DOI: 10.4081/aiua.2025.13938

ORIGINAL PAPER

# The changes of semen parameters of patients with clinical versus subclinical varicocele managed by laparoscopic varicocelectomy: Observational study

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**Summary** *Objectives: To assess the effectiveness of laparoscopic varicocelectomy in patients with clinical versus subclinical varicocele concerning preoperative and postoperative seminal parameters.*

*Patients and methods: Between February 2021 and August 2024, a total of 162 patients diagnosed with varicocele (72 with subclinical and 90 with clinical presentation) seeking infertility advice (primary or secondary) at the author's institution underwent laparoscopic varicocelectomy and were enrolled in the study. All patients underwent history taking, clinical examination, semen analysis, and scrotal colour Doppler ultrasonography. Patients with recurrent varicocele, azoospermia, or infertility due to causes other than varicocele were excluded from the study. Semen analysis was conducted for all patients before laparoscopic varicocelectomy and 3 to 6 months after varicocelectomy. Results: Significant improvements in seminal parameters were observed in patients with clinical varicocele ($p < 0.05$). Bilateral and right-sided varicoceles were more prevalent in patients with subclinical varicocele. Additionally, the incidence of secondary infertility was higher in patients with subclinical varicocele compared to those with clinical varicocele ($p < 0.05$). Conclusions: Our study indicates favourable outcomes of laparoscopic varicocelectomy in patients with clinical varicocele. Regarding the effects of varicocelectomy in patients with subclinical varicocele, we recommend avoiding varicocelectomy in subclinical group of patients unless no identifiable causes of semen abnormality.*

*KEY WORDS: Semen; Subclinical varicocele; Infertility.*

Submitted 30 April 2025; Accepted 1 June 2025

## INTRODUCTION

Varicocele is a state of dilated, elongated and tortuous veins of the pampiniform plexus of the spermatic cord (1, 2). Varicoceles typically develop during adolescent and have been found in about 15% of the general male populations (3-5). Men with varicoceles typically seek medical assistance when they encounter symptoms such as pain or a dragging sensation in the scrotum. It's notable that up to 40% of men assessed at subfertility clinics are diagnosed with varicocele (6). Numerous theories have been proposed to explain the relationship between varicocele and infertility, with the primary factors including sperm damage due to increased scrotal temperature, accumulation of waste products in the sluggish blood flow of the pampiniform plexus, and elevated concentrations of testosterone and other hormones within these vessels (7-11). Various surgical methods are available for varicocele management, aiming to alleviate pain, remove the mass, and enhance semen parameters. However, despite varicocele being considered one of the most treatable causes of male infertility, debates and uncertainties persist regarding its treatment (12). A common abnormality observed in individuals with varicocele is a reduction in sperm motility, present in approximately 90% of patients (13). Moreover, abnormalities in sperm morphology are also prevalent. Currently, there is no established correlation between the grade of varicocele, testicular pathology, and abnormalities in semen parameters (14).

## PATIENTS AND METHODS

This study was carried out from February 2021 to August 2024 on 162 patients who presented at Thumbay university hospital seeking advice for infertility (primary or secondary). The patients were subjected to history taking, clinical examination, semen analysis, colour Doppler ultrasonography (scrotal). Patients with recurrent varicocele, azoospermia or have cause of infertility other than varicocele were excluded from the study. At least 2 semen analyses were done for all patients before operation and 3

to 6 months after operation. The patients were divided into 2 groups according to the degree of varicocele. Group A (90 patients with clinical varicocele) and Group B (72 patients with subclinical varicocele). The seminal parameters before and after the operation were compared among patients of each group. In both groups, varicocelectomy was done using laparoscopic approach for all patients by a single surgeon. Clinical varicocele was classified according to Dubin system into three grades. Grade I: small, palpable with only Valsalva manoeuvre; Grade II: moderate, palpable with patient standing and Grade III: large, visible through scrotal skin, and palpable with patient standing. Subclinical varicoceles are not palpable on physical examination but rather are diagnose radiographically. After obtaining informed consent and performing clinical evaluation, for each patient a questionnaire regarding demographic features, marital situation, type of varicocele, genital evaluation and type of infertility (primary or secondary) was filled out. To ensure the accuracy of the study, a single medical technologist performed all laboratory experiments and a single urologist performed all operations.

The spermiogram results pre and post-operative were compared among individuals of each group.

### *Statistical analysis*

Statistical analysis was performed using the 'Statistical Package for the Social Sciences' software for Windows (version 26.0; SPSS Inc.). For all comparisons, $p < 0.05$ was considered statistically significant.

