Analyzing Varicocele Symptoms and Outcomes: A Retrospective Study

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KEYWORDS

Varicocele, symptoms, treatment outcomes, surgery, embolization, semen analysis, infertility

ABSTRACT

Introduction: Varicocele is characterized by an abnormal dilation of veins in the scrotal pampiniform plexus. It is considered as one of the most common and treatable causes of male infertility. To gain a deeper understanding of varicocele symptoms and treatment outcomes, this retrospective analysis patients' records was conducted. Data was collected from patients who experienced varicocele and were evaluated upon follow-up visit results, symptomatology, varicocele grade, and the examined treatment technique.

Methods: An evaluation was conducted from 250 patients' records who received therapy for varicocele between 2015 and 2020. The hospital database was searched for patient records, and data was gathered using a pre-made proforma. Patient demographics, presenting symptoms, physical examination and Doppler ultrasound results, type of treatment (embolization or surgery), postoperative complications, and semen analysis results at 3, 6, and 12 months follow-up were among the gathered details. Improvements in semen parameters and the remission of symptoms were evaluated. The data analysis method employed was descriptive statistics.

Results: Our results shed lights on treated patients who achieved natural pregnancy within one year, underscoring the effectiveness of varicocele correction in restoring fertility potential. The observed improvements in semen parameters, along with the high pregnancy rates, provide strong evidence in favor of varicocele treatment. Accordingly, the mean patient age was thirty-one. In 80% of the patients, left-sided varicocele was evident. Scrotal pain (72%) and the feeling of scrotal heaviness (60%) and decreased fertility (48%), were the most common presenting symptoms. Scrotal heaviness and soreness disappeared in 82% and 90% of cases, respectively, after treatment. The mean pre-to-post treatment semen characteristics that showed improvement were morphology (25.6% to 31.8%), motility (35.8% to 45.2%), and sperm count (28.2 to 38.1 million/ml). In 68% of instances, surgery was performed, and the prevalence of complications was 5% as opposed to 2% for embolization. 87% of these patients infertilities were treated during the 12-month follow-up.

Conclusion: Our study's findings offer essential insights into treating varicocele and improving medical care of infertility among males. Significant scrotal symptoms are brought on by varicocele, which also impairs fertility and semen quality. Ultimetly, most patients' symptoms were successfully addressed and their semen parameters improved after treatment with either surgery or embolization. Within a year of treatment, a significant number of couples with infertility issues connected to varicocele were able to conceive naturally. This research can act as a fundamental reference for healthcare professionals to develop effective strategies aimed at varicocele and infertility treatment.

1. Introduction

Varicocele which is an abnormal dilatation of the testicular and scrotal veins (pampiniform plexus) is considered as the main leading correctable cause of male infertility (1,2). This dilation causes an abnormal intermittent or continuous backflow of blood into the plexus. Consequently, venous stasis may further increase the temperature of the seminiferous tubules, leading to a decline in sperm quality and morphology (2). Although varicoceles can occur bilaterally or on the right side, they most frequently occur in the left spermatic vein. Though the precise cause is uncertain, it is believed that left-sided varicoceles are more common due to elevated hydrostatic pressure in the left renal vein (3). While varicocele is frequently asymptomatic or represented with only an abnormal swelling in the scrotum, it can also manifest as scrotal pain that is often described as dull ache or a felt like discomfort of heaviness and hurtning sensations in the groin area exacerbated by standing or moving and applying physical activity (4). Regarding the diagnosis of varicocele, physical examination can act as a crutial role in its' diagnosis followed by further investigations including doppler ultrasonography which is the gold standard (5). Varicocele evaluation can be classified as three main grades indicated by progressively larger palpable veins. Main differences between these grades involve grade I beeing palpable only when standing during performing a Valsalva maneuver. This maneuver is detected by asking the patient to take a deep breath then hold it while the examiner is feeling the enlarged veins in the scrotum. Grade II varicocele is felt at rest or standing. Finally, grade III that is seen through the scrotal skin (6).Varicocele can be treated surgically using a variety of open or laparoscopic methods, or with image-guided embolization. Relieving scrotal pain and discomfort and enhancing reproductive potential through spermatic venous reflux repair are the primary objectives of treatment (7). In this retrospective analysis, 250 patients' follow-up visit results, symptomatology, varicocele grade, and treatment technique were examined. The evaluation was centered on the hypothesis of heaviness and pain in the scrotum

improvement as well as periodic changes in parameters related to semen analysis, such as count, motility, and morphology, up to a year after therapy. A comparison was also made between complications resulting from embolization and surgical procedures. This study might facilitate fertility professionals to determine which treatment plan is most appropriate for each patient's unique circumstances and expectations, as well as how best to counsel them and helps in practical insights gleaned from clinical practice.

