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ASSOCIATION BETWEEN VARICOCELE GRADE, REFLUX, AND DIAMETER: A RETROSPECTIVE ANALYSIS

Microbiology

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ABSTRACT

Varicocele, characterized by the dilation of veins within the scrotum, is a common condition affecting male fertility. This retrospective analysis examines the relationship between varicocele grade, reflux presence, and vein diameter. Data were collected from [insert source] and included 47 observations. Varicocele grade, reflux presence, and vein diameter were analysed for their associations. Results revealed varying mean diameters across different grades and reflux statuses. Grade 3 varicoceles exhibited the largest mean diameter, while reflux presence was associated with increased diameter. These findings underscore the complex interplay between varicocele characteristics and provide insights for clinical assessment and management strategies.

KEYWORDS

Varicocele Grade, Reflux Presence, Vein Diameter, Hemodynamic

INTRODUCTION

A varicocele is defined as an abnormal dilation and tortuosity of the pampiniform plexus venous system that drains the testis. The prevalence of varicocele in the adolescent population has been shown to mirror that of adults. (1)

The prevalence of varicocele in prepubescent boys younger than 10 years of age was much lower at <1%. In 2000, Akbay and colleagues reported a 0.8% prevalence in boys aged 2–6 years, 1.0% at 7–10 years, 7.8% at 11–14 years, and 14.1% at 15–19 years (2)

Varicoceles can have a negative impact on spermatogenesis through multiple pathways, thus resulting in a progressive decline in male fertility. The abnormalities of semen quality in infertile men with varicocele are variable ranging from oligozoospermia to complete azoospermia (3)

It is now accepted that oxidative stress (OS) is a central and common pathogenic mediator of testicular damage in varicocele, and that the exposure to scrotal heat, hypoxia, and toxic adrenal and renal metabolites enhances the generation of reactive oxygen species (ROS) (4)

Potential genetic predisposition factors and a decreased ability to fight against the effects of seminal OS have also been described to explain clinical variations of varicocele impact on sperm parameters and fertility (5,6)

Studies related to varicoceles have shown an increasing trend over the last few decades based on a scient metric analysis by Agarwal et al (7)

Around 2000 original articles have been published to explore the relationship of varicoceles with male fertility. While the diagnosis, treatment, and prognostic aspects are mainly studied, a limited number of articles address epidemiology and pathophysiology of varicoceles. (8)

Understanding whether the alleged correlation between impaired spermatogenesis, infertility and varicocele is evidence based is fundamental in making a recommendation for US as a valuable investigation in infertile patients. Infertility is defined as "failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse (9)

Approximately 15% of couples do not achieve a pregnancy within the first year, although almost half of them will do so in the second year. Up to 12% of men have fertility problems, and when a specific cause for infertility can be identified, a male contributing factor is found in approximately 45–50% of cases (10)

Varicocele is the most commonly identifiable and treatable potential cause of male subfertility, with an estimated prevalence of 15% in the general population, 40% in sub-fertile men, and 75–81% in men with secondary infertility (11,12)

Clinically, varicoceles reduce sperm quantity and quality, slow testicular development in adolescents, cause dull discomfort and pain, and decrease testosterone levels (13,14)

While prior studies have identified numerous anatomic, genetic, and molecular contributors to varicoceles, the true factors underlying the development of male varicoceles remain largely unknown (15)

Furthermore, the molecular underpinnings predisposing only a subset of men to pathological changes continue to evolve and have increasing relevance for clinical management (16)
The next-generation omics advances (proteomics, transcriptomics, epigenomics, etc.) have begun to provide insight into understanding the pathophysiology of infertility associated with varicoceles (17)

These studies have identified numerous molecular changes in men with varicoceles, including regional hypomethylation or reduced expression of spermatogenesis-related proteins, which may reduce sperm viability and negatively impact fertility (18)

There is clear and compelling evidence from multiple studies and meta-analyses that surgical repair of clinically significant varicoceles in infertile males with abnormal semen parameters can significantly improve sperm counts, motility, morphology, and pregnancy rates (19,20)

Varicocele

Although common in the general population and often asymptomatic, varicoceles are associated with gonadal dysfunction including testicular atrophy, infertility, and hypogonadism in a subset of men diagnosed later in life. Varicoceles have detrimental effects on semen quality, sperm function, and pregnancy outcomes in some men. Oxidative stress seems to have a central role in the pathogenesis of varicocele-induced infertility.

Current evidence supports beneficial effects of varicocelectomy on semen parameters, sperm function, and pregnancy outcomes in men from couples with documented infertility with clinical varicoceles and affected semen parameters.The optimal technique for performing varicocelectomy is a microsurgical approach, owing to reduced complication rates and increased pregnancy rates compared with other techniques.

