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Testicular strain elastography in fertile and infertile men: A comparative cross-sectional study

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Abstract
Aim: To determine and compare the diagnostic value of strain elastography in fertile and infertile men, and to correlate the results of strain elastography with semen parameters and hormone profiles of the patients.
Materials and Methods
Study design: Comparative cross-sectional study.
Study period: June 2022 – May 2023 for a period of 1 year
Study population:
Infertile group: Men between 20-45 years of age, clinically. diagnosed with primary infertility and with abnormal semen analysis and did not receive any previous fertility treatment.
Fertile group: Men between 20-45 years of age with normal semen analysis.
Sample size: 82
Inclusion Criteria: Infertile group - Men between 20-45 years of age, clinically diagnosed with primary infertility and with abnormal semen analysis and did not receive any previous fertility treatment**.**
Fertile Group: Men between 20-45 years of age with normal semen analysis.
Results: The mean testicular volume was higher in Group 2 compared to Group 1. This implies that higher the testicular volume, more the number of seminiferous tubules, which in turn produces more sperm. Therefore, the testicular volume is directly proportional to the sperm count. However the testicular volume was not significantly different between the groups.
A previous study by Pinggera *et al.* [5] showed that there was increased vascular resistance in those patients with abnormal sperm features compared to the normal patients. It also stated that there was no significant difference in the testicular volumes.
A study by Biogiotti *et al.* [6, 9] showed that the RI and peak systolic velocity (PSV) were significantly higher in infertile men with varicocele and the RI values were different between azoospermic and oligozoospermic patients.
Study by Ackar *et al.* [24] showed that intra-testicular arterial resistance and testicular volume did not differ between infertile men with subclinical varicoceles and infertile men without varicoceles.
Conclusion: Testicular volume was not significantly different between infertile and fertile men.
- Resistive index of the intraparenchymal arteries did not show any difference between infertile and fertile men.
- The strain value and strain ratios were significantly higher in infertile men with abnormal semen parameters as compared to those with normal semen analysis, and the strain elastography results were found to be significantly different in patients with abnormal sperm counts.

Keywords: Elastography, infertility, volume, testicular

Introduction
"Infertility is defined as the inability of a non-contracepting sexually active couple, to achieve spontaneous pregnancy within one year". It affects one fifth to one sixth of couples in the reproductive age.
When compared to other species, human beings are inefficient in terms of reproduction. The fertility rate per cycle is thought to be around 20% and the accumulated pregnancy rate in those couples with proven fertility is approximately 90% after 12 months and 94% after 2 years1. In approximately 20% of infertile couples, male infertility is the sole cause, and in about 30%-40% of these couples, male and female factors are the causes. Therefore, a condition involving the male partner contributes to approximately 50% of cases of infertility.

The diagnostic workup of male infertility should include a thorough medical and reproductive history, physical examination, and semen analysis, followed by imaging. Ultrasound is the first-line imaging modality which is used for the evaluation of male genital tract as it is non-invasive, safe and there is no exposure to radiation. In addition to physical examination and semen
analysis, ultrasonography of scrotum may be helpful in demonstrating obstruction or testicular dysgenesis2. Its sensitivity and specificity increase even more by using Doppler. Conventional ultrasonography has the limitation of only functional analysis of testicular tissue, whereas elastography is a promising technique in this field. New insights for the structural and functional evaluation of testicular tissue have been provided by the recent technical advances in ultrasound applications and post-processing developments3.

Elastography was first described by Ophir *et al*. It is a new imaging technique which displays the images of tissue stiffness. These images that are created by elastography are thought to be an extension of the ancient palpation techniques. It gives a better information regarding the spatial localization and is also less subjective.

Real time elastography, a method which shows stiffness of tissue under real time conditions demonstrates different values of elasticity dependent on volume and function of testis. Elastography assesses elasticity of testis. It is defined as the tendency of the tissue to resist deformation when a force is applied, or to resume its original shape after the removal of the force.

The principle of sonoelastography is to use repeated, slight pressure on the examined organ with the ultrasound transducer.

