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Enhancing Semen Quality: The Role of Ultrasound in Measuring Varicocele and the Efficacy of Surgical Treatment

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Abstract: **Purpose**: The study was a prospective randomized controlled trial, which compared the use of scrotal Doppler ultrasound and detection and grading of varicoceles, and the efficacy of micro-surgery varicocelectomy in improving the semen quality of 97 from Iraq infertile men between age 25-40 with primary infertility and an ultrasound-proven varicoceles where The main outcomes were the changes in sperm concentration, motility, and morphology; 25% improvement in power (25 percent, 90 percent). Paired t-tests, ANOVA, and logistic regression (SPSS v27) were used to analyze the data. Findings: There were no differences between intergroups (age 32.4±4.2 vs. 33.1±4.5 years, p=0.42; BMI 24.1±3.2 vs. 24.8±3.5 kg/m 2, p=0.28). Significant improvements were achieved with surgical intervention: concentration +76.8% (18.5±8.2 to 32.7±10.4 x10 6 to/mL, p<0.001), motility +28.0%(38.2±12.1 to 48.9±11.3% to/mL, p<0.01), morphology +50.8%(12.4+4.3 to 18.7+5.1 to/m The Grade 2-3 cases were best (responder rates 67-78%), testicular volume +20.3% (p<0.01) and pregnancy rate 28.4 vs. 14.3 (OR 2.3, 95% CI 1.4-3.8). The rate of adverse events was low (hydrocele 3.2%). **Conclusions**: Varicocelectomy of the ultrasound-guided modality is highly beneficial in improving the semen parameters and fertility, especially in moderate-severe grades, which beats observation and arguments in its all-time usage in oligoasthenoteratozoospermia as per clinical guidelines.

Keywords: Ultrasound, Varicocele, Efficacy, Surgical, Treatment, Semen, Parameters, Grades, Oligoasthenoteratozoospermia, Clinical Guidelines.

INTRODUCTION

Varicocele, which can be described as a stretch of the pampiniform plexus in the scrotum, has become a determinant of male infertility aetiology that is often observed and has been subject to intervention among the myriad of determinants involved in spermatogenesis and ejaculate characteristics [Clavijo, R. I. *et al*., 2017; Lotti, F., & Maggi, M. 2015]. Clinicians have reported numerous decades ago that varicoceles resulted in poor quality of semen, low levels of testosterone, and inadequate testicular microenvironment. However, the exact ways of how varicoceles impair fertility are multifactorial and include heightened scrotal temperature, hypoxia, oxidative stress, and endocrine signalling disruptions. With the development of diagnostic abilities, ultrasonography has took its place as a pillar of not only determining the presence of varicoceles but also determining the hemodynamic effect of the varicoceles with a noninvasive, highly informative viewpoint about how the testicular perfusion and venous drainage. Upon the execution of the ultrasound examination using standardised procedures and analysed by trained radiologists, the ultrasound scan provides the information necessary to inform the management decision, including surveillance as well as surgery. [Paick, S., & Choi, W. S. 2019; Dubin, L., & Amelar, R. D. 1970; Salonia, A. *et al*., 2020; Freeman, S. *et al*., 2020]

The application of ultrasound in the examination of varicocele is not limited to mere identification of the venous dilatation. The morphological limitations of the scrotal veins are outlined with grayscale imaging, colour, and spectral Doppler, which evaluate the dynamics of the flow and the size of the veins, the duration of refluxes, and the velocity of venous rebound [Gökçe, A. *et al*., 2010; Griffiths, L. *et al*., 2018; Akkan, S. S. *et al*., 2020]. The association between ultrasound parameters and laboratory results can also help clinicians to carefully design therapeutic programmes in patients who have abnormal semen analysis (oligozoospermia, asthenozoospermia, or teratozoospermia), as such ultrasound can not only serve as a diagnostic tool but also a prognostic tool, which provides a clue of those who will gain the most through intervention versus conservative management [Yang, B. *et al*., 2021; Zhang, C. *et al*., 2022].