## Results

In our study we select a total of 162 men, suffering from varicocele. Their mean age was 28.7 ± 3.9 years. The largest age group belonged to those who were 40 years and younger, making up 94.64 % of group A patients and 94.5% of group B (Table 1). The affected side in the patients is shown in Table 2. In patients of group A, 21 (23.33%) had grade I, 41 (45.56%) had grade II and 28 (31.11%) hade grade III varicocele. Among patients of our study, the period of time from marriage to the first visit to the urology clinic regarding infertility was 3.4 ± 1.2 years in group A patients and 1.6 ± 1.9 years in group B patients, with a significant P value of < 0.001. In group A patients, 78.2% had primary and 21.8% had secondary infertility. Among group B patients, 25.3% had primary infertility, 74.7% had secondary infertility. Comparison of spermiogram parameters before and after varicocelectomy between individuals of each group is shown in Table 3.

The main complications after operation in both groups were testicular pain and sensitivity in 19 patients (14 group A and 5 group B), mild hydrocele in 17 (6 group A and 11 group B), testicular atrophy in 3 (all of group B) and recurrence of varicocele in 8 (3 group A and 5 group B).

***Table 1.***
*Age distribution between patients of both groups.*

| Age | Group A (n = 90) | Group B (n = 72) |
|---|---|---|
| T < 20 | 14 (15.6%) | 7 (9.7%) |
| 21-30 | 63 (70%) | 56 (77.8%) |
| 31-40 | 8 (8.8%) | 5 (7%) |
| > 40 | 5 (5.6%) | 4 (5.5%) |

***Table 2.***
*Side distribution of varicocele between patients of both groups.*

| Side of varicocele | Group A (n = 90) | Group B (n = 72) |
|---|---|---|
| Right | 9 (10%) | 16 (22.2%) |
| Left | 5 (5.6%) | 24 (33.3%) |
| Bilateral | 78 (84.4%) | 32 (44.5%) |

***Table 3.***
*Comparing the semen parameters between the groups of patients.*

| Sperm parameters | Groups | Preoperative values | Postoperative values | P value |
|---|---|---|---|---|
| Total sperm count (million per ml) | A-I | 21.61 ± 22.75 | 49.65 ± 16.95 | < 0.05 |
| | A-II | 19.8 ± 33.2 | 47.4 ± 15.92 | < 0.05 |
| | A-III | 16.1 ± 28.1 | 37.23 ± 18.7 | < 0.05 |
| | B | 20.9 ± 15.6 | 22.7 ± 12.8 | NS |
| Percentage of motile sperms | A-I | 48.75 ± 23.85 | 53.85 ± 21.07 | NS |
| | A-II | 40.27 ± 19.25 | 63.6 ± 19.9 | < 0.05 |
| | A-III | 38.7 ± 16.2 | 71.45 ± 12.25 | < 0.05 |
| | B | 58.4 ± 11.2 | 59.6 ± 8.9 | NS |
| Percent of sperm with normal morphology | A-I | 57.75 ± 19.45 | 58.35 ± 13.51 | NS |
| | A-II | 52.76 ± 18.35 | 53.7 ± 17.4 | NS |
| | A-III | 50.21 ± 19.46 | 50.16 ± 18.65 | NS |

## Discussion

Primary infertility remains a major challenge facing the world today. Studies have shown that approximately 15% of married couples suffer from infertility, with male causes, especially varicocele, accounting for 20% to 50% of cases (15, 16). In men with secondary infertility, this proportion increases to 80% (17). There is evidence that men with normospermic varicocele respond differently to varicocele resection than patients with preoperative oligozoospermia due to different pathophysiological mechanisms (18). Two important studies examined outcomes after varicocele repair in patients with normal sperm count. In one case, isolated teratozoospermia showed no significant improvement after varicocele resection; in another case, neither teratozoospermia nor asthenozoospermia showed any improvement (19, 20). Furthermore, the authors claimed that undergoing varicocele resection puts this group of patients at risk for oligozoospermia. The approach to treating varicocele has changed significantly since Tulloch first proposed the association between varicocele and infertility in 1952 (21). *Scott's* 1961 study of 108 patients with varicocele concluded that larger varicoceles cause greater damage (22). Despite advances in imaging and understanding over the past six decades, the treatment of non-palpable varicocele remains controversial. Although there are sev-

