

PROBING THE DEPTHS OF INFERTILITY: TRUS AND SCROTAL ULTRASOUND REVEALS

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ABSTRACT

BACKGROUND: Male infertility is a widespread issue that many couples are dealing with. Medical practitioners have begun to use modern diagnostic methods such as transrectal ultrasonography (TRUS) and scrotal ultrasound (US) to better understand the reasons and potential remedies for this disease. With the aid of these imaging tools, the male reproductive system can be thoroughly examined to assess structural abnormalities and other acquired illnesses that may be contributing factors to infertility. **AIM/OBJECTIVE:** To identify the underlying causes of male infertility through the use of transrectal ultrasound (TRUS) and scrotal ultrasound, with a focus on emphasizing their diagnostic role. **RESULTS:** In our study encompassing 127 male participants aged between 22 and 70 years (mean age 38.11), 121 individuals presented with primary infertility, while 6 exhibited secondary infertility. Transrectal Ultrasound (TRUS) findings indicated a range of abnormalities, 20 unilateral seminal vesicle agenesis, 5 unilateral atrophic seminal vesicle, 5 bilateral seminal vesicle agenesis, 1 bilateral atrophic seminal vesicles, 4 seminal vesicle calculi, 2 vas deferens calculi, 2 testicular microlithiasis, 14 ejaculatory duct calculi, 1 ejaculatory duct stricture, 1 epididymal head cyst, 16 prostatic cysts, 6 prostatitis and 57 normal studies. Among the 121 patients, 51 underwent scrotal ultrasound which revealed 13 normal, 24 varicoceles, 2 hydroceles, 1 spermatocele, 9 epididymal cysts, 5 epididymitis, 4 atrophic testis, 1 epididymo-orchitis and 1 undescended testis. **CONCLUSION:** Ultrasounds of the scrotum and transrectum are crucial for identifying anomalies in male infertility that can be corrected. The likelihood of becoming a parent is increased by these imaging modalities, which also improve clinical assessments and guide treatment plans.

Keywords: TRUS, transrectal ultrasound, male infertility, scrotal ultrasound.

Introduction

Fertility is a phenomenon involving both genders with successful conception depending upon complex interactions between male and female reproductive tracts involving multiple factors. Infertility is defined as inability to conceive after 1 year of unprotected intercourse. Infertility is common affecting about 15% of couples worldwide.¹ Despite the myth of female being the more common cause of infertility, male

infertility accounts for almost 40-60 % of the overall infertility cases with male being solely responsible for the infertility in about 15% of the incidences. Male and female factors even coexist in about one third of cases. The central principal behind the imaging evaluation is to diagnose and treat correctable pathologies and anatomical variants.^{2,3}

After medical history and clinical examination multiple

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imaging modalities are available to evaluate males to diagnose the root cause of infertility, including scrotal ultrasound, transrectal ultrasound, vasography, seminal vesiculography etc. This article focuses on scrotal ultrasound and transrectal ultrasound for evaluation of infertility. Testicular and scrotal ultrasound is primary modality for evaluation of male reproductive system as it does not apply ionizing radiation and is quick and inexpensive.^{3,4}

Materials and Methods

A descriptive retrospective study was conducted at Radiology department, Shifa International Hospital after taking approval from ethical review board. Data was collected from prior medical records of patients who underwent scrotal and transrectal ultrasound at our department from 2015 up to 2023. Data was collected on a structured proforma and analysed using SPSS version 25.

Inclusion Criteria:

Patients who underwent transrectal and scrotal ultrasound with complaint of primary or secondary infertility and having abnormal semen analysis.

Exclusion Criteria:

Infertility due to impotence.
Infertility due to female causes.

Statistics:

Simple frequencies were calculated using IBM SPSS version 23.