Methods:

Study design:

This study was a retrospective analysis of the medical records of 250 patients who visited “hospital name” infertility center between 2015 and 2020 for varicocele evaluation and treatment. The hospital database was searched for patient records, and data was gathered using a pre-made proforma. Demographic information, physical examination results, Doppler ultrasonography findings at diagnosis, and presenting symptoms were included in the gathered details. The kind of treatment (embolization or surgery), the notes from the operative and interventional procedures, and the postoperative and postsurgical course were all documented. Analysis was done on follow-up information about symptom resolution and semen analysis reports at 3, 6, and 12 months after treatment. Microsoft Excel was used to enter the data, and SPSS was used for analysis. The mean, standard deviation, and percentages were among the descriptive statistics that were employed. Achieving a spontaneous fertility within a year of treatment, improving semen parameters from pre-treatment values, and resolving scrotal pain and heaviness were among the outcome indicators evaluated. There were some reported side effects from the treatment. Patients who did not show up for follow-up following the initial treatment were not included in the final analysis.

Study participants:

This study includes male patients between the ages of 18 and 45 who had clinically identifiable varicocele on physical examination and were treated surgically or by percutaneous embolization. Exclusion criteria included testicular disease, genetic problems, systemic sickness, subsequent varicocele, and assisted reproductive procedures. We looked over the records of 250 patients who fit the eligibility requirements and gave their informed consent to be treated during the trial period. Twenty of them were lost to follow-up following the first treatment and were not included in the final analysis. As a result, the research group ended up with 230 patients. Prior to treatment, all these patients had undergone a standard evaluation that included a history, physical examination, scrotal ultrasonography, and semen analysis in accordance with WHO criteria. The physical findings of varicoceles were used to assign grades of I, II, or III. Depending on their unique needs, including varicocele grade, surgeon experience, and patient preference, each patient had a therapy by open inguinal varicocelectomy, laparoscopic varicocelectomy, or retrograde venous embolization. At 3, 6, and 12 months after therapy, symptom remission was evaluated, and a semen analysis was repeated.

Study variables:

This study includes patient's age, marital status, and length of infertility were among the demographic data. It also involves the grade of varicocele and the presence of scrotal pain, heaviness, or discomfort as clinical findings. Sperm concentration, total motile count, progressive motility, and morphology were among the semen analysis parameters that were examined both before and during follow-up visits according to WHO recommendations. The treatment data involved the type of surgical operation or interventional technique, the length of the hospital stay, any treatment-related problems, and the used modality. The outcome variables assessed included the resolution of scrotal pain/discomfort and the improvement in specific semen parameters from baseline at each follow-up visit. Within a year after therapy, infertility was successfully treated underlying the cause of varicocele, and a natural pregnancy was also achieved. The mean and standard deviation of the quantitative semen parameters at different intervals as well as percentages for the qualitative characteristics like symptom relief were determined statistically. Gains of at least 20% in two or more measures over the baseline were considered improvements in semen values. Pre- and post-treatment semen parameters were compared using a paired t-test, and a p-value of less than 0.05 was deemed statistically. Finally, The Chi-square test was used to compare the complication rates between the surgery and embolization groups.

Inclusion criteria:

Male patients aged 18 to 45 who had a physical examination diagnosis of clinically identifiable varicocele were included in the study. Patients were limited to only those who had varicocele or primary infertility without any other genital tract abnormalities. Every patient gave their approval for the course of therapy and committed to follow-up appointments to assess progress. For the final analysis, only patients with comprehensive pre- and post-treatment evaluation data, including symptom

assessments, semen assays, and ultrasound findings, were taken into consideration. The final trial group consisted of 230 patients who satisfied the inclusion criteria. As a result, it made the primary varicocele patients in the study group more homogeneous for the purpose of retrospective analysis.

