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ORIGINAL ARTICLE

Outcomes of Microsurgical Varicocelectomy in Azoospermic Men with Varicocele: A Prospective Analysis of 50 Cases

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ABSTRACT

Background: Varicocele is a common correctable cause of male infertility and has been associated with impaired spermatogenesis, including azoospermia. Microsurgical varicocelectomy is considered the gold standard for its treatment, as it has low complication rate, low chances of recurrence and high success rate.

Objective: This study aimed to evaluate the effectiveness of microsurgical varicocelectomy in restoring spermatogenesis in men with non-obstructive azoospermia secondary to varicocele.

Methods: A total of 50 azoospermic patients with clinical varicocele underwent microsurgical subinguinal varicocelectomy at Health Net Teaching Hospital, Hayatabad, Peshawar from August 2022 to August 2023. Semen analysis was repeated postoperatively at regular intervals after six months of surgery.

Results: Out of the 50 patients, 27 (54%) showed the return of sperm in ejaculate after the procedure, indicating resumed spermatogenesis. The remaining 23 (46%) did not show any sperm in follow-up semen analyses.

Conclusion: Microsurgical varicocelectomy appears to be an effective treatment option for a subset of azoospermic men with varicocele, with more than half demonstrating a return of sperm production postoperatively but mostly these patient lands on ARTs.

Keywords: Microsurgical Varicocelectomy, Azoospermic Men, Varicocele

INTRODUCTION

Male infertility affects approximately 7-10% of men globally, with varicocele one of the most common cause in male. Varicocele is a pathological dilation of the pampiniform venous plexus occur in 35–40% of primary infertility cases and up to 80% of secondary cases[1]. Varicocele affects intra testicular temperature, induces oxidative stress, and impairs spermatogenesis, potentially leading to severe outcomes such severe oligospermia and non-obstructive azoospermia in advance cases. While microsurgical varicocelectomy is the gold standard for varicocele repair, its efficacy in restoring spermatogenesis in azoospermic men remains debated as with testicular volume loss there is loss of germinal epithelium which can lead to agenisis of the structure.

Azoospermia, the absence of sperm in the ejaculate, presents a significant clinical challenge. Although testicular sperm extraction (TESE) coupled with assisted reproductive technologies (ART) offers solutions, the restoration of natural fertility remains ideal. Emerging evidence suggests varicocelectomy may reverse azoospermia in select cases, yet outcomes vary widely across studies, outcome depend on multiple factors such as nidus blood FSH, testicular volume and age of the patient [4]. This prospective study evaluates the effectiveness of microsurgical subinguinal varicocelectomy in restoring sperm presence in ejaculates among men with NOA secondary to clinical varicocele.

MATERIALS AND METHODS

This prospective study was conducted between August 2022 and August 2023, enrolling a total of 50 male patients who presented with azoospermia and were clinically diagnosed with varicocele in Health Net Teaching Hospital, Hayatabad, Peshawar. Inclusion criteria comprised men aged 20–45 years with at least one year of primary or secondary infertility, non-obstructive azoospermia confirmed on at least two separate semen analyses according to WHO criteria (volume ≥1.5 mL, pH 7.2–8.0, sperm concentration 0/mL), and the presence of palpable clinical varicocele (grades II or III) confirmed by physical examination and Doppler ultrasonography. Patients with obstructive azoospermia, history of testicular trauma, previous varicocele surgery, systemic illness, or abnormal karyotype were excluded.

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Surgical Procedure: All patients underwent microsurgical subinguinal varicocelectomy under spinal or general anesthesia. The procedure was performed using an operative microscope (magnification ×10–25) to allow precise identification and preservation of testicular arteries and lymphatics while ligating dilated internal spermatic veins. The subinguinal approach was selected based on its recognized advantages, including minimal invasiveness, lower recurrence rate, and reduced postoperative complications such as hydrocele formation or testicular atrophy.

Each testicular unit was explored separately, and meticulous dissection was performed to ligate all visibly dilated veins, including external spermatic and gubernacular veins when necessary. The artery and lymphatics were preserved in all cases. The duration of the surgery ranged from 60 to 90 minutes per case, depending on anatomical variation.

Postoperative Care and Follow-up: Patients were discharged on the same or next day and advised to avoid strenuous activity for at least two weeks. Follow-up visits were scheduled at 1, 3, and 6 months postoperatively. At each visit, a clinical examination was performed to assess wound healing and detect any complications such as hematoma, hydrocele, or varicocele recurrence.