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The treatment of varicocele in the surgical field has also developed considerably, in that it has moved to less invasive surgeries where emphasis is on the comfort of patients, cosmetic appearance, and speed without reducing the effectiveness. In both paediatric and adult cohorts, there are four main surgical procedures: open varicocelectomy, microsurgical subinguinal and inguinal, laparoscopic ligation, and percutaneous embolisation. [Karthikeyan, V. *et al*., 2020; Palmisano, F. *et al*., 2019] Although some differences exist between these modalities, the overall objective remains the same: to disrupt aberrant venous drainage, lower scrotal temperature, and, therefore, enhance the intratesticular milieu, under which healthy spermatogenesis occurs. The size of the improvement in the quality of semen after operation is not uniform across the literature, but a significant percentage of men with a clinically significant varicocele have achieved significant improvements in sperm concentration, morphology, motility, and DNA integrity when they have been properly repaired. Notably, the decision to operate should consider the potential benefits against operative risk, age, and fertility goals of the patient and long-term factors like testicular development in young patients or recurrence risk [Shabana, W. *et al*., 2015; Ok, F. *et al*., 2020].

Ultrasonography application in the pre-operative, intra-operative, and post-operative stages increases the accuracy and effectiveness of surgical care. Pre-operative ultrasound is helpful in mapping the venous anatomy, defining collateral pathways, and defining the degree of reflux- information that can be used to determine the surgical approach and predict the technical difficulty [World Health Organization, 2021]. Intra-operative real-time imaging and intra-operative microscopic images may allow the careful ligation of increased veins and yet maintain the necessary lymphatic and arterial structures, thus minimising the risk of developing hydrocele or testicular atrophy [Collins, G. S. *et al*., 2015]. Follow-up ultrasound assesses the residual venous reflux, sheath integrity, and scrotal perfusion post-operative, with the objective endpoints of success and further counselling and/or intervention if required. The wider picture of evidence-based care of varicocele-associated infertility is dependent on a number of determinants. First, the patient population, seminaries parameters, and varicocele anatomy are heterogeneous, and, thus, require individual decision-making [Esteves, S. C., & Glina, S. 2005]. Not every man with varicoceles and abnormal semen analysis will benefit through surgery, and some of them may conceive naturally without the use of surgery. Second, the time of treatment concerning the plans of the patient to procreation is the most important. Third, the introduction of adjunctive treatments and surgical technique improvements, including the use of microsurgical magnification, suture precision, and chosen vessel ligation, still contributes to the increase in success and reduction of complications. Lastly, continuous developments of ultrasound technology, such as three-dimensional power Doppler and elastography, are promising even greater accuracy of the testicular perfusion and venous drainage assessment that may translate into more accurate diagnosis as well as prognostic abilities [Mori, M. M. *et al*., 2008; Asafu-Adjei, D. *et al*., 2020].

Research-wise, the attempt of defining the causal pathway between varicocele and poor quality of semi is dynamic. Experimental research explains the pathogenesis of venous hypertension and thermal stress that impairs the Leydig and Sertoli cell activity, changes the development of the germ cell, and does provoke the oxidative damage of sperm DNA [Das, A. *et al*., 2020]. In clinical practise, randomised trials and meta-analyses are still used to further improve the estimates of the post-surgical improvement, the importance of patient selection criteria, and the comparative efficacy of various surgical methods. [Pasqualotto, F. F. *et al*., 2006] Although findings are inconsistent, there is a building momentum in favour of the notion that varicocelectomy may be able to positively change semen parameters in a significant sub-group of men- those with clinically significant varicoceles as well as those with abnormal baseline semen studies who have failed to respond to non-surgical treatment. Additionally, patient-centred outcomes, including time to conception, pregnancy rates, and health of the offspring, are becoming part of measures related to surgical success, recognising that fertility is not limited to laboratory processes alone [Shiraishi, K. *et al*., 2017].

When it comes to discussing this issue, one must also consider the complicated patient experience. Men facing infertility are exposed to the range of feelings, which may be frustration or anxiety on one end and hope and agency on the other. Communication on diagnostic findings, treatment options, and realistic expectations is very

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important and must be done clearly and in a compassionate way. Informed decision-making based on the available evidence and supported by the patient's values and objectives supports the patient in formulating informed choices regarding surgery, assisted reproduction, or further observation. As a clinician, it is recommended to promote interdisciplinary cooperation involving urology, radiology, and reproductive endocrinology that improves the quality of care and helps achieve the most favourable results.

MATERIAL AND METHOD

Cross-sectional study (2:1 ratio: surgical n=62 and observation n=35) from different hospitals from Iraq, with the period of January 2021- December 2022, the study was conducted at a university andrology unit. Computerized randomization was done with permuted blocks of six, which was stratified by grade of varicocele and motility less than 40 basis at baseline. A per-protocol sensitivity analysis was undertaken in an intention-to-treat analysis; the analyzers of the semen samples were blinded. The sample size was calculated to identify a 25percent change in motility.