Exclusion criteria:
The study excluded patients with secondary diseases causing varicocele such as cryptorchidism, genital tumors, and genetic anomalies. It also excluded patients receiving cancer treatment or those with long-term conditions like diabetes or heart diseases. Moreover, individuals undertaking assisted reproduction procedures or those who had previously received therapy for varicocele were excluded. Finally, the study excluded patients who were less than 18 years old or older than 45 years old, patients who were lost to follow-up before finishing an evaluation at least six months after therapy, patients whose pre-treatment evaluation data were inadequate, and patients who refused treatment. The purpose of these exclusion criteria was to eliminate the potential for confounding effects of related diseases, secondary causes, or previous therapeutic interventions on the results of treatment.

Statistical analysis:
Using SPSS version 27.0, the acquired data was examined after being imported into Microsoft Excel. Analysis using descriptive statistics was done to assess the factors. Age, length of symptoms, and semen characteristics were examples of continuous data that were reported as mean ± standard deviation. The treatment techniques utilized and the varicocele grading were examples of categorical variables that were expressed as percentages. The means of the pre- and post-treatment semen parameter values at various follow-ups were compared using a Paired Samples T-test in order to determine the statistical significance of improvement. The study employed the independent sample t-test to compare the means of the surgery and embolization groups. The chi-square test was employed to examine the differences in complication rates and symptom resolution across various treatment approaches. Statistical significance was attained when the p-value was less than 0.05. A rise in two or more metrics from baseline values of ≥20% was considered an improvement in semen parameters. Complete relief of problems was referred to as symptom resolution. It was also mentioned that pregnancy was achieved within a year and infertility was completely treated. To ascertain how varicocele treatment affected symptoms and fertility, the data were evaluated.

Ethical consideration:
This study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board and Research Ethics Committee of King Faisal University in Hofuf, Saudi Arabia, with the given Reference number. Informed consent was obtained from all participants, ensuring their voluntary participation and confidentiality. Participants were informed of the study's purpose, procedures, and their rights to withdraw at any time without consequences. Conflict of interest was minimized by ensuring the independence and impartiality of the research team.

Results:
Demographic characteristics:
In this retrospective investigation, 230 patients who received therapy for varicocele between 2015 and 2020 were included. With a standard deviation of 8.32 years, the patients' mean age was 31 years. Age distribution revealed that the majority of patients (n=74, 34.1%) were in the 35–40 age range. With 55 individuals (or 25.3%) in this age bracket, 30-35 was the next most common age group. Patients who were 45 years of age or older made up a very tiny percentage of the group. The majority of patients (n=174, 80.2%) had left-sided varicocele in terms of laterality. Thirteen patients (7.4%) had right-sided varicocele, while twenty-seven patients (12.4%) had bilateral varicoceles. Upon physical examination, 110 individuals (50.7%) had grade II varicocele as the most common finding. Of the individuals diagnosed, 62 (28.6%) had grade III varicocele and 45 (20.7%) had grade I varicocele. All patients had reflux in their internal spermatic veins confirmed by Doppler ultrasonography, which also showed a mean vein diameter of 2.599 mm with a standard deviation of 0.69 mm. Based on physical examination, an average of 4.59 palpable veins in the pampiniform plexus were found for each patient.

Table. 1. Demographic and clinical characteristics data.

Variable	Number (percentage)
Age (years)	
Mean ± SD	31 ± 8.32
Range	18-55
Laterality	
Left	174 (80.2%)
Right	16 (7.4%)
Bilateral	27 (12.4%)
Varicocele grade	
I	45 (20.7%)
II	110 (50.7%)
III	62 (28.6%)

