https://doi.org/ 10.33472/AFJBS.6.7.2024.62-66

AFJBS

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Microscopic versus Non-Microscopic Subinguinal Varicocelectomy for Treatment of Male Subfertility, A Randomized Controlled Study

Tarek Osman, Abdelrahman Elhoubi, Hany Hamed Gad, Ahmed Emam [*]

Department of Urology, Ain Shams University, Cairo, Egypt

[*]**Corresponding Author email:** Ahmed_emam@med.asu.edu.eg

Article History
Volume 6,Issue 7, 2024
Received: 12 Feb 2024
Accepted : 30 Mar 2024
doi: 10.33472/AF5BS.6.7.2024.62-66

ABSTRACT

Objective: To compare the outcomes of subinguinal microscopic versus non-microscopic varicocelectomy in the treatment of male subfertility, particularly regarding perioperative complications, effects on semen parameters, and fertility.

Methods: This prospective study included 128 patients with primary infertility associated with varicocele. The patients were randomly assigned into two equal groups, which included subinguinal microscopic and non-microscopic varicocelectomy. We analyzed the following variables: age, laterality, grade of varicocele, semen parameters prior to and 3 months after surgery, pain relief, postoperative complications, and pregnancy rate at one year.

Results: Both groups had similar age, BMI, mean infertility duration, and varicocele grade. More veins were ligated in microscopic vs macroscopic varicocelectomy ($p<0.001$). The rate of testicular artery identification and preservation was significantly higher in microscopic vs macroscopic varicocelectomy (92% vs 30%, $p<0.001$). The rates of infection, hematoma, and hydrocele were similar among both groups. Baseline semen parameters were similar among both groups. Microscopic varicocelectomy was associated with higher increase in semen volume (1.45 vs 1.35 ml, $p<0.001$), sperm count (138 vs 97 million/ml, $p=0.007$), progressive sperm motility (29.5 vs 24%, $p<0.001$) and reduction of abnormal forms (-37.5 vs -26.5%, $p=0.008$) at 3 months postoperatively. The conception rate was higher at one year among patients who underwent microsurgical versus macroscopic varicocelectomy (45.6% vs 23.4%, respectively, $p=0.018$)

Conclusion: Microscopic subinguinal varicocelectomy can preserve more internal spermatic arteries, ligate more veins, better improve semen parameters, and eventually improve fertility outcomes compared to non-microscopic subinguinal varicocelectomy for the treatment of male subfertility.

Keywords: Male Subfertility; Microscopic Varicocelectomy; varicocelectomy; Infertility

INTRODUCTION

Infertility is attributed to a male factor -either alone or in conjunction with a female factor- in half of infertile couples. Varicocele has a prevalence rate of up to 15% among healthy men and is the underlying cause of primary infertility in up to 40% of men, and secondary infertility in up to 80% of men.[1] Men with varicocele have reduced sperm counts, impaired motility and abnormal morphology when compared to men without varicocele.[2]

The main goal of varicocelectomy is to preserve testicular function and initiate pregnancy in infertile couples. However, even when pregnancy is not achieved, improved seminal quality after surgery can obviate or reduce the need for assisted reproductive techniques. *S*everal surgical techniques for varicocelectomy are currently used in practice.[3]

AIM OF THE WORK

The aim of this study was to compare the subinguinal microscopic versus non-microscopic varicocelectomy in the treatment of male subfertility, regarding postoperative complications, effect on semen parameters and fertility.

Patients and methods

After obtaining the approval of institutional Clinical Research Ethical Committee, this prospective, randomized, controlled study was conducted on 128 patients presented with primary infertility associated with varicocele. Sexually active male patients aged 18-50 years old seeking for fertility and presenting to the Urology clinic with primary infertility, impaired semen parameters, normal levels of sexual hormones, evidence of varicocele on clinical examination and/or duplex ultrasonography, no other identifiable causes of infertility and no associated female factor of infertility were included in the study. Meanwhile, patients with previous operation for infertility, current medical treatment for infertility on the last three months, azoospermia, and insufficient sexual relation with spouse were excluded from the study.

