International Journal for Scientific Research (IJSR)
المجلة الدولية للبحوث العلمية
Vol. (2), No. (6)
June 2023
الإصدار (2)، العدد (6)

Varicocelectomy's Impact on Semen Analysis in Infertile Patients

Basheer Faisal Ali Alasad
Arab Board of Urology, Yemen
alasadbasheer91@gmail.com

Salah Ahmed Abdullah
Consultant of Urology, Arab Board of Urology, Yemen

Khaled M Alkohlany
MD, Program Coordinator, Arab Board of Urology, Yemen
Associate Professor of Urology, Head of Urology Department (MH), Faculty of Medicine, Sanaa University

Athmar Hussein Ali
MD, General Secretary of Yemeni Board of Medical Specializations, Yemen

Abstract:

This study aimed to evaluate the effects of open subinguinal varicocelectomy on sperm parameters in infertile men. Results: The study included 70 patients with varicocele who underwent the surgery, and significant improvements were observed in semen parameters, including volume, concentration, count, motility, and morphology. Additionally, there was an increase in the likelihood of achieving pregnancy after surgery. Unilateral varicocelectomy had a greater impact on improving these parameters than bilateral varicocelectomy. Furthermore, undergoing the surgery at a younger age had a more significant impact. The mean age of patients was 27 years old, with all being married; unilateral varicocele was found in 71% of

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

cases, while the remaining cases presented as bilateral; duration of infertility averaged around one year for all participants, with primary infertility accounting for most cases (87%). Varicocele grade II occurred among approximately one-third (34%) of participants, while grade III occurred among two-thirds (66%) of participants. No intra-operative complications were reported during or after surgeries that involved routine preoperative investigations such as physical examination and color Doppler ultrasound, along with hormonal profile analysis, before scheduling open subinguinal conventional varicocelectomies. **In conclusion,** this prospective descriptive study showed that subinguinal varicocelectomy improves patients' semen quality by increasing volume, concentration, count, motility, and morphology. All differences mean an increase in all parameters (volume = 0.7 ml, count = 13 million/mL, motility = 12%, and achievement of pregnancy (no = 16, 22.9%), leading to higher chances of achieving pregnancy. This effect is greater when performed unilaterally (n = 45,64.3%) than bilaterally (n = 18,25.7%), especially if done at younger ages, but further studies are needed to confirm these findings using larger sample sizes.

Keywords: Varicocelectomy, Semen Analysis Parameters, Infertile Patients.

Introduction

Infertility affects 15% of all couples who are intending to conceive (Sharlip et al, 2002). Male factors alone contribute to 20–30% of all infertility cases, and when combined with the female element, it is responsible for 50% of overall cases (Agarwal et al, 2015). Varicocele is known to be the most common correctable male infertility etiology (Witt and Lipshultz, 1993).

Several studies have reported the prevalence of varicocele as 15–20% in healthy subjects, and 40–70% in men with infertility (Schauer et al, 2012; Zhang et al, 2017).

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

The exact pathophysiological mechanism explaining how varicocele affects testicular function is still uncertain. However, several studies have reported that a reduced testicular volume, weak sperm parameters, and changes in testosterone levels in infertile men have been observed in patients with varicocele (Jungwirth et al, 2001).

Therefore, varicocele correction has been a mainstay in the treatment of male infertility. The current guidelines recommend treatment of varicocele should be performed in cases of documented infertility, in the presence of one or more abnormal semen parameters of sperm function tests, in palpable varicocele, and in normal female fertility or potentially correctable female fertility (Fertile Steril, 2014). However, the efficacy of varicocele repair in infertile males has been controversial. Improvement in sperm parameters and testicular volume after varicocele repair has been reported in the literature, yet its correlation with spontaneous pregnancy has been unclear (Cho and Seo 2014; Kamischke and Nieschlag, 2001).

The prevalence of varicocele increases with decreasing BMI (body mass index) and is associated with adipose tissue compression of the left renal vein (Handel et al, 2006).

Although there are many studies on the correlation between BMI and the prevalence of varicocele (Shin and Lee 2007), there are no studies that have compared semen parameters according to BMI after varicocelectomy (Schauer et al 2012, Jung Wirth et al 2001, Prabakaran et al 2006).

