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"Effect of Varicocele Surgery on Sperm Quality"

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Abstract

Introduction: A varicocele is a vascular lesion characterized by dilatation and tortuosity of the veins of pampiniform plexus. Varicocele is found in approximately 15% to 20% of adult male population and is the most common cause of treatable fertility.

Physical examination may or may not show a palpable varicocele, most of the times varicoceles are diagnosed only when patients present with infertility or adolescents during a physical examination.

Varicoceles are associated with various deleterious effects on testes like testicular hypotrophy, impairment in spermatogenesis mainly in form of low or absent count, decreased sperm motility and abnormal sperm morphology. Oxidative stress, scrotal hyperthermia, hormonal disturbances, testicular hypoperfusion, hypoxia and backflow of toxic metabolites are potential mediators of varicocele mediated infertility of which oxidative stress has been implicated as the central mediator of varicocele-associated infertility.

Treatment for varicocele includes medical therapies, radiological embolization, and surgical techniques. Medical therapy, including antioxidants and anti-inflammatory agents have been utilized to treat symptomatic men with varicocele and infertility in men with varicocele with variable success.

A definitive conclusion of indication of medical treatment cannot be drawn at the present time because most published studies have inadequate design and lack controls. Radiological embolization of varicocele is newer technique in treatment of varicocele, but it is associated with high recurrences and high cost. Varicoceles are surgically treated either by open or laparoscopic approaches. The principle aim of the surgery is the occlusion of the dilated veins of the pampiniform plexus.

Various studies in the past have concluded significant change in sperm parameters (total count, motility, morphology) post varicocele repair. Natural pregnancy rates after varicocelectomy when female factors are excluded, are approximately 44.1% at 1 year follow-up. However, few other studies suggest no improvement in sperm parameters following surgical varicocele repair and studies that conclude recommendations against repair of varicocele.

Thus, conflicting opinion have opened scope to establish this fact by this study.

Aim: To evaluate changes in sperm morphology, sperm count, sperm motility in a patient with varicocele after varicocele surgery.

Materials and Method: Study conducted in the Department of Surgery, North Delhi Municipal Corporation Medical College & Hindu Rao Hospital, Delhi, India from August 2019 to February 2021. Sample size was calculated to be 50 using Slovin's formula with a confidence level of 95% with margin error taken as 5% (p value 0.05).

Sperm morphology, sperm count, sperm motility were the parameters studied before and after 3 months of surgery.

Results: Majority of patients belonged to age group of 18 to 25 years (42%) followed by 26 to 35 years (40%) (27.78 ± 6.547 years.)

Left sided varicocele was more common (54%), followed by bilateral varicocele (42%) Varicocele grade II was most common (58%) followed by grade I (30%) and lastly grade III (12%).

Total sperm count improved by 8.88 million per ml after varicocelectomy. Total sperm motility improved by 6.08% after the surgery. Total normal sperm forms improved by 6.44% after varicocele repair.

Conclusion: Based on above findings it was conclude that Varicocelectomy results in significant improvement in total sperm count, total sperm motility and total normal sperm morphology.

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Best improvement was seen in sperm count followed by total normal sperm forms and lastly total sperm motility.

Keywords: Varicocele; Infertility; Sperm quality; Surgery

Introduction

A varicocele is a vascular lesion caused by dilatation and tortuosity of the veins of pampiniform plexus1. Varicocele is found in approximately 15% to 20% of adult male population and is the most common cause of treatable fertility [1]. Varicocele is rarely seen in pre-adolescent group in which its incidence is 0.92% [2].

Patient with varicocele usually presents with scrotal pain; worm like swelling in the scrotum and male infertility. Physical examination may or may not show a palpable varicocele, most of the times varicoceles are diagnosed only when patients present with infertility or adolescents during a physical examination [3].

Varicoceles are associated with various deleterious effects on testes like testicular hypotrophy, impairment in spermatogenesis mainly in form of low or absent count, decreased sperm motility and abnormal sperm morphology [4]. Oxidative stress, scrotal hyperthermia, hormonal disturbances, testicular hypoperfusion, hypoxia and backflow of toxic metabolites are potential mediators of varicocele mediated infertility of which oxidative stress has been implicated as the central mediator of varicocele-associated infertility [5].

Color Doppler Ultrasound study is the primary modality for diagnosing varicocele. Invasive techniques such as spermatic venography to diagnose varicocele has now become obsolete. Thermography has also been used to diagnose varicocele and has a higher sensitivity and specificity but is comparatively costlier.

Treatment for varicocele includes medical therapies, radiological embolization, and surgical techniques. Medical therapy, including antioxidants and anti-inflammatory agents have been utilized to treat symptomatic men with varicocele and infertility in men with varicocele with variable success [6].

1. Varicoceles are surgically treated either by open or laparoscopic approaches. The principle aim of surgery is the occlusion of the dilated veins of the pampiniform plexus. Open surgery is by following approaches:Palomo's operation: Supra-inguinal extraperitoneal ligation of the testicular vein.

2. Inguinal approach (Ivanissevich approach)

3. Subinguinal approach (Marc-Goldstein) is subinguinal approach at superficial inguinal ring outside the external oblique aponeurosis without opening the external oblique aponeurosis and is most commonly performed.