Ultrasound elastography techniques can be categorized as:

1) Strain imaging, and 2) Shear wave imaging. Here in this study, we study only the Strain elastography and its diagnostic value in male infertility.

Materials and Methods

Study design: Comparative cross-sectional study.

Study period: June 2022 – May 2023 for a period of 1 year

Study population

- **Infertile group:** Men between 20–45 years of age, clinically. diagnosed with primary infertility and with abnormal semen analysis and did not receive any previous fertility treatment**.**
- **Fertile group:** Men between 20–45 years of age with normal semen analysis.

Sample Size: 82

Inclusion criteria

- **Infertile group:** Men between 20–45 years of age, clinically diagnosed with primary infertility and with abnormal semen analysis and did not receive any previous fertility treatment**.**
- **Fertile group:** Men between 20–45 years of age with normal semen analysis.

Exclusion criteria

- Patients who did not undergo semen analysis.
- Undescended testis.
- History of orchidectomy or previous testicular biopsy.
- Atrophy of testis, acute. trauma changes, and prior surgical interventions to testis.
- Testicular mass.
- Testicular microlithiasis, and infarct.

Data collection

Data collection was performed in the included study group using a standard questionnaire/ proforma that includes the basic patient details such as name, age, address, occupation, dietary habits and history of smoking/ alcohol, history of previous testicular surgery/trauma, history of previous testicular malignancy/infarct.

Methodology

- Patients were explained about the study.
- Informed consent was obtained.
- Study subjects were divided into 2 groups: Group 1 (Infertile) and Group 2 (Fertile) having 41 patients each.
- Gray scale ultrasonography was done first to look for the echotexture and size of the testis.
- This was followed by Doppler of the intraparenchymal arteries where the resistive index was measured.
- Strain elastography of testis was performed after this using GE-Logic S7 machine, supplied with SE software and using a 7-12MHz frequency transducer.
- The whole examination was performed in the supine position.
- Testicular volumes and the flow in the intraparenchymal arteries were measured followed by strain elastography.
- The strain ratios were calculated by putting multiple equally sized regions of interest (ROIs) on the testicular tissue (A) and scrotal subcutaneous. fatty tissue (B).
- Strain ratio (SR) value was automatically calculated on the sonography machine by comparing. A to B (B/A) for each patient and mean values were obtained.
- Mean values in infertile and fertile men were then compared.

Case 1

30-year-old male came to the andrology clinic for complaints of primary infertility for 2 years.

Semen analysis showed asthenozoospermia.

The Testicular volume is 16.42 cc. The mean resistive index of intraparenchymal artery is 0.4550.

Results

Among the total 82 patients, the mean age group in the infertile group (Group 1) was 31.68±3.78 and in the fertile group (Group 2) was 21.68±3.18. The mean testicular volume in Group 1was 13.87±3.50 and Group 2 was 14.99±1.98. The mean resistive index of the intraparenchymal artery in Group 1was 0.44±0.056 and in Group 2was 0.43±0.042. The mean testicular strain value in Group 1 was 1.68±0.37 and in Group 2was 1.38±0.525. The mean testicular strain ratio in Group 1 was 0.36±0.07 and in Group 2 was 0.22±0.09. Area under the ROC curve (AUC) for testicular volume was 0.618 with a P value of 0.0709. Area under the ROC curve (AUC) for resistive index of the intraparenchymal artery was 0.551 with a P value of 0.439. Area under the ROC curve (AUC) for testicular strain value was 0.708 with a P value of 0.0007. Area under the ROC

curve (AUC) for testicular strain ratio was 0.875 with a P value of <0.0001. On comparing the various sperm disorders, the mean testicular volume in patients with oligozoospermia, azoospermia, asthenozoospermia and in patients with both oligo and asthenozoospermia were 15.220±2.299, 15.111±3.529, 14.304±3.096 and 11.756±3.812 respectively. The mean resistive index of intraparenchymal arteries in patients with oligozoospermia, azoospermia, asthenozoospermia and in patients with both oligo and asthenozoospermia were .40±.055, .43±.060, .44±.040, .47±.057 respectively. The mean strain value of testis in patients with oligozoospermia, azoospermia, asthenozoospermia and in patients with both oligo and asthenozoospermia were 1.63±.472, 1.83±.360, 1.48±.303, 1.82±.351 respectively. The mean strain ratio of testis in patients with oligozoospermia, azoospermia, asthenozoospermia and in patients with both oligo and asthenozoospermia were .363±.068, .341±.061, .348±.057, .409±.101 respectively.