Varicocele is a prevalent condition characterized by the abnormal enlargement of scrotal veins, affecting approximately [insert prevalence] of the male population. While varicocele is often asymptomatic, it has been implicated in male infertility and testicular dysfunction.

The severity of varicocele is commonly graded, and the presence of reflux has been identified as a potential contributing factor. However, the association between varicocele grade, reflux, and vein diameter remains poorly understood. This retrospective analysis aims to elucidate these relationships and provide valuable insights into varicocele pathophysiology.

Clinical features of a varicocele

1. Enlarged veins in your scrotum.
2. Scrotal swelling
3. A lump in your testicle that doesn't hurt.
4. An uncomfortable, dull ache in your scrotum.
5. Pain that gets worse the longer you stand and gets better when you lie down.
6. Pain that's worse after prolonged or strenuous exercise.
7. Pain that gets worse in hot weather.
8. Infertility.
9. scrotal pain—Radiating to abdomen
10. Testicular atrophy (Rare)

Grading Varicocele

Grade—1--It is not possible clinically or visible at rest or Valsalva maneuver, but demonstrable on ultrasound.
Grade-2—It is palpable only while standing during Valsalva maneuver.
Grade—3--It is palpable even at rest while standing
Grade—4—It is visible through scrotal skin.

METHODS:

Data were retrospectively collected from medical records of patients who underwent scrotal ultrasound examinations at Shruthi Super Specialties Hospitals, Vijaynagar Colony, Hyderabad, Telangana, between February 2022 to February 2024)A total of 47 observations were included in the analysis. Varicocele grade, reflux presence, and vein diameter were recorded for each observation. Statistical analysis, including mean comparison and descriptive statistics, was performed to examine the associations between varicocele characteristics.

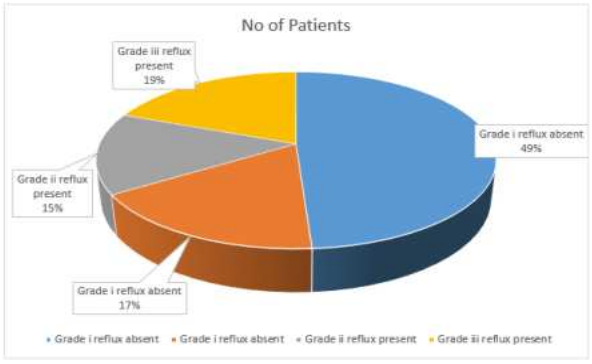
RESULTS:

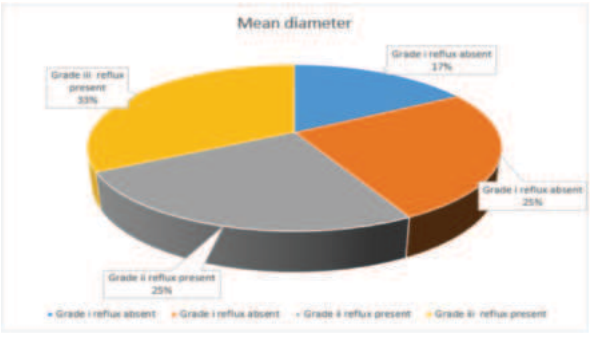
The analysis revealed distinct patterns in varicocele characteristics across different grades and reflux statuses. Grade 3 varicoceles exhibited the highest mean diameter (3.32 mm), followed by grade 2 varicoceles (2.59 mm). In the absence of reflux, grade 2 varicoceles displayed a slightly higher mean diameter compared to those with reflux present (2.59 mm vs. 2.57 mm, respectively). However, the difference was not statistically significant.

Conversely, among grade 3 varicoceles, the presence of reflux was associated with a larger mean diameter (3.32 mm with reflux vs. 3.32 mm without reflux). These findings suggest a potential interaction between varicocele grade, reflux presence, and vein diameter.

Grade	Reflux	No of Patients	Mean diameter
Grade i	reflux absent	23	1.71
Grade i	reflux absent	8	2.59
Grade ii	reflux present	7	2.57
Grade iii	reflux present	9	3.32

The provided results are parameter estimates from a statistical model examining the association between varicocele grade, diameter, reflux, and the response variable of interest.





Variable	Varicocele grade	Standard Error	t Value	Pr > |t|
Intercept	-0.65	0.14	-4.52	<.0001
diameter	0.98	0.07	13.72	<.0001
reflux	0.27	0.10	2.72	0.0093

Intercept:

The intercept represents the estimated mean value of the response variable when all predictor variables (varicocele grade, diameter, and reflux) are zero.

- In this model, the intercept is estimated to be -0.65.
- The standard error associated with the intercept estimate is 0.14.
- The t-value associated with the intercept is -4.52, indicating that the intercept is significantly different from zero.
- The p-value associated with the intercept is < .0001, indicating that the intercept estimate is statistically significant.