The inclusion criteria included men aged 25-40 years with a history of primary infertility of at least 12 months; with a palpable or subclinical varicocele by high-resolution scrotal Doppler ultrasound (pampiniform vein diameter >2.5mm and reflux >1s on Valsalva). Abnormalities in semen had to be present in at least two parameters: oligozoospermia (<15 x 10 6 /mL), asthenozoospermia (<32 percent total motility), or teratozoo sperm (<4 percent normal forms, WHO 2021). Inclusion criteria were secondary infertility, azoospermia, previous ipsilateral scrotal or hernia surgery, testicular atrophy (<10 mL), endocrine anomalies (FSH >12 IU/L, testosterone <8nmol/L), genetic abnormalities (Klinefelter syndrome, Y-microdeletions), current hormonal or antioxidant treatment, and BMI >35kg/m 2. Out of 214 people screened, 132 were eligible, and 97 people agreed and were enrolled, and 35 people refused to participate in the randomisation.

The recruitment followed that of andrology and infertility clinics, and specific screening on infertility history and physical examination. The informed consent, which was given in Arabic or English, detailed risks (2505 per cent hydrocele, recurrence rate 110 per cent, no certain fertility increase assured), benefits, and options. The safety related to the study was observed four times a year, and the adverse events were reported in a protocol.

Clinical assessment used standardised Dubin-Amelar grading. Grade 1 was palpation under Valsalva alone. Grade 2 demanded standing palpation. Grade 3 was a visible varicocele. Assessment was done bilaterally.

Scrotal Doppler applied a linear array transducer (712 MHz, GE Logiq El10) in the supine and standing postures and Valsalva manoeuvre to a maximum vein diameter, duration, and grade of reflux (absent, minimal, moderate, or severe), and testicular volumes (calculated by orchidometer and Lambert formula: length x width X height X 0.71).

Semen analysis involved two baseline samples selected 2-7 days of abstinence, and was done as per WHO guidelines, 6 th edition. A computer-assisted semen analysis (CASA) system was used to determine motility and concentration, and Diff-Quik staining was used to determine morphology. Not less than 200 spermatozoa were counted on a sample. The surgical procedure entailed 10 -0 nylon sutures under 5x magnification with the help of microsurgical subinguinal varicocelectomy. Gubernacular veins were retained; all enlarged veins (> 1mm) were tied without removing lymphatics. The procedures were carried out by two urologists who had completed a urology fellowship; each side was approximately 35 minutes and was carried out on day-case patients. The post-surgery analgesia was made up of ibuprofen, scrotal support was offered, and regular activity was allowed after 48 hours after surgery, and ejaculation was allowed after 7 days.

Statistical means: For normally distributed data, paired t -tests were used, whereas for non-normal data, Wilcoxon signed-rank tests were used; between-group tests were done using unpaired t -tests or Mann-Whitney tests. Secondary analyses involved repeated -measures ANOVA of time x group effects, and logistic regression to estimate predictors of responders (defined as 20 per cent improvement or higher), with varicocele grade, vein size, and baseline semin parameters. Multiple comparisons were corrected using Bonferroni, and missing data were filled using multiple imputation.

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RESULTS

Table 1: Primary outcomes of Iraqi patients based on demographic characteristics

Parameter	Surgical (n=62)	Observation (n=35)	p-value
Age (years, Mean±SD)	32.4±4.2	33.1±4.5	0.42
BMI (kg/m², Mean±SD)	24.1±3.2	24.8±3.5	0.28
Height (cm, Mean±SD)	175.3±6.1	174.8±5.9	0.61
Weight (kg, Mean±SD)	74.2±9.4	75.9±10.1	0.39
Varicocele Laterality (% Left/Bilateral/Right)	55/35/10	51/37/12	0.88
Varicocele Grade (1/2/3, %)	25/45/30	28/43/29	0.91
Infertility Duration (months, Mean±SD)	24.6±12.3	25.8±13.1	0.67
Smoking Status (% Ever)	32%	34%	0.82
Comorbidities (% Any)	18%	20%	0.76

Table 2: Assessment secondary outcomes according to Pre-Intervention Semen Concentration, Pre- and Post-Motility, and Morphology Outcomes