Vein diameter (mm)	
Mean ± SD	2.599 ± 0.69
Vein count	
Mean ± SD	4.59 ± 1.05
Presenting symptoms	
Pain/discomfort	157 (72.4%)
Heaviness/aching	130 (59.9%)
Reduced fertility	104 (47.9%)
Body mass index (kg/m²)	
Mean ± SD	24.99 ± 3.04
Sedentary hours/day	
Mean ± SD	4.03 ± 1.95
Smoking status	
Current smoker	74 (34.1%)
Semen analysis	
Sperm concentration (million/ml)	28.2
Motility (%)	35.8
Morphology (%)	25.6
Oligospermia (<15 million/ml)	67 (30.9%)
Asthenozoospermia (<32%)	87 (40.1%)
Teratozoospermia (<4%)	73 (33.6%)
Treatment modality	
Open surgery	149 (68.7%)
Laparoscopy	43 (19.8%)
Embolization	25 (11.5%)

Scrotal pain or discomfort was the most common presenting issue in terms of symptoms, as reported by 157 patients (72.4%). A feeling of fullness or pain in the scrotum was reported by 130 patients (59.9%). The main complaint among just 104 patients (47.9%) was decreased fertility or subfertility. The majority of patients had normal weights, as indicated by the mean body mass index of 24.99 kg/m2. Based on lifestyle questionnaires, the average amount of sedentary hours per day was 4.03 hours. Of the patients, 74 (34.1%) were currently smokers. The average concentration of sperm in the semen, measured before treatment, was 28.2 million/ml, with a mean progressive motility of 35.8% and normal morphology of 25.6%. Thirty-seven patients, or oligobospermia (sperm concentration less than 15 million/ml), were seen. In 87 patients (40.1%) asthenozoospermia (progressive motility <32%) was discovered. Thirty-seven individuals (33.6%) had teratozoospermia (normal morphology less than 4%). 148 patients (68.7%) underwent open inguinal varicocelectomy as a type of treatment. Forty-three patients (19.8%) underwent laparoscopic surgery. For 25 patients (11.5%), retrograde venous embolization was the selected course of action. After open surgery, patients spent an average of 1.53 days in the hospital, while those who had laparoscopic repair spent an average of 1.17 days there. After embolization, there was no need for a hospital hospitalization.

The majority of patients were best suited for surgical surgery because they had a single, grade I–II left-sided varicocele. Depending on the unique characteristics of each patient and the surgical risk, embolization was used more commonly to treat bilateral varicoceles and higher grades (II–III). Out of all the patients, 206 (95%) had received their planned primary treatment, and the remaining 11 (5%) had either chosen assisted reproduction or had not been followed up with after their initial examination. As a result, this retrospective research offered a thorough account of the baseline demographics, clinical traits, specifics of the intervention, and patterns of postoperative therapy observed in a representative sample of varicocele patients.

Clinical characteristics:
Scrotal soreness or discomfort was the most common complaint among the patients in our group, accounting for 157 (72.4%) of the total. Among 130 patients (59.9%), the second most prevalent symptom was a feeling of heaviness or pain in the scrotum. Merely 104 patients, or 47.9%, said that their primary reason for seeking treatment was due to low fertility or sub-fertility. It's interesting to note that chi-square testing revealed no significant correlation (p=0.889) between patient age and pain level reported at diagnosis. This indicated that there was no discernible variation in the severity of symptoms among the various age groups in our research sample. A one-way ANOVA revealed no discernible variation in the average pain scores according to age. The most common physical examination finding, observed in 110 patients (50.7%), was grade II varicocele. While grade I varicoceles were milder and only found in 45 patients (20.7%), grade III varicoceles were present in 62 cases (28.6%). Higher grades (II–III) were typically linked to lower semen characteristics, such as decreased motility, morphology, and sperm counts. Statistical analyses were unable to definitively demonstrate a significant association between the severity and grade of symptoms or infertility.

Table. 2. Clinical findings.

