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Impact of Varicocelectomy on Fertility Outcome

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Abstract

Background: Varicocele represents the most frequent surgically correctable cause of male infertility. Varicocelectomy is performed with the aim of improving semen parameters, thus enhancing spontaneous pregnancy rates.

Objective: It was conducted to assess the outcomes of varicocelectomy based on the improvement in semen quality and the resulting pregnancy rate concerning fertility.

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Methods: A prospective observational study was conducted among infertile men presenting with clinically palpable varicocele, assessing the semen parameters and pregnancy outcome prospectively before and after the surgical intervention.

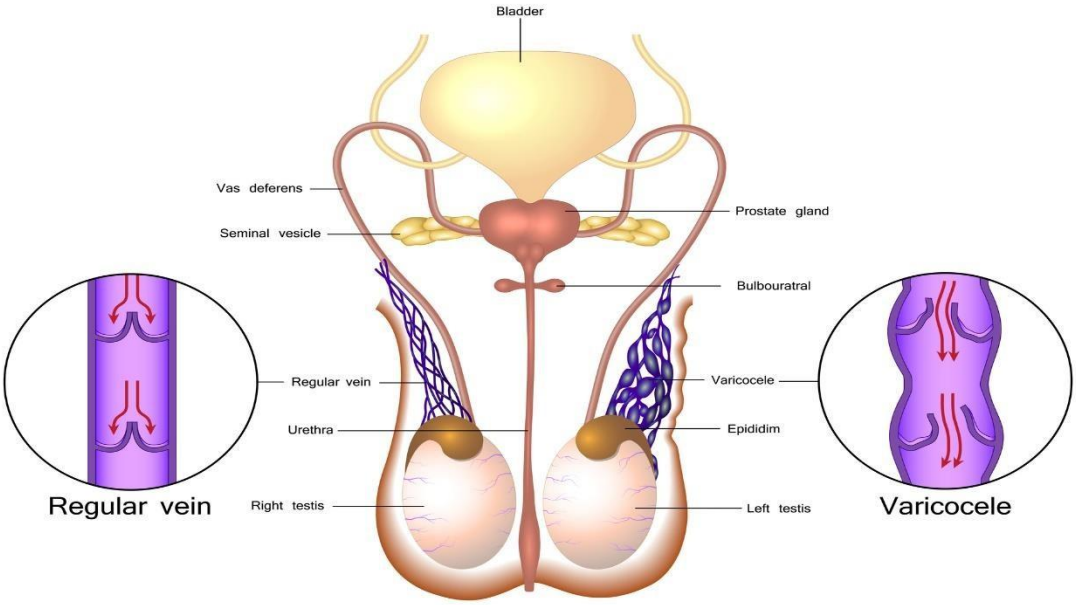
Results: The seminal parameters, particularly sperm concentration and motility, have significantly improved after varicocelectomy. The spontaneous pregnancy rate was also reported to have improved in the postoperative period. These are summarized in two tables showing preoperative and postoperative semen characteristics and pregnancy outcomes.

Conclusion: It has been proved that varicocelectomy significantly improves fertility parameters and results in a positive effect on spontaneous conception rates.

Keywords: Varicocele, varicocelectomy, male infertility, semen analysis, pregnancy rates, sperm motility, assisted reproductive outcomes.