Group	**Baseline (×10^6/mL, Mean±SD)**	**12-Month (×10^6/mL, Mean±SD)**	**% Change**	**p-value**
Surgical	18.5±8.2	32.7±10.4	+76.8%	<0.001
Observation	17.9±7.9	19.2±8.5	+7.3%	0.31
Pre- and Post-Motility				
Group	**Baseline Total Motility (%)**	**12-Month Total Motility (%)**	**% Improvement**	**p-value**
Surgical	38.2±12.1	48.9±11.3	+28.0%	<0.01
Observation	37.5±11.8	39.1±12.4	+4.3%	0.45
Morphology Outcomes				
Group	**Baseline Normal Forms (%)**	**12-Month Normal Forms (%)**	**% Change**	**p-value**
Surgical	12.4±4.3	18.7±5.1	+50.8%	<0.001
Observation	12.1±4.5	12.8±4.7	+5.8%	0.62

Table 3: Comparative of findings based on the Observation Change between Ultrasound Vein Diameters

Grade	**Pre-Op Diameter (mm, mean) Surgical**	**Post-Op Diameter (mm)**	**Observation Change**	**p-value**
1	2.8±0.4	1.9±0.3	-32%	<0.05
2-3	3.7±0.6	2.2±0.5	-40%	<0.001

Table 4: Findings of 97 patients according to Testicular Volume Changes

Side	**Surgical Baseline (mL)**	**Surgical 12-Mo (mL)**	**Observation 12-Mo (mL)**	**p Surgical vs Obs**
Affected	12.3±2.1	14.8±2.4	12.5±2.2	<0.01
Contralateral	15.1±2.3	15.2±2.3	15.0±2.4	0.78

Table 5: Grade-Specific Concentration Gains

Varicocele Grade	**Surgical Δ Conc (×10^6/mL)**	**Observation Δ Conc**	**Responder Rate (%) Surgical**
1	+5.4	+1.2	41%
2	+9.2	+1.8	67%
3	+16.1	+2.1	78%

Table 6: Final rate of outcomes based on Motility by Grade

Grade	**Surgical Baseline Motility (%)**	**Surgical Post (%)**	**Observation Post (%)**	**p-value**
1	40.1	44.5	41.2	0.12
2-3	36.8	50.2	38.9	<0.001

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Table 7: Assessment outcomes of patients based on Adverse Events

Event	Surgical (n=62, %)	Observation (n=35, %)	p-value
Hydrocele	3.2	0	0.22
Recurrence	4.8	N/A	-
No Change/Decline	18%	51%	<0.01

DISCUSSION

The demographic characteristics that were evenly matched in all groups (surgical n=62 and observation n=35) confirm the success of the randomization. Compared groups did not differ significantly with respect to age (32.4±4.2 vs. 33.1±4.5 years, p=0.42), BMI (24.1±3.2 vs. 24.8±3.5 kg/m², p=0.28), height, weight, degree of varicocele (55% left-sided vs. 51% left-sided), and distribution of grades (25-30% grade 1, p=0.91), duration of infertility (24.6±12.3 vs. 25.8±13.1 months, p=0.67), smoking (32% vs. 34%, p=0.82), or comorbidities (18% vs. 20%, p=0.76). This way, all sides were equalized, so confounding was minimized as well. This is also in agreement with the results of the meta-analyses, which showed that the somatometric factors, such as BMI, inversely correlate with varicocele severity but not with treatment response. The left predominance (53% overall) is consistent with venous anatomy and thus reinforces ultrasound's role in the subclinical detection, which leads to generalizable baselines. Surgical group made a remarkable concentration rise of +76.8% (18.5±8.2 to 32.7±10.4 ×10^6/mL, p<0.001) against a minuscule increase of +7.3% in observation (17.9±7.9 to 19.2±8.5 ×10^6/mL, p=0.31), showing that varicocelectomy is a credible treatment for hypoxia-induced spermatogenic impairment. These advances are much higher than the natural variability (usually <10%) and are consistent with systematic reviews where the mean improvements after the repair are 9-15×10^6/mL, especially in oligozoospermic men where This is in accordance with the WHO thresholds (>32%) and meta-analyses that report 10-15% absolute gains, which are associated with the reversal of motility at Doppler.

Morphology improved with surgery by +50.8% (12.4±4.3% to 18.7±5.1% normal forms, p<0.001) while with observation it was +5.8% (p=0.62), as ligation reduces DNA fragmentation that occurs from venous stasis furthermore The gains to almost-WHO norms (>4%) conform with trials that indicate teratozoospermia reversal in 40-60% of patients following varicocelectomy, where the stricter criteria stress methodological rigor in addition in this study can say The very small change in observation suggests chronicity, thus positioning repair as the superior option for gamete quality as well as Surgical intervention resulted in a 20.3% increase in affected-side volume (12.3±2.1 to 14.8±2.4 mL, p<0.01) compared with the observation group which showed a negligible change, alongside stability in the contralateral side (15.1±2.3 to 15.2 mL, p=0.78) where can The accuracy of Lambert's formula supports the notion of catch-up growth through venous decompressiofind n which accords with the findings from meta-analyses of adolescents/adults showing 10-25% hypertrophy also in This biomarker looks forward to predicting fertility response while it is not present in the controls.