Aim of Study:

The aim of this study was to evaluate the outcome of open varicocelectomy and effects on sperm parameters and spontaneous pregnancy rates among Yemeni

IJSR, VSRP Publishing, UK E-ISSN 2755-3418
https://ijsr.vsrp.co.uk https://doi.org/10.59992/IJSR.2023.v2n6p3

patients with varicocele at the urology and nephrology center, Al-Thawra Modern Hospital, Sana'a.

Patients & Methods

This is a prospective study conducted on 70 patients for whom Open varicocelectomy was done for the management of varicocele grade II, III, either unilateral or bilateral. The study was conducted at The Urology and Nephrology Center, AL-Thawra Modern General Hospital- Sana'a during the period between January 2020 and December 2022. All cases underwent open sub-inguinal varicocelectomy.

Study population:

All men presenting with, a clinically palpable varicocele and abnormally altered semen variables on one or more semen samples were deemed to be candidates for varicocele repair, admitted to Al-Thawra General Hospital, and managed by Open varicocelectomy.

Exclusion criteria:

1- Patients with azoospermia, total necrospermia, recurrent varicocele, and pituitary hormonal abnormalities (such as high LH, FSH denoting primary testicular failure).

2- Men with a history of cryptorchidism, testicular trauma, torsion, infection, previous scrotal surgery or genetic abnormality.

3- Couples in whom the female partner had tubal obstruction or ovulatory failure

4- Patients who were treated by other approaches such as high ligation, inguinal, laparoscopic, or sub-inguinal microscopic surgery.

5- Patient diagnosis as grade I varicocele.

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

Methods

Preoperative Assessment:

Clinical assessment:

All patients underwent an informed consent process, clinical evaluation by history, including the length of symptoms (pain, swelling, infertility, and constitutional symptoms), history of prior operations, associated medical conditions, or medications that had an impact on fertility, and physical examination (general and genital). Both the erect and supine positions were used for the physical examination. During rest and the Valsalva maneuver, scrotal color Doppler ultrasonography was performed on each subject.

A clinical and US diagnosis of varicocele was made based on the spermatic venous diameter being more than 3 mm. Doppler-detected venous reflux and a larger diameter during the Valsalva maneuver **(Jimenez Garrido et al., 1999)**. The pampiniform plexus of veins' biggest vein diameter and reverse blood flow were measured. Each varicocele was assessed, and **a**ll varicocele were evaluated and graded based on the Dubin grading system (grades I–III). (Dubin and Amelar, 1977; Jarow, 2001)

Preoperative laboratory tests: The following tests were performed on each patient:

Analysis of the sperm three to five days after the last sexual activity Semen was collected using the standard method of masturbation in a wide-mouth sterile container without the use of soap or other lubricant known to impact the semen parameters. (General Urinalysis Examination) (CBC) Complete blood count. Prothrombin time and prothrombin concentration in the coagulation profile serum

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

creatinine and urea. Serum follicular-stimulating hormone (FSH), luteinizing hormone (LH), and total testosterone levels were assessed in cases of severe oligospermia in addition to regular laboratory tests. The same technicians who performed each analysis did it in the same lab. Semen was liquefied, and sperm concentration and motility were assessed in accordance with WHO recommendations (fertile and sterile, 1992). Following the surgery, a semen assay was performed four months later.

Statistical analyses:

At first, the Kolmogorov-Smirnov (K-S) test was conducted to determine the normality of the distribution for the study variables. All estimated results were expressed as mean ± SD. Mean values will be assessed for significance by the paired sample t-test, where abnormality distributions variables compared to the nonparametric test (Wilcoxon signed-rank test) and the use of variables used by Spearman correlation test was also done to examine the relationship between some variables such as varicocele side and the effect of varicocelectomy on sperm count for quantitative variables. Statistical analysis was performed using the Statistical Package for the Social Science program (SPSS 26.0). Frequencies and percentages were used for the categorical measures. Probability values $p < 0.05$ was considered statistically significant.

End points:

Our primary endpoint was the determination of any significant effect of varicocelectomy on sperm volume, concentration, count, motility, and morphology.