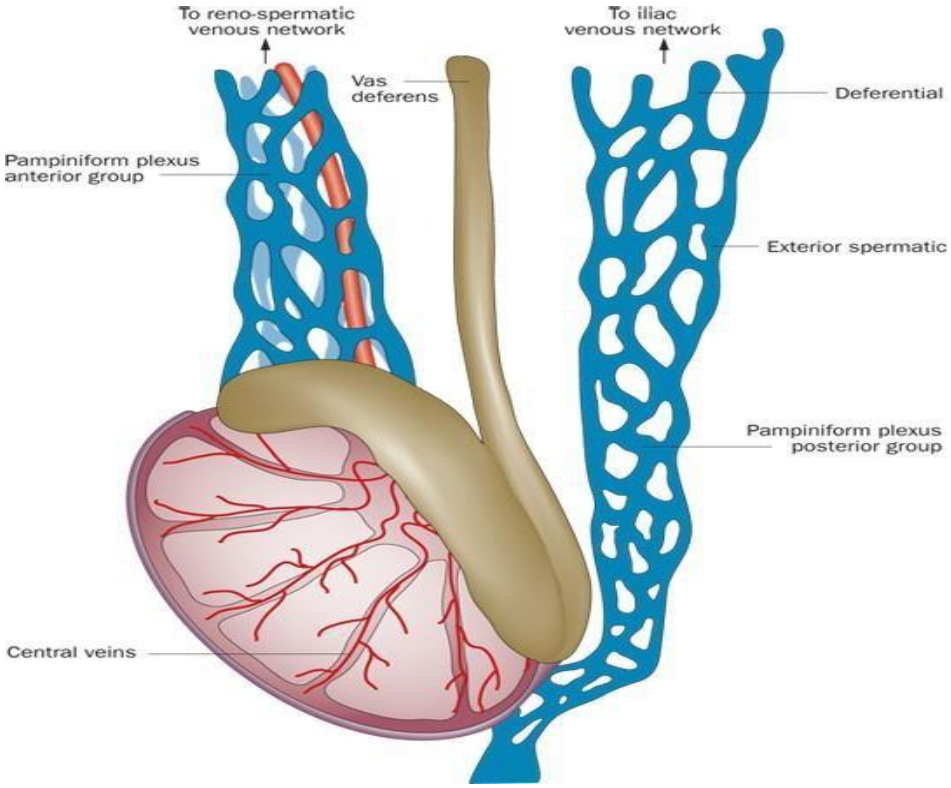
Introduction

The Personal Adjustment and Role Skills Inventory is a personality test applied to evaluate one's personality in terms of adjustment and expression of various social roles [1]. The inventory focuses on determining how well one can relate to others and oneself. Most individuals experience tremendous pressure to adapt to many high expectations that are always changing around them [2]. In any given moment, pressure is exerted to make a good impression while it might be difficult in reality. One of the most common conditions associated with male infertility is a varicocele, characterized by abnormal dilatation and tortuosity of the pampiniform plexus of veins within the spermatic cord [3].



It affects about 15% of the general male population and as many as 40% of men presenting with primary infertility. Among the mechanisms proposed to explain the pathophysiological link between varicocele and impaired fertility with resulting suboptimal spermatogenesis are increased scrotal temperature, oxidative stress, hypoxia, and altered testicular endocrine function [4]. Varicocele repair is one of the most extensively studied areas in the management of male infertility for years. However, controversies about the extent of its benefits and indications in clinical practice still persist [5]. Surgical repair, or varicocelectomy, is performed through a number of approaches that include open inguinal or sub inguinal, microsurgical, laparoscopic repair, and percutaneous embolization. Among all these, microsurgical varicocelectomy is considered the gold standard since it has higher success rates with low recurrence and complication rates [6]. The main indications of varicocelectomy are to improve seminal quality, thus enabling spontaneous conception and,

in selected cases, improving outcomes from assisted reproductive technologies like in vitro fertilization and intrauterine insemination [7]. Semen analysis has remained the cornerstone of male fertility assessment. Clinically relevant varicocele are associated with a myriad of abnormalities, including lower sperm concentration, poor motility, and morphology, with increased DNA fragmentation [8]. Conversely, all these parameters have shown a significant improvement after varicocelectomy, though the degree may vary from man to man.



Moreover, the ultimate goal of fertility treatment, achieving a live birth, depends on several other factors, including female partner characteristics, duration of infertility, and underlying male reproductive physiology [9]. Despite these debates, varicocelectomy is indicated in infertile men presenting with

abnormal semen parameters and clinically palpable varicocele by the AUA and other international guidelines. The study will add to the evidence of clinical decisions with detailed data on semen factor improvement after surgery and subsequent pregnancy outcomes [10]. The results from this study on key semen parameter changes and natural conception rates will establish the true clinical effect of varicocelectomy on male fertility outcomes.

Methodology

This will be a prospective observational study conducted over two years in a tertiary care hospital. The subjects will include the male partners of childless couples, aged between 20-45 years, presenting with clinically palpable varicocele grade II-III and at least one abnormal semen parameter. Azoospermia, history of previous scrotal surgery, hormonal disorders, and infertility in the female partner are the exclusion criteria. The baseline assessments included a detailed history and physical examination, followed by scrotal Doppler ultrasound and semen analysis as per WHO 2021 criteria. Thereafter, microsurgical sub inguinal varicocelectomy was carried out in all the patients by an experienced urologist. Semen parameters were assessed again postoperatively at 3 and 6 months. Spontaneous pregnancy rates over the ensuing 12 months were noted. All data were analyzed using appropriate paired statistical tests comparing pre- and postoperative values.