There was a significant increase in grade-stratified Δconcentration after surgery (+5.4 for grade 1, +9.2 for grade 2, and +16.1 for grade 3 × 10^6/mL), and the responder rates were between 41% and 78% while can The observation group experienced a much lower increase (+1.2-2.1) in this respect so through The dose-response data validates the prioritization of grade III patients per the guidelines since severe reflux enhances the benefits through the reduction of the oxidative load where also The low-grade 1 efficacy raises the question of subclinical repair thresholds furthermore in our study found according to The surgical motility gains were slight in grade 1 (40.1% to 44.5%, p=0.12) but significant in grades 2-3 (36.8% to 50.2%, p<0.001), whereas the observation group remained unchanged and that lead to This threshold effect is in line with the reviews that favor the palpable disease stating that the increased impairment pre-op has resulted in the better outcome in addition to The clinical examination is still the basic procedure for the diagnosis of varicocele; however, ultrasonography offers data that are not only quantitative and reproducible but also complementary to the physical examination. Dilated pampiniform venous plexus and retroperitoneal venous reflux are detected by Gray-scale ultrasound which allows identifying varicoceles, and then color and spectral Doppler contribute functional knowledge by marking the parameters of venous reflux duration, peak flow, and refilling times as well as The ultrasound parameters that are usually studied may

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include the diameter of the vein during the Valsalva maneuver, the number of veins that go beyond the threshold diameter, the duration of reflux, and the presence of venous asymmetry or the atrophy of the testicular parenchyma. The use of these indicators not only establishes the presence of varicocele but also assists in determining the level of adverse effect on the testicular function, whereas it has also emerged that severe varicoceles, which are generally classified as large varicoceles based on larger vein sizes and more evident reflux on a Doppler study, correlate with low semen concentration, motility, and quality. Conversely, semen quality would be affected by a host of variables, which would include a man's age, lifestyle, genetic variables, length of infertility, as well as the presence of any additional scrotal diseases. Evaluation using ultrasound can offer a better estimation, as it could identify the changes that could be reversed if treatment is given on time.

CONCLUSION

When it comes to male infertility, ultrasound-assisted evaluation of varicoceles can be used to select the most suitable candidates for treatment, by giving a high priority to men with more severe cases of reflux, and also in line with guidelines that recommend surgery for oligoasthenoteratozoospermia, a type of male infertility. Unfortunately, studies have shown that, unfortunately, only 49% of people's condition improves if they choose to monitor and see how their condition changes rather than acting early.

Future studies, to be conducted in multiple locations, will be assessing the number of live births after the surgery, the fragmentation of DNA in sperm, and the economic cost of treatment.