Discussion

There are many causes of male infertility which are classified as pre-testicular, testicular and post testicular. Imaging is primarily done to identify correctable causes of infertility which predominantly include obstructive causes involving sperm transport systems, which if timely diagnosed can be treated accordingly. On the other hand, abnormalities that cause testicular failure or impaired spermatogenesis are not potentially treatable.^{3,5} In nonobstructive pathologies, patients

may proceed directly with assisted reproductive techniques like intracytoplasmic sperm injections.⁶

Seminal obstruction can be classified according to the site of obstruction. It is classified as proximal including epididymis and scrotal was depressed and distal seminal obstruction including inguinal and pelvic regions of vas deferens and ejaculatory ducts. Obstruction is also classified as partial or complete, congenital and acquired. Congenital anomalies include atresia, stenosis and midline prostatic cystic lesions. Echo causes include inflammatory, traumatic and iatrogenic etiologies.^{3,6,8}

Numerable Imaging modalities are seen for evaluation of infertility in men. Majority of infertile men are initially evaluated with scrotal ultrasound, later on proceeding to transrectal ultrasound (TRUS), vasography and MRI. Later on invasive procedures like seminal vesicle aspiration, seminal vesicle washout and vesiculography are done.³

Our study focuses on transrectal and scrotal ultrasound findings in infertile men with abnormal semen analysis findings.

Scrotal ultrasound is very widely used and is usually the primary initial investigation for infertility.¹¹ Scrotal ultrasound is performed using a linear high-frequency probe. Testicular volume, echotexture and vascularity is evaluated using grayscale and colour Doppler modes. Proximal portion of epididymis is also evaluated. Pampiniform plexus is also evaluated using colour Doppler mode and resting and Valsalva.^{9,13}

Scrotal ultrasound can be used in evaluating numerous obstructive and nonobstructive causes of infertility owing to its excellent soft tissue resolution. Usual nonobstructive pathologies that are diagnosed include cryptorchidism, varicocele, hydrocele, numerous infections like tuberculosis, mumps and torsion/infarction. Varicocele is the most common pathology in diagnosed cases of infertility with ultrasound being an excellent modality for its diagnosis.¹²

Our study also showed that varicocele is the most common cause and among 51 patients who underwent scrotal ultrasound, varicocele was present in 24 patients. Epididymal cyst was the second most common observation in our study and was seen in 9 out of 51 patients. The results are comparable to a study performed in our neighbor country India where 25 out of 50 patients had varicocele and 7 cases of epididymal cysts were also seen. Our study showed

hydroceles in fewer patients i.e 2 out of 51 as compared to 8 out of 50 in the aforementioned study.¹⁷ Similarly, a study conducted by Sakamoto on 545 infertile men, varicocele was found in 317 out of 545 (58%) patients. Left sided varicocele was most frequently found as compared to right. However, according to this study microlithiasis was 2nd most frequent observation seen in 5.5 % patients(30 out of 545). In our study, no case of microlithiasis was seen.¹⁸

Scrotal ultrasound can also demonstrate some of the obstructive causes of infertility in the proximal portion of seminal duct. It can be used to demonstrate secondary changes of obstruction like seminal duct dilatation in its intratesticular and proximal portions.¹⁰

Transrectal ultrasound performed using transrectal multifrequency probe. The patient is evaluated in left lateral position with both knees flexed, as in fetal position. Prostate gland volume, echotexture and pathologies are evaluated. Distal part of seminal tract and seminal vesicles are also evaluated.⁹

Transrectal ultrasound is modality of choice for evaluation of distal part of seminal tract. Obstructive causes of infertility with pathology being in the distal seminal tract including inguinal and pelvic portions can be evaluated using TRUS. The most common indication for transrectal ultrasound is low ejaculate volume for evaluation of acquired and pathologies or seminal vesicles. Pathologies include congenital agenesis/hypoplasia of seminal vesicles or any other obstructive pathologies like cysts and calcification.⁸ According to our study, TRUS findings indicated a range of abnormalities, with congenital anomalies of seminal vesicle being most common. Out of 121 patients, 31 (25%) had seminal vesicle atrophy and agenesis. The results were comparable to study performed in Egypt where 9.9% had hypoplastic seminal vesicle, while 24.3% had dilated seminal vesicles.¹