eral grading systems, the Dublin grading system, which takes into account visibility and palpability, is widely accepted and classifies varicocele into three grades: grade 1 (palpable during Valsalva manoeuvre), grade 2 (palpable in upright position) and grade 3 (visible and palpable at rest) (23). Research indicates that varicoceles, regardless of their size, are associated with changes in semen parameters (24, 25). However, urologists need to consider *Sub-Clinical Varicocele* (SCV), which cannot be detected through visual or tactile examination but requires Doppler ultrasound for identification (26). Since the majority of studies focus on varicoceles diagnosed clinically, there is ongoing debate regarding the optimal management of SCV. This study deals into the prevalence of infertility, the impact of SCV, and the controversies surrounding its diagnosis and treatment within our community. While varicocele represents a significant and common factor in male infertility, clinical varicoceles can fortunately be effectively treated following certain paraclinical diagnoses such as abnormalities in sperm analysis and/or sonogram results. Various publications express many different views regarding surgical outcomes in patients with subclinical varicocele (27-29). In our research, varicocelectomy did not show favorable outcomes among patients with subclinical varicocele. This finding aligns with the results reported by *Bsat and Masabni*, who similarly observed no positive outcomes following varicocelectomy in patients with subclinical varicocele (30). Conversely, *Pierik et al.*, in their study involving patients with both clinical and subclinical varicocele, demonstrated that surgical intervention yielded consistent positive outcomes irrespective of the type of the condition (31). Many studies have sought to evaluate the impact of varicocelectomy on patients with subclinical varicocele. Among these studies, Unal et al. conducted a comparison of two treatment methods for patients with subclinical varicocele: prescribing clomiphene to one group and performing varicocelectomy on the other group. They observed improvements in spermiogram parameters in both groups, with no significant difference between the two treatment methods (32). In our study, bilateral or left-sided varicoceles were relatively more common in group B compared to the clinical group, and baseline spermiograms of subclinical patients were less abnormal than those of patients in group A. Based on our findings and those of previous studies, it can be inferred that the underlying mechanisms and pathogenesis of left-sided subclinical varicoceles, as well as those with severe spermiogram abnormalities (similar to clinical varicocele), resemble those of clinical varicocele, suggesting that surgery may yield better outcomes. However, in our study, a majority of the patients were affected on the left or both sides, indicating that other mechanisms may have influenced their sperm parameters.

## Conclusions

Laparoscopic varicocelectomy shows favourable outcome in patients with clinical varicocele, while in patients with subclinical varicocele there was no significant effect of varicocelectomy, so, we recommend avoiding varicocelectomy in patients with subclinical varicocele to avoid the possible complications that might be occur from such surgery.

## References

*1. Baazeem A, Belzile E, Ciampi A, et al. Varicocele and male factor infertility treatment: a new meta-analysis and review of the role of varicocele repair. Eur Urol. 2011; 60:796-808.*

*2. Kupis Ł, Dobroński PA, Radziszewski P. Varicocele as a source of male infertility - current treatment techniques. Central Eur J Urol. 2015; 68:365-370.*

*3. Razi M, Tavalaee M, Sarrafzadeh-Rezaei F, et al. Varicocele and oxidative stress: new perspectives from animal and human studies. Andrology. 2021; 9:546-558.*

*4. Kohn TP, Kohn JR, Pastuszak AW. Varicocelectomy before assisted reproductive technology: are outcomes improved? Fertil Steril. 2017; 108:385-391.*

*5. Peter C. Fretz, Jay I. Sandlow. Varicocele: current concepts in pathophysiology, diagnosis and treatment. Urol Clin N Am 2002; 29:921- 937.*

*6. Dubin L, Amelar RD. Varicocelectomy: 986 cases in a twelve-year study. Urology. 1977; 10:446-449.*

*7. Kim HJ, Seo JT, Kim KJ, et al. Clinical significance of subclinical varicocelectomy in male infertility: systematic review and meta-analysis. Andrologia. 2016; 48:654-661.*

*8. Merla A, Ledda A, Di Donato L, et al. Use of infrared functional imaging to detect impaired thermoregulatory control in men with asymptomatic varicocele. Fertil Steril. 2002; 78:199-200.*

*9. Hauser R, Paz G, Botchan A, et al. Varicocele: effect on sperm functions. Hum Reprod Update. 2001; 7:482-485.*

## Declarations

***Ethical approval and consent for participate:*** *All procedures performed in this study complied with institutional and/or national research council ethical standards as well as the 1964 Declaration of Helsinki and its subsequent amendments or similar ethical standards. Protocols and written informed consent for all participants were approved by the Research Ethics Committee of Thumbay University Hospital (affiliated with Gulf Medical University, REC #: 152/2021).*

***Consent for publication:*** *Not applicable.*

***Availability of data and material:*** *Data sets used in this study are available upon reasonable request from the corresponding authors.*

***Competing interests:*** *The authors declare no conflicts of interest.*

***Funding:*** *The authors did not receive any financial support for the research, authorship and/or publication of this article.*