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

The Results:

The population was divided into three age groups: under 29 years old (n = 48, 68.57%), 30-39 years old (n = 19, 27.14%), and over 40 years old (n = 3, 4.29%). Of the 70 patients, most had unilateral varicocele (n = 50, 71.4%), while the rest had bilateral varicocele (n = 20, 28.6%), and none had right varicocele alone. All cases were married and presented with infertility as the main issue. Most cases had grade III varicocele (n = 46, 65.7%) and presented with primary infertility (n = 55, 78.57%). Among the patients, khat chewing was the most common special habit (n = 38,54.3%). The mean duration of infertility was 1.66 years, with patients ranging from having infertility for three years to more than seven years.

Our intervention involved performing open subinguinal varicocelectomy on all patients, with 50 patients undergoing unilateral surgery on the left side and 20 patients undergoing bilateral surgery. The majority of procedures were done under general anesthesia, with a mean operative time of 90 minutes. No complications were recorded during surgery, and all patients were discharged within 24 hours. Following the operation, all patients took antioxidants (BD) and vitamin E (OD) for three months, starting one month after the surgery. During the post-operative period, we followed up with patients for a minimum of one month and a maximum of six months through history, physical examination, and doppler ultrasound. Out of 68 patients, only five experienced complications such as pain (4.3%), hydrocele (2.9%), or recurrence of varicocele (2.9%). The remaining 63 patients (90%) had no complications. Within three months after the operation, partners of the patients experienced an improvement in semen parameters, and pregnancy occurred in 16 partners (22.9%), while 54 partners (77.1%) did not become pregnant.

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

Pre- and post-varicocelectomy semen parameters:

The paired sample test conducted by SPSS revealed significant differences between the pre- and post-operation parameters, as indicated by the t-test results (volume = -8.761, count = -6.387, motility = -8.997, morphology = -3.940) and p-values (0.00) for volume, count, motility, and morphology. The mean values for all parameters before the operation were volume = 2.110.9, count = 711, motility = 23.5713, and morphology = 3317, while after the operation they were volume = 2.80.8, count = 2120, motility = 3614, and morphology = 3815. The mean difference in all parameters increased (volume = 0.7 ml, count = 13 million/mL, motility = 12%, morphology = 11%).

Semen Parameter Pre and Post Operation

Parameters	Pre-Operative	Post-Operative	Mean difference	t	p-Value
Volume (mL)	2.11±0.9	2.8±0.8	.683	-8.761	0.00
Total count (million/mL)	7 ± 11	21±20	13	-6.387	0.00
Motility (%)	23.57±13	36±14	12.171	-8.997	0.00
Morphology (%)	33±17	38±15	4.429	-3.940	0.00

Subgroup analysis of pre- and post-varicocelectomy semen parameters improvement:

The results of our study indicate that in grade II, 11 students (15.7%) showed improvement, while 10 students (14.3%) demonstrated slight improvement and 3

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

students (4.3%) did not show any improvement. In grade III, 28 students (40%) improved, 14 students (20%) showed slight improvement and 4 students (5.7%) did not show any improvement. In terms of the left side, 29 individuals (41.4%) experienced improvement, 16 (22.9%) saw slight improvement, and five (7%) did not improve. For bilateral cases, 10 individuals (14.3%) improved, eight (11.4%) slightly improved, and two (2.9%) did not improve.

Several statistical methods used in our research:

Our study found that there was a lack of correlation between age and pre- and post-operative results, with negative correlation being low significant (p value = 0.06). Additionally, there was no correlation and significance between count and age (p value = 0.061). Motility was found to be significant in relation to infertility state (p=0.035). Finally, special habits were also significant in relation to semen parameters before operation (p=0.011, -.304) and after operation (rho=-316; p=0.008).

Our study found that there is no significant relationship between semen parameter pre and post operation and the side of varicocele, as indicated by a p value of 0.921. However, there was a significant correlation between pregnancy of the partner (p value = 0.000) and special habits (p value = 0.01). Additionally, our study did not find any significant associations between the author, side of varicocele, state of infertility, or grade of varicocele.

Our study revealed that smoking and khat chewing (rho=1, p=.013 - rho=0.81, p=0.0 respectively) have a correlation, according to our analysis of the correlation between these habits and pre and post-parametric data. Additionally, we found that there was a positive correlation between the duration of infertility and all factors, particularly when the duration exceeded 7 years (rho=0.9, p=0.00).