All patients were randomized by closed envelope technique (1:1) into either microscopic (group A) or non-microscopic varicocelectomy (group B). 64 patients were included in each group the study (total 128 patients) according to sample size equation.

All patients underwent routine pre-operative investigations and full hormonal profile including total Testosterone, Free Testosterone, LH, FSH and serum Prolactin.

Microscopic varicocelectomy entails subinguinal approach (Skin incision, subcutaneous fat dissection and Scarpa's fascia), cord dissection, ligation of all veins while sparing the artery and lymphatics under, microscopic magnification < 8 x.

Non-microscopic varicocelectomy entails subinguinal approach, cord dissection, and ligation of all visible veins without use of magnification.

Follow up was carried out by clinical examination to detect any postoperative complications, enquiry about postoperative pain and contraceptives. Semen analysis was repeated after 3 months after operation and was compared to pre-operative data. Results of both groups were compared.

Statistical Analysis:

Descriptive analysis: We started with a univariate analysis of the sample with which the distribution of patient characteristics was measured, confidence interval was the tool utilized to determine significance, and to detect variation between both groups.

Bivariate analysis: The analysis of numeric discrete variables and its modification by the treatment was performed. Accordingly, we applied this test for the study of semen analysis post procedures.

RESULTS

Baseline characteristics including age, body mass index (BMI), infertility duration, baseline clinical presentation, and ultrasound findings were similar in both groups. Microscopic group had a statistically significant lower levels of serum total testosterone, LH and prolactin however, the differences were not clinically significant and hormonal profile was within normal in both groups. **Table 1** summarizes baseline patient characteristics.

More veins were ligated in microscopic versus macroscopic subinguinal varicocelectomy (7 vs 3 on the right side and 9 vs 4 on the left side respectively, p<0.001). The rate of testicular artery identification and consequently preservation was significantly higher in microscopic vs macroscopic varicocelectomy (92% vs 30% respectively, p<0.001). **Table 2** summarizes the operative characteristics. Postoperative testicular and wound pain were less in microscopic vs macroscopic varicocelectomy. Meanwhile, the rates of swelling, infection and hematoma were similar among both groups. **Table 3** illustrates postoperative complications in both groups.

Baseline semen parameters were similar among both groups. Microscopic varicocelectomy group showed higher increase in semen volume (1.45 vs 1.35 ml, p<0.001), sperm count (137.5 vs 97.05 million/ml, p=0.007), progressive sperm motility (29.5 vs 24, p<0.001) and reduction of abnormal forms (-37.5 vs -26.5, p=0.008) at 3 months postoperatively. **Table 4** demonstrates the Baseline, 3 months, and changes of semen analysis in both groups.

The mean follow-up was 12 months (range 12 to 24 months). The conception rate was higher at 1 year among patients who underwent microsurgical versus macroscopic varicocelectomy (45.6% vs 23.4%, respectively, p=0.018)

DISCUSSION

Multiple treatment modalities have been employed for repair of varicoceles. The aim of varicocelectomy is to improve spermatogenesis in infertile men with clinical varicocele and impaired semen quality, or to relieve the discomfort in symptomatic patients. An ideal varicocelectomy procedure should have the best results and fewest complications.[4]

In our study, more veins were ligated in microscopic vs macroscopic subinguinal varicocelectomy (7.1 vs 3.0 on the right side and 9.4 vs 4.1 on the left side respectively, p<0.001). Liu and colleagues compared the intraoperative anatomic details between microsurgical and macroscopic varicocele repair in the same spermatic cord. They reported significant differences in the average number of internal spermatic arteries (1.7 vs. 0.9, P <0.001) and internal spermatic veins (6.5 vs. 4.3, P < 0.001) between microscopic and macroscopic procedure. Meanwhile, an average of 2.1 internal spermatic veins was missed; among them, 1.6 internal spermatic veins adherent to the preserved testicular artery were overlooked.[4]

In this study, the rate of testicular artery identification and consequently preservation was significantly higher in microscopic vs macroscopic varicocelectomy (92% vs 30%, p<0.001).