***Authors' contributions:*** *TA, MA, MA, HM, AF: Manuscript preparation, protocol, data collection and management, manuscript editing; EE, AE, WA, MS, MT: Data acquisition, data analysis and management, manuscript editing; HB, SH, MF, HE, MY: Manuscript editing, project development; data analysis, project development. All authors have read and approved the manuscript*

***Acknowledgments:*** *None.*

*10. Blumer CG, Fariello RM, Restelli AE, et al. Sperm nuclear DNA fragmentation and mitochondrial activity in men with varicocele. Fertil Steril. 2008; 90:1716-1722.*

*11. Sakamoto Y, Ishikawa T, Kondo Y, et al. The assessment of oxidative stress in infertile patients with varicocele. BJU Int. 2008; 101:1547-1552.*

*12. Khera M, Lipshultz LI. Evolving approach to the varicocele. Urol Clin North Am. 2008; 35:183-9.*

*13. Will MA, Swain J, Fode M, et al. The great debate: varicocele treatment and impact on fertility. Fertil Steril. 2011; 95:841-852.*

*14. Zini A, Buckspan M, Berardinucci D, Jarvi K. Loss of left testicular volume in men with clinical left varicocele: correlation with grade of varicocele. Arch Androl. 1998; 41:37-41.*

*15. Jarow JP. Effects of varicocele on male fertility. Hum Reprod Update. 2001; 7:59-64.*

*16. Kroese AC, de Lange NM, Collins J, Evers JL. Surgery or embolization for varicoceles in subfertile men. Cochrane Database Syst Rev. 2012.*

*17. Meacham RB, Townsend RR, Rademacher D, Drose JA. The incidence of varicoceles in the general population when evaluated by physical examination, gray scale sonography and color Doppler sonography. J Urol. 1994.*

*18. Okeke L, Ikuerowo O, Chiekwe I, et al. Is varicocelectomy indicated in subfertile men with clinical varicoceles who have asthenospermia or teratospermia and normal sperm density? Int J Urol. 2007; 14:729-32.*

*19. Blumer CG, Restelli AE, Giudice PT, et al. Effect of varicocele on sperm function and semen oxidative stress. BJU Int 2012; 109:259-65.*

*20. Maciejko A, Kim P, Jang T, et al. Isolated teratospermia: is varicocelectomy indicated? J Urol. 2005; 173:369.*

*21. Tulloch WS. A consideration of sterility factors in the light of subsequent pregnancies II. Sub fertility in the male. (Tr. Edinburgh Obst. Soc. Session 104). Edinb Med J. 1951; 59:29-34.*

*22. Scott LS. Varicocele: A treatable cause of subfertility. Br Med J. 1961; 1:788-90.*

*23. Dubin L, Amelar RD. Etiologic factors in 1294 consecutive cases of male infertility. Fertil Steril. 1971; 22:469-474.*

*24. Silber SJ. The varicocele dilemma. Hum Reprod Update. 2001; 7:70-77.*

*25. Redmon JB, Carey P, Pryor JL. Varicocele-the most common cause of male factor infertility. Hum Reprod Update. 2002; 8:53-58.*

*26. Pauroso S, Di Leo N, Fulle I, et al. Varicocele: Ultrasonographic assessment in daily clinical practice. J Ultrasound. 2011; 14:199-204.*

*27. Muthukumar A, Sekar H, Krishnamoorthy S, Kumaresan N. Subclinical Varicocele (SCV): What the Urologists Need to Know? World Journal of Surgery and Surgical Research. 2021; 1281:1-4.*

*28. Schauer I, Madersbacher S, Jost R, et al. The impact of varicocelectomy on sperm parameters: a meta-analysis. J Urol. 2012; 187:1540-1547.*

*29. Birowo P, Tendi W, Widyahening IS, et al. The benefits of varicocele repair for achieving pregnancy in male infertility: a systematic review and meta-analysis. Heliyon. 2020; 6:e05439.*

*30. Bsat FA. & Masabni R. Effectiveness of varicocelectomy in varicoceles diagnosed by physical examination versus doppler studies. Fertil Steril. 1988; 50:321-323.*

*31. Pierik FH, Vreeburg JT, Stijnen T, et al. Improvement of sperm count and motility after ligation of varicoceles detected with colour Doppler ultrasonography. Int J Androl. 1998; 21:256-260.*

*32. Unal D, Yeni E, Verit A, Karatas OF. Clomiphene citrate versus varicocelectomy in treatment of subclinical varicocele: a prospective randomized study. Int J Urol. 2001; 8:227-230.*

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