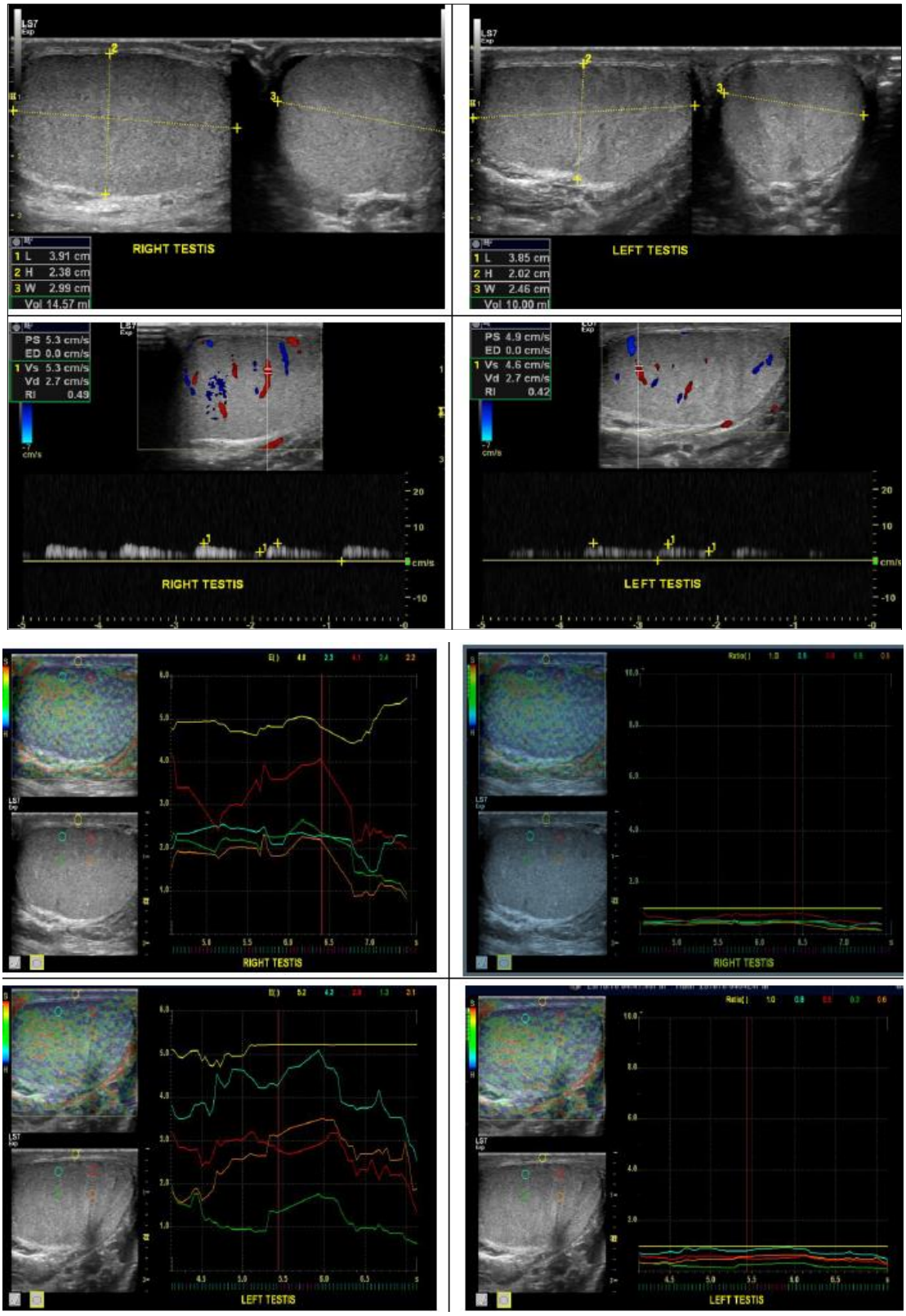

Fig 1: The Strain value (SV) was 2.8 and the Strain ratio (SR) was 0.56.