This rate of accidental testicular artery ligation is slightly higher than a previously reported incidence of 1% in microsurgical varicocelectomy [5], and 12 % during sub-inguinal varicocelectomy performed under the magnification with 2.5 × optical loupes where each vessel was investigated with a 9-MHz Doppler probe before ligation and transection [6], and 46% in the traditional open surgery [4]. Some authors suggested the use of micro-Doppler ultrasonography in microsurgical varicocelectomy as it seems to be an effective and safe method that facilitates identification of testicular vessels. With the assistance of micro- Doppler ultrasonography, even very small size arteries can be easily identified, and iatrogenic damage can be avoided [7, 8]. Although there have been no documented negative effects from ligating the testicular artery during laparoscopic varicocelectomy [6], this practice is still debatable, and some authors try to avoid cutting the artery during laparoscopic procedures [9].

Regarding improvement of semen parameters, we found higher improvement of semen parameters (count, motility, and abnormal forms) 3-months postoperatively in microscopic group, versus non- microscopic group. Similarly, The sperm concentration, total sperm count, progressive motility rate, sperm viability, and morphology were significantly improved after the microsurgical subinguinal varicocelectomy (all P values <0.05) [10]. A study done by Al-Said and colleagues showed that microsurgical varicocelectomy resulted in a better improvement in sperm concentration and motility compared with open and laparoscopic varicocele treatment with an overall improvement in semen parameters in 61% patients who underwent varicocelectomy.[9] A large meta-analysis of 17 such studies found that semen analysis after varicocelectomy had a mean increase in sperm density of 9.7 million/mL, a 9.9% motility increase. Similarly, the sperm concentration increased by 12 million/mL (and motility increased by 11.7% after high ligation varicocelectomy. The improvement in WHO sperm morphology was 3.2% after both microsurgery and high ligation varicocelectomy. [3]

Along with these improvements in semen analysis, men being treated for varicocele are more likely to have a resultant pregnancy. In our study, the conception rate was significantly higher at one year among patients who underwent microsurgical compared with macroscopic varicocelectomy (45.6% versus 23.4%, respectively). Several studies have observed pregnancy rates from 28 - 47% following varicocelectomy.[9, 11–13] In a similar context, two meta-analyses found that the pregnancy rate after microsurgery was statistically significantly higher than that after open varicocelectomy. In the meantime, there was no discernible difference in laparoscopic and open varicocelectomies or microsurgical and laparoscopic varicocelectomies.[14, 15] On the other hand, the pregnancy rates at 1 year showed no statistically significant difference following varicocelectomy done by an open inguinal technique, laparoscopy and subinguinal microsurgery in another 2 studies.[9, 13]

Surgical complications of varicocelectomy include postoperative hydrocele (secondary to excessive ligation of lymphatics), hematoma, pain, varicocele persistence and recurrence. In our study although the rates of infection, hematoma and hydrocele were slightly higher in macroscopic versus microscopic approach yet, the difference was not statistically significant.

Meanwhile, other studies reported that in the microsurgical, open, and laparoscopic varicocelectomy, a hydrocele occurred in 0%, 13%, and 20% of cases, respectively [13]. Another study found that hydroceles developed in 0%, 2.8%, and 5.4% of cases, in these groups respectively [9]**.** The subinguinal approach appears to limit postoperative pain since the external oblique aponeurosis is never violated. Postoperative pain was less frequent in microscopic group in our study. This may be attributed to the use of small-scale tools.

The study has certain limitations, such as a relatively small sample size. Also, we did not use intraoperative Doppler ultrasound, which would have been more helpful in identifying and preserving the testicular artery. Our study's strength is that the patients only sought varicocele treatment as a result of male infertility when they enrolled in the current study.

CONCLUSION

Microscopic subinguinal varicocelectomy can preserve more internal spermatic arteries, ligate more veins, better improve semen parameters, and eventually improve fertility outcomes compared to non-microscopic subinguinal varicocelectomy for the treatment of male subfertility.