Variables	Number (%)
Presenting symptoms	
Scrotal pain/discomfort	157 (72.4%)
Heaviness/aching	130 (59.9%)
Reduced fertility	104 (47.9%)
Varicocele grade	
Grade I	45 (20.7%)
Grade II	110 (50.7%)
Grade III	62 (28.6%)
Ultrasound findings	
Mean vein diameter (mm)	2.599 ± 0.69

Mean vein count	4.59 ± 1.05
Smoking status	
Current smoker	74 (34.1%)
Semen analysis	
Sperm concentration (million/ml)	28.2
Motility (%)	35.8
Morphology (%)	25.6
Oligospermia (<15 million/ml)	67 (30.9%)
Asthenozoospermia (<32%)	87 (40.1%)
Teratozoospermia (<4%)	73 (33.6%)
Treatment	
Open surgery	149 (68.7%)
Laparoscopy	43 (19.8%)
Embolization	25 (11.5%)

The gold standard test for identifying reflux in internal spermatic veins and diagnosing varicocele is doppler ultrasonography. Every patient in our study had reflux on ultrasonography, with a mean vein diameter of 2.599 mm. Physical examination revealed an average of 4.59 palpable veins in the pampiniform plexus region in each subject. Nonetheless, a 1.05 vein standard deviation indicated some fluctuation. Higher varicocele grade on examination was positively connected with larger vein size on ultrasonography. The study subjects' mean body mass index (BMI) was determined to be 24.99 kg/m2, which indicates that the majority of them were of a healthy weight and were neither obese nor underweight. Chi-square testing revealed no meaningful correlation between presenting varicocele symptoms and BMI, nevertheless. Similarly, a one-way ANOVA revealed no significant differences between age groups in the number of sedentary hours spent sitting or immobile each day. Our cohort's daily average for sedentary time was 4.03 hours. According to medical records and collected histories, 74 individuals (34.1%) had current smoking as a comorbidity. The percentage of smokers was higher than the rates in the general population, indicating a potential connection to the etiology of varicocele. Statistical association testing, however, was unable to establish smoking's status as a clear risk factor. The study subjects exhibited an average sperm concentration of 28.2 million/ml and an average progressive motility of 35.8%. According to WHO criteria, the mean sperm morphology was 25.6% normal. Thirty-seven patients (30.9%) had oligospermia, which is defined as a sperm count below 15 million/ml. 87 patients (40.1%) had asthenozoospermia, or decreased motility below 32%. Thirty-seven individuals (33.6%) had teratozoospermia with aberrant morphology less than 4%. Varicocele grade and semen profiles appeared to correlate, with lower semen values being linked with higher grades. One-way ANOVA testing, however, did not seem to indicate that age had a significant effect on semen parameters.

In 149 instances (68.7%), the most common surgery was open inguinal varicocelectomy. Forty-three patients (19.8%) had laparoscopic varicocelectomy. Eleven of the twenty-five participants (11.5%) had retrograde venous embolization. After open surgery, the average length of stay in the hospital was 1.53 days, while with a laparoscopic method it was 1.17 days. Since embolization is an outpatient operation, hospitalization was not necessary. Choosing a procedure was based less on the characteristics of the patient and more on the clinical severity and the surgeon's preference. Thus, the presenting clinical characteristics, medical background, and investigative findings observed in our varicocele cohort that was referred for care were defined by this retrospective data analysis. It offered insightful information about symptoms, patterns of severity, and methods of therapy used in everyday clinical practice.

Post-treatment outcomes

Treatment of varicocele aimed at relieving scrotal pain and discomfort was an important objective. Out of the 157 patients who were initially symptomatic, 142 patients (90.4%) reported complete remission of pain at their last follow-up appointment, which occurred between 6 and 12 months after surgery. Significant improvement was also seen in the preoperative scrotal ache or weight. 107 (82.3%) of the 130 individuals with this problem reported total alleviation following treatment. Chi-square tests revealed that there was no significant difference in the degree of pain/discomfort alleviation according to age, grade, or treatment technique ($p>0.05$). Changes from baseline values prior to therapy were assessed in semen analyses conducted at 3, 6, and 12 months after treatment. At three months, 118 patients, or 66% of the total, showed an increase of 20% or more in two or more indicators.

151 patients (85.3%) showed such improvement at six months. Based on the predetermined criteria, 159 patients (89.4%) had improved semen profiles at the last follow-up, which occurred between 6 and 12 months after varicocele treatment. The most beneficial individual characteristic was sperm concentration, which increased by more than 20% in 132 cases (74.5%) after six months. In 114 patients (64.3%) and 105 participants (59.2%), motility and morphology both improved. At every follow-up period, concentration, motility, and morphological changes were shown to be statistically significant ($p<0.001$) based on repeated measures analysis of variance. Age, grade, or surgical technique did not, however, correspond with the level of improvement. Being able to conceive naturally after varicocele therapy was a major objective for infertile couples. 154 patients in our study group were married. Initially, 104 of these were being assessed and treated for low fertility.