Congenital anomalies of vas deferens comprises the largest group of abnormalities diagnosed on transrectal ultrasound. The congenital agenesis ranges from complete absence (bilateral or unilateral) to a small vestigial remnant.^{4,14} There is also association of vasal agenesis with renal anomalies which ranges from ipsilateral renal agenesis, crossed fused ectopia and ectopic pelvic kidney.^{7,15}

Abnormalities of echotexture of the distal duct are

also identified which also ranges from central altered echotexture to complete fibrosis and calcification, which causes distal occlusion and stenosis. Association of these pathologies is thought to be secondary to prior infection like vasculitis and prostatitis.⁷

Cysts are also commonly identified pathologies especially in the periurethral location. Cyst in the seminal vesicles and vas deferens are less common. Cyst around the urethra are classified based on the location and presence of the sperm within the cyst. These include utricle cyst that are analogical remnants of müllerian and ducts. Sperm containing cysts originate from wolffian duct and are termed as ejaculatory duct cyst. Other cysts include prostatic retention cysts which compress the ejaculatory ducts extending owing to the other mass-effect. Seminal vesicle cyst or most associated with renal anomalies like agenesis and duplication of collecting system.^{7,16}

Distal seminal tract calculi are commonly present at vasal ampulla, verumontanum and ejaculatory ducts. Sometimes calculi are also seen in the seminal vesicles.

Almost all the above-mentioned pathologies are potentially treatable via a radiological or surgical techniques. Our study describes the spectrum of pathologies of almost 127 patients who underwent scrotal and transrectal ultrasounds for complaint of infertility (121 patients with primary infertility and 6 patients with secondary infertility). The details of each pathology are described in the in the results section. The common pathologies that are seen on the scrotal and transrectal ultrasounds in patients with primary or secondary infertility are outlined and the study emphasizes on a timely diagnosis and interventions of the potential repeatable anatomical and pathological anomalies.

Results

There were 127 males participants with mean age of 38.11 years and age range of 22 to 70 years. 121 patients had primary infertility and 6 had secondary infertility.

All of these patients had undergone transrectal ultrasound (TRUS) which showed a range of under-

lying abnormalities for infertility with unilateral seminal vesicle agenesis being the most common one.

Abnormality	No. of participants	Percentage
Unilateral seminal vesicle agenesis	20	15.7%
Bilateral seminal vesicle agenesis	5	3.9%
Unilateral atrophic seminal vesicle	5	3.9%
Bilateral atrophic seminal vesicle	1	0.7%
Seminal vesicle calculi	4	3.1%
Vas deferens calculi	2	1.5%
Testicular microlithiasis	2	1.5%
Ejaculatory duct calculi	14	11%
Ejaculatory duct stricture	1	0.7%
Epididymal head cyst	1	0.7%
Prostatic cyst	16	12.6%
Prostatitis	6	4.7%
Normal examination	57	44.8%

About 51 patients among them had undergone scrotal ultrasound as well which revealed a variety of abnormalities with varicoceles being the most common.

Table 1: Shows frequency distribution of different abnormalities found via transrectal ultrasound (TRUS).

Abnormality	No. of participants	Percentage
Varicocele	24	47%
Hydrocele	2	3.9%
Spermatocele	1	1.9%
Epididymal cyst	9	17.6%
Epididymitis	5	9.8%
Atrophic testis	4	7.8%
Epididymo-orchitis	1	1.9%
Undescended testis	1	1.9%
Normal	13	25.4%

Table 2: Shows frequency distribution of abnormalities found via scrotal ultrasound.

Conclusion

Scrotal ultrasound and transrectal ultrasonography (TRUS) are useful diagnostic techniques for locating anomalies associated with male infertility that may be able to be corrected. The accuracy of clinical assessments is increased by these imaging modalities, which provide vital information on anatomical and physiological abnormalities. Healthcare providers can improve the chances of becoming parents by using

information from scrotal ultrasonography and TRUS to better guide infertility therapies.

Conflict of Interest: None.

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