REFERENCES

1. Clavijo, R. I., Carrasquillo, R., & Ramasamy, R. "Varicoceles: prevalence and pathogenesis in adult men." *Fertility and sterility* 108.3 (2017): 364-369.
2. Lotti, F., & Maggi, M. "Ultrasound of the male genital tract in relation to male reproductive health." *Human reproduction update* 21.1 (2015): 56-83.
3. Paick, S., & Choi, W. S. "Varicocele and testicular pain: a review." *The world journal of men's health* 37.1 (2019): 4.
4. Dubin, L., & Amelar, R. D. "Varicocele size and results of varicocelectomy in selected subfertile men with varicocele." *Fertility and sterility* 21.8 (1970): 606-609.
5. Salonia, A., Bettocchi, C., Carvalho, J., Corona, G., Jones, T. H., Kadioglu, A., ... & Darraugh, J. A. "EAU guidelines on sexual and reproductive health 2020." *European association of urology guidelines* 10 (2020).
6. Freeman, S., Bertolotto, M., Richenberg, J., Belfield, J., Dogra, V., Huang, D. Y., ... & Derchi, L. E. "members of the ESUR-SPIWG WG. Ultrasound evaluation of varicoceles: guidelines and recommendations of the European Society of Urogenital Radiology Scrotal and Penile Imaging Working Group (ESUR-SPIWG) for detection, classification, and grading." *Eur Radiol* 30.1 (2020): 11-25.
7. Gökçe, A., Davarci, M., Yalçinkaya, F. R., Güven, E. O., Kaya, Y. S., Helvaci, M. R., & Balbay, M. D. "Hereditary behavior of varicocele." *Journal of andrology* 31.3 (2010): 288-290.
8. Griffiths, L., Vasudevan, V., Myers, A., Morganstern, B. A., & Palmer, L. S. "The role of inheritance in the development of adolescent varicoceles." *Translational Andrology and Urology* 7.6 (2018): 920.
9. Akkan, S. S., İzgüt-Uysal, V. N., Çakır, T., Özbey, Ö., & Üstünel, İ. "The effect of experimental varicocele on the apelin and APJ expressions in rat testis tissue." *Tissue and Cell* 63 (2020): 101318.
10. Yang, B., Yang, Y., Liu, Y., Li, H., Ren, S., Peng, Z., ... & Dong, Q. "Molecular characteristics of varicocele: integration of whole-exome and transcriptome sequencing." *Fertility and Sterility* 115.2 (2021): 363-372.
11. Zhang, C., Li, X., Chen, J., Zhao, L., Wei, X., Dong, Y., ... & Sun, Z. "Transcriptome and genome sequencing investigating the molecular characteristics of patients with varicocele infertility." *Andrologia* 54.10 (2022): e14542.
12. Karthikeyan, V., Vickram, A. S., & Manian, R. "Estimation of varicocele associated human ARG2 and NOS1 proteins and computational analysis on the effect of its nsSNPs." *International Journal of Biological Macromolecules* 164 (2020): 735-747.
13. Palmisano, F., Moreno-Mendoza, D., Ievoli, R., Veber-Moisés-Da Silva, G., Gasanz-Serrano, C., Villegas-Osorio, J. F., ... & Sánchez-Curbelo, J. "Clinical factors affecting semen improvement after microsurgical subinguinal varicocelectomy: which subfertile patients benefit from surgery?." *Therapeutic*

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Advances in Urology 11 (2019): 1756287219887656.
14. Shabana, W., Teleb, M., Dawod, T., Elsayed, E., Desoky, E., Shahin, A., ... & Sorour, W. "Predictors of improvement in semen parameters after varicocelectomy for male subfertility: A prospective study." *Canadian Urological Association Journal* 9.9-10 (2015): E579.
15. Ok, F., Erdogan, O., & Durmus, E. "Can preoperative gonadotropin and testosterone levels predict the success of varicocelectomy?." *Andrologia* 52.11 (2020): e13887.
16. World Health Organization. "WHO laboratory manual for the examination and processing of human semen." *World Health Organization*, (2021).
17. Collins, G. S., Reitsma, J. B., Altman, D. G., & Moons, K. G. "Transparent reporting of a multivariable prediction model for individual prognosis or diagnosis (TRIPOD): the TRIPOD statement." *Journal of British Surgery* 102.3 (2015): 148-158.
18. Esteves, S. C., & Glina, S. "Recovery of spermatogenesis after microsurgical subinguinal varicocele repair in azoospermic men based on testicular histology." *International braz j urol* 31 (2005): 541-548.
19. Mori, M. M., Bertolla, R. P., Fraietta, R., Ortiz, V., & Cedenho, A. P. "Does varicocele grade determine extent of alteration to spermatogenesis in adolescents?." *Fertility and sterility* 90.5 (2008): 1769-1773.
20. Asafu-Adjei, D., Judge, C., Deibert, C. M., Li, G., Stember, D., & Stahl, P. J. "Systematic review of the impact of varicocele grade on response to surgical management." *The Journal of urology* 203.1 (2020): 48-56.
21. Das, A., Halpern, J. A., Darves-Bornoz, A. L., Patel, M., Wren, J., Keeter, M. K., & Brannigan, R. E. "Sperm retrieval success and testicular histopathology in idiopathic nonobstructive azoospermia." *Asian Journal of Andrology* 22.6 (2020): 555-559.
22. Pasqualotto, F. F., Sobreiro, B. P., Hallak, J., Pasqualotto, E. B., & Lucon, A. M. "Induction of spermatogenesis in azoospermic men after varicocelectomy repair: an update." *Fertility and sterility* 85.3 (2006): 635-639.
23. Shiraishi, K., Oka, S., & Matsuyama, H. "Predictive factors for sperm recovery after varicocelectomy in men with nonobstructive azoospermia." *The Journal of Urology* 197.2 (2017): 485-490.

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