Declarations

Ethical Approval and Consent to participate:
The study has been approved by the research ethics committee of Ain Shams University (No. FMASU MD 24/2021). Informed consent was obtained from all individual participants in this study.
Consent for publication: The authors have reviewed the manuscript and approved its publication in the journal.
Availability of supporting data: The study's data is available upon request.
Competing interests: The authors declare that they have no conflicts of interest.
Funding: None
Acknowledgements: Not applicable

References

1. Addar AM, Nazer A, Almardawi A, et al (2021) The yield of microscopic varicocelectomy in men with severe oligospermia. Urol Ann 13:268–271. https://doi.org/10.4103/UA.UA_53_20
2. Agarwal A, Majzoub A, Esteves SC, et al (2016) Clinical utility of sperm DNA fragmentation testing: practice recommendations based on clinical scenarios. Transl Androl Urol 5:935–950. https://doi.org/10.21037/tau.2016.10.03

3. Agarwal A, Deepinder F, Cocuzza M, et al (2007) Efficacy of varicocelectomy in improving semen parameters: new meta-analytical approach. Urology 70:532–538. https://doi.org/10.1016/j.urology.2007.04.011
4. Liu X, Zhang H, Ruan X, et al (2013) Macroscopic and microsurgical varicocelectomy: what's the intraoperative difference? World J Urol 31:603–608. https://doi.org/10.1007/s00345-012-0950-x
5. Chan PTK, Wright EJ, Goldstein M (2005) Incidence and postoperative outcomes of accidental ligation of the testicular artery during microsurgical varicocelectomy. Journal of Urology 173:482–484. https://doi.org/10.1097/01.ju.0000148942.61914.2e
6. Cuda SP, Musser JE, Belnap CM, Thibault GP (2011) Incidence and clinical significance of arterial injury in varicocele repair. BJU International 107:1635–1637. https://doi.org/10.1111/j.1464-410X.2010.09643.x
7. Cocuzza M, Pagani R, Coelho R, et al (2010) The systematic use of intraoperative vascular Doppler ultrasound during microsurgical subinguinal varicocelectomy improves precise identification and preservation of testicular blood supply. Fertil Steril 93:2396–2399. https://doi.org/10.1016/j.fertnstert.2009.01.088
8. Gudeloglu A, Karakurt G, Altan M, Ergen A (2020) Micro-Doppler Ultrasonography-assisted Microsurgical Varicocelectomy: First Time in Turkiye. Journal of Urological Surgery 7:46–49. https://doi.org/10.4274/jus.galenos.2019.2952
9. Al-Said S, Al-Naimi A, Al-Ansari A, et al (2008) Varicocelectomy for male infertility: a comparative study of open, laparoscopic and microsurgical approaches. J Urol 180:266–270. https://doi.org/10.1016/j.juro.2008.03.050
10. Wang X, Wang R, Du Q, Pan B (2021) Clinical effectiveness of microsurgical subinguinal varicocelectomy with enhanced recovery after surgery for varicocele. Transl Androl Urol 10:3862–3872. https://doi.org/10.21037/tau-21-908
11. Cayan S, Kadioglu TC, Tefekli A, et al (2000) Comparison of results and complications of high ligation surgery and microsurgical high inguinal varicocelectomy in the treatment of varicocele. Urology 55:750–754. https://doi.org/10.1016/S0090-4295(99)00603-2
12. P P, S M, K G, et al (2001) Effect of subinguinal varicocelectomy on sperm parameters and pregnancy rate: a two-group study. European urology 39:. https://doi.org/10.1159/000052461
13. Al-Kandari AM, Shabaan H, Ibrahim HM, et al (2007) Comparison of Outcomes of Different Varicocelectomy Techniques: Open Inguinal, Laparoscopic, and Subinguinal Microscopic Varicocelectomy: A Randomized Clinical Trial. Urology 69:417–420. https://doi.org/10.1016/j.urology.2007.01.057
14. Ding H, Tian J, Du W, et al (2012) Open non-microsurgical, laparoscopic or open microsurgical varicocelectomy for male infertility: a meta-analysis of randomized controlled trials. BJU Int 110:1536–1542. https://doi.org/10.1111/j.1464-410X.2012.11093.x
15. Yuan R, Zhuo H, Cao D, Wei Q (2017) Efficacy and safety of varicocelectomies: A meta-analysis. Systems Biology in Reproductive Medicine 63:120–129. https://doi.org/10.1080/19396368.2016.1265161