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

Discussion

This study aimed to evaluate the impact of varicocelectomy surgery on sperm parameters, as normal values of semen parameters are crucial for fertility and varicoceles are a common operable and curable cause of infertility. The findings revealed that varicocele surgery led to significant improvements in all sperm parameters, including sperm count, motility, and morphology.

In the present study which was prospectively designed, the data of 70 patients with varicocele has been collected and analysis, the mean age of patients was 27.66 years. Of the 70 patients studied, 24 patients had varicocele grade II and 46 patients grade III, which were almost similar to the findings of Jorsaraei et al study (Jorsaraei et al, 2006).

In Anupam Kakade et al study, total number of cases was 51 patients, 32 (62.74%) had a unilateral varicocele, and 19 patients (37.25%) had a bilateral varicocele. (Anupam Kakade et al,2020) which are close to our study figure with 50 (71.4%) had unilateral and 20(28.6%) and bilateral disease.

In the scientific study conducted by (Ayoub Barzgarnezhad et al 2016), it was observed that out of the 51 cases analyzed, 22 cases (43.13%) had left side varicocele and 29 patients (56.86%) had bilateral varicocele. The study aimed to investigate the relationship between the varicocele side and its effect on sperm count after surgery. The results indicated that there was no significant relationship between the varicocele side and the effect of varicocele on sperm count after surgery, as evidenced by a p-value of 0.33. Furthermore, our study found that there was no significant relationship between sperm count after surgery and the side of varicocele, with a p-value of 0.921.

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

In their scientific research, Kibar et al investigated the effects of sub-inguinal varicocelectomy on infertile patients. The study utilized the Kruger classification sperm morphology evaluation to assess changes in sperm morphology. Results showed a significant increase in the percentage of normal forms and forms with head and acrosome defects (p value; 0.0001, 0.0014 and 0.0028, respectively), while there were no significant changes in strict morphology in forms with mid piece and tail defects or immature forms (p value > 0.05) (Kibar Y et al, 2002). Our study yielded similar findings to this research, with preoperative and postoperative percentages of normal forms at 33% ±17% and 38% ±15%, respectively (P value =0.00).

In a scientific study conducted by (Ali Shamsa et al 2010), it was observed that three months post-operation, there was a significant increase in sperm count, motility, and morphology by 55%, 51%, and 46% respectively (P value 0.000, 0.000, and 0.015 respectively). These findings were consistent with the results of our own research where we observed an increase in sperm count (21±20) million/ml, motility (36±14) %, and morphology (38±15) % with a P value of 0.000, 0.000, and 0.000 respectively.

In a recent scientific study conducted by (Ahmed Mahmoud Attia et al, 2019), it was observed that the mean sperm density increased significantly from 7.36 million/mL preoperatively to 27.5 million/mL postoperatively, with a mean time to pregnancy of 3 months and a spontaneous pregnancy rate of 22.2%. Our study yielded similar results. The mean sperm density increased significantly from 7 million/mL preoperatively to 21 million/mL postoperatively. The mean time to pregnancy was also observed to be 3 months, with a spontaneous pregnancy rate of 22.9%. These

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

findings are consistent with those reported in another study by (Kamischke and Nieschlag, 2001), which reported a pregnancy rate of 29%.

In our study, we aimed to investigate the effect of age on semen parameters in male patients. Similar to Ramy Abou Ghayda et al, we divided the population according to age groups and found that the most significant improvement in total sperm count was observed in patients under 29 years of age, with a statistically significant increase from 8.7 ± 13.8 million/mL to 21.6 ± 19 million/mL ($p = 0.00$). Furthermore, patients aged between 30 and 40 years also showed a significant increase in total sperm count from 5.21 ± 5 million/mL to 19.9 ± 23.4 million/mL ($p = 0.011$). We also observed a statistically significant increase in motility across all age groups; however, the highest age group (>40 years) showed the greatest increase from 36.7% ± 20.8% to 54% ± 10.8% with a p-value of 0.00, similar to the findings of (Ramy Abou Ghayda et al, 2020). These results suggest that age plays an important role in semen quality and should be considered when evaluating male fertility potential.

In our scientific research, we found that the mean operative time for our sample population was between 70 to 140 minutes. This duration is consistent with the findings of a previous study conducted by (Leung et al, 2013) at an academic institution in Hong Kong, which focused on male infertility and treated 42 patients with varicocele. The study reported a mean operative time of 100 to 150 minutes.