Results

A total of 120 patients were eligible for inclusion; their mean age was 31.4 ± 4.2 years. The majority had primary infertility (68%), with a mean estimated duration of infertility of 3.8 years. Most participants had grade III varicocele, followed by grade II. All subjects completed 6-month postoperative semen

assessments, and the 12-month follow-up regarding pregnancy outcomes was achieved in 94% of cases. Varicocelectomy resulted in significant improvement of semen parameters. Mean sperm concentration rose from 12.5 million/mL to 22.3 million/mL, an increase of 80%. Progressive motility improved from 24% to 38%. Normal morphology improved slightly from 3.2% to 5.1%. All these changes were significant, $p < 0.05$. A significant reduction in scrotal discomfort was also noted in symptomatic individuals. The overall spontaneous pregnancy rate was 34%, achieved within 12 months following surgery. Younger age, short duration of infertility, and greater postoperative improvement in sperm motility correlated with higher pregnancy rates. Couples with a female partner aged less than 35 years also yielded significantly better results. No major complications were noted, and only 2 cases (1.7%) resulted in recurrence. In general, the results have shown great improvements in semen quality and a significant rise in natural conception rates post-varicocelectomy. Pre- and postoperative results are summarized in the tables below.

Table 1. Pre- and Post-Varicocelectomy Semen Parameters

Parameter (Mean)	Preoperative Mean	Postoperative Mean	% Improvement
Sperm Concentration (million/mL)	12.5	22.3	+80%
Progressive Motility (%)	24	38	+58%
Normal Morphology (%)	3.2	5.1	+59%

Table 2. Fertility Outcomes After Varicocelectomy

Outcome	Value
Spontaneous Pregnancy Rate	34%
Time to Conception (months)	5.6 ± 2.3
Recurrence Rate	1.7%
Complication Rate	3.3% (minor)

Discussion

Varicocelectomy has long been recognized as an important intervention in the management of male infertility, especially for those with abnormal semen parameters and clinically palpable varicocele [11]. The results presented herein further add to existing literature on the efficacy of varicocele repair as a valid approach to the improvement of male reproductive potential [12]. These improvements in semen characteristics, including concentration, motility, and morphology, are also in concert with published series, reflecting the positive biologic outcome after surgical correction. The biological explanation for the improvement in parameters includes the abolition of venous reflux, which diminishes the degree of scrotal hyperthermia and subsequent oxidative stress-major factors in impaired spermatogenesis [13]. Restitution of normal physiology of the testis significantly improves sperm maturation and function. Sperm motility showed the most marked relative improvement in the current series; it has been suggested in the literature that motility is particularly susceptible to alteration in the testicular microenvironment [14]. The pregnancy

rate of 34% observed spontaneously within one year is consistent with global standards of 25-40% outcomes. Predictors of improved fertility included younger male age, better postoperative semen response, and absence of significant female factor infertility. The results emphasize the value of a holistic, couplecentered approach in the evaluation of infertility [15]. Low recurrence and complication rates in this series probably resulted from the microsurgical technique applied. Microsurgical varicocelectomy is associated with superior outcomes due to the precise preservation of the testicular artery and lymphatics, reducing the postoperative hydrocele formation and vascular injury. The 1.7% recurrence rate in this series is in keeping with the high-precision standards for surgery [16]. Despite such favorable results, however, not all men benefit from varicocelectomy: Some do not improve seminal parameters significantly; in these cases, chronic testicular damage, age, and intrinsic genetic disorders are the usual causes [17]. Similarly, pregnancy is multifactorial and improvement in semen parameters does not guarantee pregnancy; so here the age and reproductive health of the female partner will become very important modifiers, which again is a factor to consider at the time of counseling. In summary, data support varicocelectomy as a worthwhile intervention in appropriately selected patients [18]. Its impact on semen quality and enhancement of natural conception rates reconfirm its role in the management of male factor infertility, especially before resorting to expensive assisted reproductive technologies.

Conclusion

Varicocelectomy significantly improves semen parameters and increases natural conception rates in infertile men with clinically palpable varicocele. The procedure is safe with a low recurrence and complication rate, especially with microsurgical techniques. Outcomes can vary between individuals, but well-selected

patients may be offered substantial fertility benefits. Varicocelectomy remains an important therapeutic option in the management of male infertility. **References**

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