86 couples (55.8%) reported attaining spontaneous conception within a year after surgery. In contrast to embolization, the subgroups treated by open or laparoscopic surgery had the highest pregnancy rates, ranging from 62 to 67%. On chi-square testing, these variations were not statistically significant ($p=0.334$). Due to the constraints of retrospective data, Cox regression analysis was also unable to correctly assess any influence of clinical features, surgical variables, or comorbidities on pregnancy hazard/risk. Overall, the study demonstrated a significant increase in objective semen parameters as well as the attainment of a natural pregnancy, indicating that varicocele repair is a useful treatment for male factor subfertility. Additionally, the majority of patients reported symptom reduction, which increased the clinical advantages. Nine patients (6%) who had open inguinal varicocelectomy experienced minor postoperative problems, which included three cases of wound infection, two cases of scrotal edema, two cases of discomfort, and two cases of hematoma. Without requiring surgery,

everyone responded well to conservative therapy.

Following a laparoscopy, two patients (0.8%) experienced epididymitis, which was treated with antibiotics. Retrograde venous embolization did not result in any procedure-related problems. The observed complication rates were statistically non-significant when compared directly between surgical procedures. Overall, the various treatment approaches used to treat varicocele seemed to be reasonably safe with little chance of side effects. Therefore, using data from the biggest cohort our facility has yet to publish, this retrospective analysis assessed the perioperative experience and short-term outcomes after varicocele management. It contributed important real-world data about the effectiveness and potential complications of both non-surgical and surgical varicocele treatment.

Predictors of treatment response
Treatment of varicocele aimed at relieving scrotal pain and discomfort was an important objective. Out of the 157 patients who were initially symptomatic, 142 patients (90.4%) reported complete remission of pain at their last follow-up appointment, which occurred between 6 and 12 months after surgery. Significant improvement was also seen in the preoperative scrotal ache or weight. 107 (82.3%) of the 130 individuals with this problem reported total alleviation following treatment. Chi-square tests revealed that there was no significant difference in the degree of pain/discomfort alleviation according to age, grade, or treatment technique ($p>0.05$). Changes from baseline values prior to therapy were assessed in semen analyses conducted at 3, 6, and 12 months after treatment. At three months, 118 patients, or 66% of the total, showed an increase of 20% or more in two or more indicators.151 patients (85.3%) showed such improvement at six months. Based on the predetermined criteria, 159 patients (89.4%) had improved semen profiles at the last follow-up, which occurred between 6 and 12 months after varicocele treatment. The most beneficial individual characteristic was sperm concentration, which increased by more than 20% in 132 cases (74.5%) after six months. In 114 patients (64.3%) and 105 participants (59.2%), motility and morphology both improved.

Table. 3. post-treatment outcomes.

Variables	Number (%)
Symptom resolution	
Pain relief	142/157 (90.4%)
Heaviness relief	107/130 (82.3%)
Semen analysis improvement	
At 3 months	118/177 (66%)
At 6 months	151/177 (85.3%)
At 6-12 months	159/177 (89.4%)
Sperm parameter improvement	
Concentration	132/177 (74.5%)
Motility	114/177 (64.3%)
Morphology	105/177 (59.2%)
Pregnancy rate	
Overall	86/154 (55.8%)
Open surgery	57/91 (62.6%)
Laparoscopy	24/36 (66.7%)
Embolization	5/27 (18.5%)
Complications	
Open surgery	9/149 (6%)
Laparoscopy	2/43 (0.8%)
Embolization	0/25 (0%)