Diameter:

- The parameter estimate for diameter is 0.98.
- This suggests that for every one-unit increase in diameter, the response variable is expected to increase by approximately 0.98 units.
- The standard error associated with the diameter estimate is 0.07.
- The t-value associated with diameter is 13.72, indicating that the diameter estimate is highly significant.
- The p-value associated with diameter is < .0001, confirming its statistical significance.

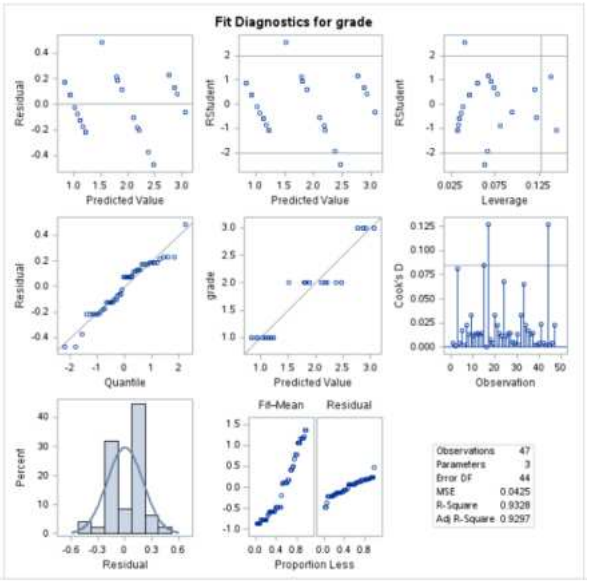
Reflux:

- The parameter estimate for reflux is 0.27.
- This suggests that the presence of reflux is associated with an increase of approximately 0.27 units in the response variable, holding other variables constant.
- The standard error associated with the reflux estimate is 0.10.
- The t-value associated with reflux is 2.72, indicating that the reflux estimate is statistically significant.
- The p-value associated with reflux is 0.0093, confirming its statistical significance at a significance level of 0.05.

Interpretation:

- Both diameter and reflux have significant effects on the progression of the varicocele, as indicated by their parameter estimates and associated p-values.
- An increase in diameter is strongly associated with an increase in the disease severity.
- The presence of reflux also contributes to an increase in the disease

severity, although to a lesser extent compared to diameter.
- These results highlight the importance of considering both diameter and reflux in understanding and predicting the disease severity in the context of varicocele.



DISCUSSION:

The observed variations in mean diameter across different varicocele grades and reflux statuses highlight the heterogeneity of this condition. The association between reflux presence and increased diameter in grade 3 varicoceles suggests a possible role of hemodynamic in varicocele pathogenesis.

Radiology

Dilatation of pampiniform plexus of veins more than 2.5 mm is considered abnormal. They show serpiginous appearances. There will be flow of reversal in the pampiniform plexus.

Computed tomography

Varicoceles develop as a result of dilatation and tortuosity of veins. A varicocele is a common abnormality, occurring in approximately 15% of men. Some patients may have scrotal pain and swelling, but more importantly, a varicocele is considered to be a potential cause of male infertility (21,22)

Magnetic resonance image-

The prevalence of varicocele increases with advancing age , probably because of the aging of venous valves (23,24,25)

Ultrasonography

The relationship between a varicocele and male infertility is controversial, but improved fertility and sperm quality have been reported after treatment, including occlusive treatment for varicoceles. On physical examination, large varicoceles are easily identified as the classic "bag of worms" surrounding the testis. Ultrasonography, particularly Doppler ultrasonography, allows accurate diagnosis of varicoceles, even subclinical varicoceles. Ultrasonography is the examination of choice for investigating varicoceles, and it remains the most practical and most accurate noninvasive technique. Ultrasonography does not always show reflux into the spermatic veins or pampiniform plexus (26)

Crucial points noteworthy to mention.

Left testes is more effected (85%) due to longer course of testicular vein due to angulation of insertion into left renal vein. Right testicular vein has shorter course and is obliquely inserted directly into IVC and not into renal vein as on left side.

Left sided varicocele is seen in 85% of cases
Bilateral varicocele is seen in 15% of cases.
Right sided varicocele is rarely seen and needs immediate attention for the reason of mass effect.
Isolated right sided varicocele is uncommon and should prompt an evaluation of the retro peritoneum to exclude a mass obstructing downstream testicular vein.

CONCLUSION:

This retrospective analysis provides valuable insights into the relationships between varicocele grade, reflux presence, and vein diameter. The observed variations in mean diameter across different varicocele grades and reflux statuses suggest a complex interplay between varicocele characteristics. These findings have implications for clinical assessment and management strategies, emphasizing the importance of considering multiple factors in the evaluation of varicocele.

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