4. Scrotal approach – Chances of leaving behind a few veins is high

5. Laparoscopic approach: Presently accepted, good approach.

Various studies in the past have concluded significant changes in sperm parameters (total count, motility, morphology) post varicocele repair. Natural pregnancy rates after varicocelectomy when female factors are excluded, are approximately 44.1% at 1 year follow-up [7]. However, few other studies suggest no improvement in sperm parameters following surgical varicocele repair and studies that conclude recommendations against repair of varicocele [8,9].

Thus, conflicting opinions have opened scope to establish this fact, so the aim of this study is to evaluate changes in sperm morphology, sperm count, sperm motility in a patient with varicocele after varicocele surgery [10].

Materials and Method

Study conducted in the Department of Surgery, North Delhi Municipal Corporation Medical College & Hindu Rao Hospital, Delhi, India from August 2019 to February 2021. Sample size was calculated to be 50 using Slovin's formula with a confidence level of 95% with margin error taken as 5% (p value 0.05).

Sperm morphology, sperm count, sperm motility were the parameters studied before and after 3 months of surgery.

Results

42% of the patients were in the age group of 18 to 35 years with a mean presentation at 27.78 years. 96% of varicoceles were either left sided or bilateral. Majority 58% of varicoceles were of Grade II or Grade I (Table 1 for grading).

Even though most patients (54%) had a near normal sperm count between 20 and 35 million per ml. mean pre-operative total sperm count being 24.16 ± 22.90 million per ml the quality of sperm was poor in most cases. Preoperative mean motility was 38.18 ± 10.85%. While the mean normal sperm morphology assessed preoperatively was 40.26 ± 7.46%.

Post-surgery the mean total sperm count rose to 33.04 ± 23.34 million per ml while mean total sperm motility assessed postoperatively was 44.26 ± 10.64%. The mean normal sperm morphology assessed postoperatively rose to 46.7 ± 6.91%. The p value of comparison of pre-operative and post-operative sperm quality calculated with the help of Chi-square test is <0.001 showing significant improvement in over-all quality of sperms in cases of varicocele after surgery.

Discussion

This prospective analytical study done on 50 patients of infertility with varicocele and with abnormal sperm count and quality were taken up for varicocelectomy. The results as compared to other studies are as: (Table 3).

This difference in total count, motility and morphology after surgery may be attributed to improvement in the pathophysiologic mediators in varicocele that cause reduced sperm count.

Conclusion

Based on above findings we conclude that Varicocelectomy results in significant improvement in total sperm count, total sperm motility and total normal sperm morphology in case of male infertility.

Best improvement was seen in sperm count followed by total normal sperm forms and lastly total sperm motility.

Why motility showed least improvement cannot be deduced but even this improvement is clinically significant.

However limited follow-up of up to 3 months was a limitation as some patients may show improvements up to 12 months or even

Table 1: Grades of Varicocele [11].

Grade 1	Detection of prolonged reflux in vessels only during Valsalva's maneuver.
Grade 2	Nondilated veins while supine. When standing dilated veins reach the upper pole of the testicle. Reflux to upper pole veins only while performing a Valsalva maneuver.
Grade 3	Nondilated veins while supine. When standing dilated veins reach the lower pole of the testicle. Reflux to lower pole veins only while performing a Valsalva maneuver.
Grade 4	Dilated veins while supine with reflux while performing a Valsalva maneuver.
Grade 5	Dilated veins that reflux without performing a Valsalva maneuver.

Table 2: Semen analysis cut-off reference values published by WHO (2010) [12] is as follows:

Volume	The reference limit is 1.5 ml.
Sperm Count	The reference limit taken normal above 15 × 10^6/ml.
Total sperm count	The reference limit taken normal above 39 × 10^6/ml.
Total Motility	Normal reference taken as more than 40%
Total progressive motility	Normal reference taken as more than 32% [12]
Vitality	Normal reference taken as 58% alive.
Morphology	Normal reference is 4% of normal forms.
Leucocyte count	Normal reference taken as less than 1.0 × 10^6/ml.

Table 3: The results as compared to other studies are as:

Study	Year of study	Sample size	Preoperative sperm count (Mean) in million per ml	Postoperative sperm count (Mean) in million per ml
Dhabuwala et al.	1992	38	33.8	58.6
Cayan et al.	2000	232	30.97	34.57
Kamal et al.	2001	159	22.5	29.9
Kibar et al.	2002	90	22.1	38.3
Hseih et al.	2003	96	26.2	42.78
Our study			24.16	33.04
Study	**Year of study**	**Sample size**	**Preoperative sperm motility (Mean)**	**Postoperative sperm motility (Mean)**
Goldstein et al.	1992	429	39.62%	45.66%
Cayan et al.	2000	232	29.70%	36.62%
Hseih et al.	2003	96	31.86%	47.62%
Zini et al.	2005	37	34.60%	38.40%
Our Study			38.18%	44.26%
Study	**Year of study**	**Sample size**	**Preoperative sperm normal morphology (Mean)**	**Postoperative sperm normal morphology (Mean)**
Dhabuwala et al.	1992	38	36.10%	40.30%
Goldstein et al.	1992	429	48.42%	52.10%
Zini et al.	1999	30	46.40%	54.40%
Hseih et al.	2003	96	62.30%	64.68%
Our Study			40.26%	46.70%

more. Also, outcome in terms of natural pregnancy rates following surgery was not assessed.

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