent explanation for the high occurrence of left varicocele is attributed to the "nutcracker phenomenon." According to this theory, compression of the left renal vein by the superior mesenteric artery elevates the pressure within the vein, leading to the dilation of the spermatic vein as a consequence (Mehta & Goldstein, 2013).

In our study, testicular pain was the predominant presenting complaint in 73.6% of cases. Varicoceles typically manifest with dull, aching, or throbbing pain in the testicle, scrotum, or groin, occasionally presenting as acute, sharp, or stabbing pain. In literature, about 2% to 10% of men with varicocele complain of pain, mainly in the scrotum or in the inguinal area, Interestingly, some patients may not perceive varicoceles as problematic, even when they have progressed to grade 2 (varicocele palpable on routine physical examination without the need for the Valsalva maneuver), only recognizing it during investigations for infertility, as evidenced by 26.4% of cases in our study. Guo et al. (2012) reported that up to 30% of men consulting for infertility had varicoceles, while Valentino et al. (2014) noted varicoceles in 40% of males with infertility. These findings underscore varicoceles as a significant public health concern, emphasizing the importance of early diagnosis and intervention.

The predominant finding in the preoperative semen analysis of our cohort was oligoasthenoteratozoospermia (50%), with one patient exhibiting azoospermia. There remains an ongoing debate among researchers regarding the impact and extent of varicocele on semen parameters, which typically range from normal to mild or moderate asthenospermia, teratospermia, or asthenoteratospermia. Initially, sperm concentration may not be significantly affected; however, over time, all three sperm parameters can gradually deteriorate, occasionally resulting in azoospermia, as observed in our study. This decrease in sperm concentration is attributed by some researchers to the elevated germ cell apoptosis commonly observed in affected men, while reduced motility is associated either with increased concentrations of reactive oxygen species or the presence of antisperm antibodies.

Microsurgical varicocelectomy techniques have garnered popularity due to their minimal complication rates and favorable outcomes (Paick & Choi, 2019). The recurrence rate of microsurgical varicocelectomy has been reported as low as 1% to 2%, significantly lower than that of the open approach. Studies have suggested that varicocele recurrence often stems from incomplete ligation of collateral veins, and utilizing an operating microscope to magnify the spermatic vessels has been shown to reduce the likelihood of such complications. All patients undergoing microsurgical techniques in our study reported pain relief at 1 month post-surgery. Similarly, Kim et al. (2012) performed microsurgical inguinal varicocelectomy on 114 patients with painful varicoceles, reporting an overall response rate of

91.2%, with only 8.8% experiencing postoperative pain. Park et al. (2012), utilizing microsurgical inguinal or subinguinal approaches, reported complete and partial pain relief in 52.8% and 41.5% of patients, respectively. In a study by Yemen et al. who used a subinguinal microsurgical varicocele ligation approach, as many as 88% of their patients reported complete resolution of pain at 3 months postoperatively. Kim et al. (2012) also showed that 91.3% of their patients experienced improvement in their symptoms 1 year after undergoing microsurgical varicocelectomy. Microsurgical subinguinal varicocelectomy has also been demonstrated as an effective treatment for patients with scrotal pain caused by recurrent varicocele, with 85.2% patients reported complete resolution at 3 months post-operatively. Overall, pain resolution after microsurgical repair have been reported to range from 53% to 93% for complete resolution, 5% to 20% for partial resolution, and 0% to 20% for failed treatment. Treatment failure after microsurgical varicocelectomy could be due to underlying pathology, such as epididymitis, idiopathic orchalgia, or a surgical complication.

In our study, among the 14 patients consulting for infertility, improvement in sperm quality was observed, with 5 (35.7%) successfully impregnating their partners by the end of the 3-month follow-up period. In a previous study involving 78 infertile patients, microsurgical inguinal varicocelectomy led to an increase in sperm concentration from 17.66 to 20.7 million/mL (117%) and an increase in sperm motility from 30.9% to 37.5% (121%).32 In a recent randomized controlled trial (RCT) conducted by Abdel-Meguid et al. (2011), the treatment of palpable varicoceles in men with at least one abnormal semen parameter led to a 15% improvement in sperm count and a 15% improvement in sperm motility compared to the control group. Their findings are corroborated by several high-quality meta-analyses of RCTs, which have consistently shown significant improvements in semen parameters following varicocelectomy. When comparing open, laparoscopic, and microsurgical techniques, microsurgical varicocelectomy showed the most convenient results, with the lowest level of complications and the most obvious semen parameters improvement. In adolescents with varicocele, Shebl and Sabry, (2022) have demonstrated that microsurgical varicocelectomy has led to improved semen parameters, including sperm motility, volume, count, and total progressive motility, which may positively impact their fertility potential. Retrospective reviews of varicocele treatment have also shown improved pregnancy rates after varicocele ligation.38 Supporting this, a more recent prospective RCT by Meguid et al. reported that spontaneous pregnancy occurred in 32.9% of patients who underwent varicocelectomy, whereas only 13.9% of patients in the observation group achieved spontaneous pregnancy (odds ratio 3.04, 95% confidence interval 1.33–6.95).33 Cayan et al. in their meta-analysis has also reported 41.97% pregnancy rates after microsurgical varicocelectomy, which is higher than open inguinal ligation (36%) and laparoscopic technique (30.07%).

Nevertheless, our study had several limitations. Firstly, the retrospective design introduced potential recall bias. Additionally, we did not investigate the spouses of patients consulted for infertility, precluding confirmation of whether the men were the sole contributors to infertility in those couples. Moreover, the costliness of microsurgical procedures in resource-limited settings like ours limited the sample size in our study, as they were unaffordable for the majority of the population. Future studies should include a larger sample size to confirm the findings of our research.

CONCLUSION

Microsurgical varicocelectomy proves to be an effective intervention for symptomatic varicoceles, leading to enhanced fertility outcomes and alleviation of pain. A prospective study with a larger *sample* and long-term follow-up that compares the surgical management of symptomatic varicoceles using different surgical techniques is needed to support the present data.

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