Microsurgical varicocelectomy has been shown to accurately preserve the testicular artery and lymphatics (Huang et al, 2001). Other studies have reported incidences of postoperative hydrocele ranging from 7% to 33.8% (Kaufman et al, 1983; Abdel-Maggid and Othman, 2010). In our own study, we observed a postoperative hydrocele complication rate of 2.9%. While the general recurrence rate for

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

varicocelectomy ranges from 15% to 25% according to (Kaufman et al, 1983), our study observed a recurrence rate of 2.9%.

Conclusion:

In the realm of scientific research, our study has demonstrated that subinguinal varicocelectomy can lead to significant improvements in semen parameters, including volume, concentration, count, motility, and morphology. Unilateral varicocelectomy appears to be more effective than bilateral in increasing the likelihood of pregnancy. Additionally, undergoing varicocelectomy at a younger age may have the greatest impact on these parameters. The grade of the varicocele is also a crucial factor in treatment success, with grade III varicoceles showing higher rates of improvement post-surgery. However, our study did not find a significant correlation between grade and parameter increase, highlighting the need for larger sample sizes in future studies to obtain more conclusive results.

Despite these findings, our study faced several challenges and limitations. Incomplete data in clinical charts and a lack of long-term follow-up post-varicocelectomy for some cases limited our ability to fully assess treatment outcomes. Additionally, our sample size was small and further research with larger cohorts is necessary for more robust conclusions. Furthermore, we observed a positive correlation between chewing gate and improved pregnancy outcomes for partners, which may have affected our results. Finally, difficulties in follow-up due to participants living away from the clinic may have impacted our ability to collect comprehensive data on treatment outcomes over time.

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

References:

1. Abdel-Maguid AF, Othman I. Microsurgical and no magnified subinguinal varicocelectomy for infertile men: a comparative study. Fertility Sterility. 2010;94(7):26003.
2. Agarwal A, Prabakaran S, Allamaneni SS. Relationship between oxidative stress, varicocele and infertility: a meta-analysis. Reprod Biomed Online. 2006;12(5):630–3. (PubMed PMID: 16790111).
3. Agarwal, A.; Mulgund, A.; Hamada, A.; Chyatte, M.R. A unique view on male infertility around the globe. Reprod. Biol. Endocrinol. 2015, 13, 37. [CrossRef] [PubMed]
4. Ahmed Mahmoud Attia 1 , ELnisr Rashed Mohamed 1 , Mohamed Zaki Ali 2 , Abdelbasset Abdou Mohamed Badawy 1 . Semen Parameters and Pregnancy Rate Post Varicocelectomy For Subfertile Men with Sperm Count Less Than 10 Million, Sohag Medical School Experience. SOHAG MEDICAL JOURNAL Vol. 23 No. 3 July 2019.
5. Ali Shamsa, M Nademi, M Aqaee, A Nouraee Fard, Mahmood Molaei. Complications and the effect of varicocelectomy on semen analysis, fertility, early ejaculation and spontaneous abortion. 21(6),2010, 1100-1105.
6. Anupam Kakade1, Mangesh Padamwar2, Dilip Gode3, Chandrashekhar Mahakalkar4, Ajonish Kamble5, Amit Nagdive6. CLINICAL STUDY OF THE EFFECT OF VARICOCELECTOMY ON PARAMETERS OF SEMEN ANALYSIS OF INFERTILE MEN. Journal of Critical Reviews, ISSN- 2394-5125, Vol 7, Issue 8, 2020.
7. Ayoub Barzgarnezhad1, Bezad feizzadeh kerigh1, Mostafa Ahangaran2 1Department of Urology, Mazandaran University of Medical Sciences, Orthopedic Research center, Sari, Iran 2Medical Student, Mazandaran University of Medical Sciences, Sari, Iran. Improvement of sperm parameters after varicocelectomy: a single center study during six years. Int J Med Invest 2016; vol 5; num 3;121-12.
8. Cho, K.S.; Seo, J.T. E_ect of varicocelectomy on male infertility. Korean J. Urol. 2014, 55, 703–709. [CrossRef]
9. Dubin L, Amelar RD. Varicocelectomy: 986 cases in a twelve-year study. Urology 1977; 10:446-9. cross ref.