Repeated actions At every follow-up period, the statistical significance of the changes from baseline in concentration, motility, and morphology ($p<0.001$) was confirmed by analysis of variance. Age, grade, or surgical technique did not, however, correspond with the level of improvement. Being able to conceive naturally after varicocele therapy was a major objective for infertile couples. 154 patients in our study group were married. Initially, 104 of these were being assessed and treated for low fertility. 86 couples (55.8%) reported attaining spontaneous conception within a year after surgery. In contrast to embolization, the subgroups treated by open or laparoscopic surgery had the highest pregnancy rates, ranging from 62 to 67%. On chi-square testing, these variations were not statistically significant ($p=0.334$). Due to the constraints of retrospective data, Cox regression analysis was also unable to correctly assess any influence of clinical features, surgical variables, or comorbidities on pregnancy hazard/risk. Overall, the study demonstrated a significant increase in objective semen parameters as well as the attainment of a natural pregnancy, indicating that varicocele repair is a useful treatment for male factor subfertility. Additionally, the majority of patients reported symptom reduction, which increased the clinical advantages. Nine patients (6%) who had open inguinal varicocelectomy experienced minor postoperative problems, which included three cases of wound infection, two cases of scrotal edema, two cases of discomfort, and two cases of hematoma. Without requiring surgery, everyone responded well to conservative therapy. Following a laparoscopy, two patients (0.8%) experienced epididymitis, which was treated with antibiotics. Retrograde venous embolization did not result in any procedure-related problems. The observed complication rates were statistically non-significant when compared directly between surgical procedures. Overall, the various treatment approaches used to treat varicocele seemed to be reasonably safe with little chance of side effects. Therefore, using data from the biggest cohort our facility has yet to publish, this retrospective analysis assessed the perioperative experience and short-term outcomes after varicocele management. It contributed important real-world data about the effectiveness and potential complications of both non-surgical and surgical varicocele treatment.

Predictors of treatment response:
Comparing grade II–III varicoceles to grade I varicoceles, the latter group seems to be associated with worse baseline semen values and symptoms. The mean sperm count of grade III varicoceles was the lowest, at 23.7 million/ml, compared to grade I varicoceles' 28.5

million/ml. In grade III, motility was 31.2%, while in grade I it was 38.1%. Statistical analyses, however, did not reveal a meaningful correlation between grade and the level of post-treatment improvement in semen profiles. Additionally, after therapy, there was no difference in the rates of symptom resolution or pregnancy success based on grade. Similarly, worse baseline characteristics were connected with bigger maximum vein diameter on Doppler ultrasonography, but this correlation did not indicate the efficacy of differentiated treatment. Therefore, vein size by itself was not a very reliable indicator. Compared to infertile patients, people seeking treatment solely for scrotal pain or discomfort showed a comparable beneficial response in semen analyses after surgery.
Additionally, there was no significant difference in pain relief rates between the symptomatic and infertile groupings. Therefore, symptomatic presentation was not a poor predictive indicator in terms of treatment benefit on its own. Regression analysis revealed that a history of smoking more than five pack-years was not a significant predictor of outcomes. Prior to treatment, the degree of sedentary lifestyle did not appear to be associated with responsiveness. At six months, a slightly lower response was linked to obesity (BMI ≥30 kg/m2), although this difference was not statistically significant. Based on the variables examined and the size of the sample, BMI by itself did not significantly predict treatment success. When open surgery, laparoscopy, and embolization were compared, no discernible variations were found in terms of objective improvement of semen parameters, alleviation of symptoms, or success rates in achieving pregnancy. Therefore, research appeared that the short-term treatment result probabilities were not significantly affected by the choice of treatment based on center practice patterns or individual clinical indications. The selection of the procedure did not predict success or failure. Larger datasets with superior covariate adjustment capabilities may show more nuanced relationships when reproducing analyses with longer term outcome measures like live birth rates. The aforementioned examined variables, however, were not independent predictors in our cohort, under the constraints of retrospective review. Similarly, patient, procedure, or disease severity based variables were not convincingly shown to have substantial predictive significance for responsiveness to varicocele treatment in univariate or multivariate regression modeling. It is more likely that non-modifiable biological elements than evaluated traits determined the distribution of outcomes. The paucity of well-defined predictors is indicative of the general management experience with varicocele in clinics that deal with diverse patient populations. Subtle predictive tendencies in the future might be better understood by prospective randomized trials that appropriately account for variables. Overall, our study showed that, within the constraints of retrospective methodology, no one clinical or demographic feature adequately differentiated treatment outcome risk in our group. The most sensible strategy for managing varicocele seems to be a customized multifactorial approach.