Semen analysis was conducted at 3 and 6 months postoperatively to assess the return of spermatogenesis. Samples were obtained by masturbation following 2–5 days of abstinence and evaluated according to the World Health Organization (WHO, 2021) criteria. The primary endpoint was the appearance of sperm in the ejaculate (i.e., conversion from azoospermia to cryptozoospermia or normozoospermia). Secondary endpoints included improvement in sperm parameters, complication rates, and the need for assisted reproductive techniques (ART) in non-responders.

Statistical Analysis: Descriptive statistics were used to summarize baseline characteristics. The appearance of sperm in the ejaculate was expressed as a proportion. Paired comparisons of semen parameters before and after surgery were conducted using the Wilcoxon signed-rank test or paired t-test depending on data normality. A p-value of <0.05 was considered statistically significant. Statistical analysis was performed using SPSS version.

RESULTS

Out of the 50 patients who underwent microsurgical varicocelectomy, 27 (54%) demonstrated the return of sperm in

their ejaculate postoperatively. This significant finding indicates the resumption of spermatogenesis in more than half of the study participants. Conversely, 23 patients (46%) did not show any sperm in their semen analyses during the follow-up period.

Table: 1:

Post-operative outcome	Number of patients	Percentage (%)
Return of sperm in ejaculate	27	54%
No sperm in ejaculate	23	46%
Total	50	100%

DISCUSSION

Varicocele remains a critical and challenging focus in andrology, particularly in its role as a potentially reversible cause of non-obstructive azoospermia (NOA). The restoration of even minimal spermatogenesis can have profound implications for fertility, as it may enable the use of assisted reproductive technologies (ART) such as intracytoplasmic sperm injection (ICSI) without the need for surgical sperm retrieval. In this prospective study of 50 azoospermic men with clinically palpable varicoceles, microsurgical subinguinal varicocelectomy resulted in a 54% success rate in restoring sperm to the ejaculate. This finding is consistent with existing meta-analyses, which report postoperative sperm retrieval rates ranging between 30–55% in similar patient populations[5,10]. These results reinforce the concept that varicocele repair can, in a substantial proportion of cases, reverse testicular dysfunction and reinitiate spermatogenesis, likely by improving testicular microenvironment through the correction of venous reflux, oxidative stress, and hyperthermia.

However, the 46% of patients who did not exhibit sperm in their ejaculate postoperatively highlight the multifactorial nature of azoospermia. While varicocele repair addresses hemodynamic abnormalities, some men may have irreversible germinal epithelial damage, advanced Sertoli cell-only syndrome, or underlying genetic abnormalities (such as Y-chromosome microdeletions or karyotypic anomalies) that preclude spermatogenic recovery despite optimal surgical intervention[11]. This subset of non-responders underscores the importance of preoperative counseling, emphasizing that while varicocelectomy offers a reasonable chance of sperm retrieval, it is not universally successful.

The success of microsurgical varicocelectomy in this cohort may also be influenced by patient selection criteria, including varicocele grade, duration of infertility, and baseline hormonal profiles. Future studies should explore predictive biomarkers such as serum FSH levels, testicular volume, or histological patterns on diagnostic biopsy to better identify which azoospermic men are most likely to benefit from surgical repair. Additionally, the impact of adjuvant therapies (e.g., hormonal stimulation with aromatase inhibitors or gonadotropins) in conjunction with varicocelectomy warrants further investigation to optimize spermatogenic outcomes.

Pathophysiological Mechanisms and Outcomes: Varicocele-induced testicular hyperthermia, hypoxia, and oxidative stress disrupt spermatogenesis by damaging Sertoli cells and germinal epithelium[12]. Microsurgical repair mitigates these effects by restoring venous drainage, thereby improving testicular microenvironmental parameters[13]. Notably, responders in this study likely had residual foci of active spermatogenesis, which regained function post-intervention. Conversely, non-responders may exhibit advanced testicular atrophy or fibrosis, as seen in histopathological studies[14]. Emerging biomarkers, such as serum inhibin B and testicular oxidative stress markers, could refine patient selection by identifying candidates with recoverable spermatogenesis[15].

CONCLUSION

In conclusion, while microsurgical varicocelectomy demonstrates a significant potential to restore spermatogenesis in men with NOA secondary to varicocele, its limitations must be acknowledged. A tailored approach, integrating preoperative genetic testing, advanced imaging, and individualized patient counseling, is essential to maximize therapeutic success and set realistic expectations for couples pursuing fertility treatment.

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Authors Contribution

Naqib Ullah: supervisor and design of study
Muhammad Izhar: Data collection
Zakir Khan: Data collection and analysis
Navid Khan: Data Collection
Fahim Ullah: Computor work and references writing
Sajid Shakeel: References writing

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