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3

10. Fertil. Steril. 2014.Report on varicocele and infertility: A committee opinion. Fertil. Steril. 2014, 102, 1556–1560. [CrossRef]
11. Handel, L.N.; Shetty, R.; Sigman, M. The relationship between varicoceles and obesity. J. Urol. 2006, 176, 2138–2140. [CrossRef]
12. Jarow JP: Effects of varicocele on male fertility. Hum Reprod Update. 2001; 7: 59-64.
13. Jimenez Garrido A, Garcia de la Torre MV, Sanchez de Badajoz E: A decade of laparoscopic varicocelectomy: costs and learning stages(abstract). Arch Esp. Urol. 1999; 52:245.
14. Jorsaraei G, Aghajani Mir M, Hajian K, Asghari Zadeh Ganji M. Effects of varicocelectomy on sperm parameters and fertility rate. JBUMS. 2006; 8 (1) :40-45.
15. Jungwirth, A.; Gogus, C.; Hauser, G.; Gomahr, A.; Schmeller, N.; Aulitzky, W.; Frick, J. Clinical outcome of microsurgical subinguinal varicocelectomy in infertile men. Andrologia 2001, 33, 71–74. [CrossRef].
16. Kamischke, A.; Nieschlag, E. Varicocele treatment in the light of evidence-based andrology. Hum. Reprod. Update 2001, 7, 65–69. [CrossRef] [PubMed]
17. Kaufman Sl, Kadir S, Barth Kh, Smyth JW, Walsh PC, White RI, Jr. Mechanisms of recurrent varicocele after balloon occlusion or surgical ligation of the internal spermatic vein. Radiology. 1983;147(2):435-40.
18. Kibar Y, Seckin B, Erduran D: The effects of subinguinal varicocelectomy on Kruger morphology and semen parameters. J Urol 2002, 168(3):1071-1074.
19. Leung, MB, BS, MRCS KL Ho, FRCS (Urology) (Edin), FHKAM (Surgery) PC Tam, FRCS (Urology) (Edin), FHKAM (Surgery) MK Yiu, FRCS (Edin), FHKAM (Surgery). Department of Surgery, The University of Hong Kong, Queen Mary Hospital, Pokfulam, Hong Kong. Hong Kong Med J 2013;19:334-40 DOI: 10.12809/hkmj133884.
20. Ramy Abou Ghayda , Robert Zakhia El-Doueihi , Jun Young Lee , Muhammad Bulbul, Nassib Abou Heidar, Jad Bulbul, Samer Asmar, Sung Hwi Hong, Jae Won Yang, Andreas Kronbichler and Jae Il Shin, Anthropometric Variables as Predictors of Semen Parameters and Fertility Outcomes after Varicocelectomy, Jornal of Clinical Medecine. Published: 18 April 2020.

21. Schauer, I.; Madersbacher, S.; Jost, R.; Hubner, W.A.; Imhof, M. The impact of varicocelectomy on sperm parameters: A meta-analysis. J. Urol. 2012, 187, 1540–1547. [CrossRef] [PubMed].
22. Sharlip, I.D.; Jarow, J.P.; Belker, A.M.; Lipshultz, L.I.; Sigman, M.; Thomas, A.J.; Schlegel, P.N.; Howards, S . S.;Nehra, A.; Damewood, M.D.; et al. Best practice policies for male infertility. Fertil. Steril. 2002, 77, 873–882.[CrossRef]
23. Shin, J.I.; Lee, J.S. Changes in body mass index and prevalence of varicoceles during adolescence. Urol. Int. 2007, 78, 178. [CrossRef]
24. Witt, M.A.; Lipshultz, L.I. Varicocele: A progressive or static lesion? Urology 1993, 42, 541–543. [CrossRef]
25. Zhang, Y.;Ma, T.; Su, Z.; Ye,M.; Tian,H.; Li, J.; Liu, J. Varicoceles affect semen quality of infertilemen in southern china: A cross-sectional study of 5447 cases.Medicine (Baltimore) 2017, 96, e7707. [CrossRef] [PubMed]

IJSR, VSRP Publishing, UK
https://ijsr.vsrp.co.uk
E-ISSN 2755-3418
https://doi.org/10.59992/IJSR.2023.v2n6p3