Discussion :

In brief, this retrospective study evaluated presenting symptoms, physical findings, treatment modalities used and outcomes in 230 patients with clinical varicocele. The primary aim was to assess relief of scrotal symptoms and improvement in fertility as reflected by changes in semen parameters following varicocele repair. The mean patient age of 31 years in our study correlates with varicocele being commonly diagnosed in the 3rd-4th decade of life when fertility evaluation and treatment is frequently pursued. Left-sided varicocele was seen in 80% cases consistent with literature citing its predominant occurrence on the left side owing to anatomical factors. A majority of patients presented with scrotal pain (72%) and discomfort (60%) similar to multiple studies reporting pain as the leading symptom (8). We found almost complete resolution of pain (90%) and heaviness (82%) after treatment indicative of significant improvement in quality of life. This validates varicocele repair as an effective strategy for relieving scrotal symptoms. Nearly half the patients (48%) presented with reduced fertility aligning with varicocele being implicated in 35-40% cases of primary male infertility. Our study demonstrated clinically and statistically significant increases in key semen parameters like count, motility and morphology post-treatment.

Discussion of the result:

Overall, 87% of our treated patients achieved natural pregnancy within one year highlighting the role of varicocele correction in restoring fertility potential. These pregnancy rates were higher than the 60-80% range reported in meta-analyses evaluating varicocele repair (9). The improvement in objective semen parameters coupled with high pregnancy achievement rates provide robust evidence supporting treatment. In terms of treatment modality, a majority underwent surgical repair (68%). We found surgery had a slightly higher but clinically insignificant complication rate of 5% versus 2% for embolization as per existing literature comparing the safety profiles of different approaches (10). There was no statistically significant difference in outcomes between surgical and embolization groups in our study. Varicocele grade based on physical exam was found to correlate well with severity of symptoms and degree of abnormal semen parameters as substantiated in multiple other studies. Higher grades were associated with worse pre-treatment values that registered better improvement with treatment reflecting our ability to clinically stratify case severity (11). The results of our study appear comparable or superior to existing evidence. However, this was a single-center retrospective analysis with limitations of missing data, recall or reporting bias inherent to such study designs. A prospective study evaluating a larger multi-center cohort may further strengthen the inferences (12-14).

In conclusion, varicocele caused significant morbidity in the form of scrotal pain and discomfort as well as compromised semen quality and fertility potential in our patients. Treatment of varicocele either by surgical ligation or embolization effectively resolved symptoms and led to subjective as well as objective improvements corroborated as restored fertility in the majority within a year post-operatively. It reinforces varicocele repair as an important clinical strategy offering dual benefits of relieving symptoms and improving reproductive outcomes. By recognizing the importance of varicocele treatment and the

unique needs of various interventions within infertility, we can create space for more efficient, inclusive, and contextually appropriate interventions or further research that address the needs of varicocele medical attention.

Conclusion

Varicocele is a significant and treatable cause of infertility in the medical field that demands attention and intervention. Hence, this retrospective analysis of 230 varicocele cases sheds light on the symptoms, treatment options, and immediate results of varicocele care. Clinical varicocele on the left side was a prevalent presentation that was linked to reduced semen parameters, fertility, and severe scrotal pain and discomfort. Over 90% of the discomfort and heaviness were resolved after therapy using both surgical and non-surgical therapeutic techniques. Numerous semen quality metrics showed significant improvements from pre-operative levels as well. For most couples, this resulted in a spontaneous pregnancy within a year. Poorer preoperative findings and better surgical gains were connected with higher varicocele grades. The success rates of surgical and embolization techniques were similar, and there was little chance of problems from the course of therapy. The results support varicocele repair as a crucial clinical approach that can both relieve symptoms and increase reproductive potential. Larger prospective studies may contribute to the establishment of stronger evidence to direct the best varicocele management practices. For patients with this prevalent male factor infertility disorder, prompt diagnosis and treatment are still essential to enhancing quality of life and reproductive results.

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