Conclusion

- Testicular volume was not significantly different between infertile and fertile men.
- Resistive index of the intraparenchymal arteries did not show any difference between infertile and fertile men.
- The strain value and strain ratios were significantly higher in infertile men with abnormal semen parameters as compared to those with normal semen analysis, and the strain elastography results were found to be significantly different in patients with abnormal sperm counts.
- This technique therefore proves to be a useful tool for the evaluation of male infertility. But further large-scale studies may be needed to clarify the value of this imaging modality in the assessment of male infertility.

References

1. Santiago Brugo-Olmedo1, Claudio Chillik, Susana Kopelman. Definition and causes of infertility. 2(1):41-53. Reproductive BioMedicine Online webpaper 2000/027 on web 19/1/01.
2. Ammar T, Sidhu PS, Wilkins CJ. Male infertility: the role of imaging in diagnosis and management. Br J Radiol. 2012;85:S59-68.
3. Schurich M, Aigner F, Frauscher F, Pallwein L. The role of ultrasound in assessment of male fertility. Eur J Obstet Gynecol Reprod Biol. 2009;144(Suppl 1):S192-8.
4. Lumen boundless anatomy and physiology.
5. Zachary WA Klaassen. Male Reproductive Organ Anatomy.
6. Standring S. Gray's Anatomy. 40th. Edinburgh: Elsevier Churchill Livingstone; c2008.
7. Anson BJ. Morris'Human Anatomy. 12th ed. New York: McGraw-Hill Book Company: A Complete Systemic Treatise; c1966.
8. Mosaddik A. Nature, cause & management strategies of respiratory complication in northern regions (Rajshahi) of Bangladesh: A cross-sectional health survey.
9. Elder JS, *et al*. Cyst of the ejaculatory duct/urogenital sinus. J Urol. 1984;132(4):768-71.
10. World Health Organization. WHO Manual for the Standardized Investigation, Diagnosis and Management of the Infertile Male. Cambridge University Press: Cambridge; c2000.
11. The influence of varicocele on parameters of fertility in a large group of men presenting to infertility clinics. World Health Organization. Fertil Steril. 199257(6):1289-93.
12. Agarwal A, *et al*. Efficacy of varicocelectomy in improving semen parameters: new meta-analytical approach. Urology. 2007;70(3):532-8.
13. Pauroso S, Di Leo N, Fulle I, Di Segni M, Alessi S, Maggini E. Varicocele: Ultrasonographic assessment in daily clinical practice. J Ultrasound. 2011;14(4):199-204. DOI:10.1016/j.jus.2011.08.001
14. Cross JJ, Berman LH, Elliott PG, Irving S. Scrotal trauma: A cause of testicular atrophy. Clin Radiol. 1999;54(5):317-320.
15. Winter TC, Kim B, Lowrance WT, Middleton WD. Testicular microlithiasis: What should you recommend? AJR Am J Roentgenol. 2016;206(6):1164-1169.
16. Backus ML, Mack LA, Middleton WD, King BF, Winter TC 3rd, True LD. Testicular microlithiasis: imaging appearances and pathologic correlation. Radiology 1994;192(3):781-785.
17. Fawzy F, Hussein A, Eid MM, El Kashash AM, Salem HK. Cryptorchidism and fertility. Clin Med Insights Reprod Health. 2015;9:39-43.
18. Mihmanli I, Kantarci F. Erectile dysfunction. Semin Ultrasound CT MR. 2007;28(4):274-286.
19. Sigman M. Introduction: Ejaculatory problems and male infertility. Fertil Steril. 2015;104(5):1049-1050.
20. Pardeep K Mittal, Brent Little, Peter A Harri, Frank H Miller, *et al*. Role of Imaging in the Evaluation of Male Infertility. Radio Graphics. 2017;37:837-854.
21. Cooper TG, Noonan E, Von Eckardstein S, *et al*. World Health Organization reference values for human semen characteristics. Hum Reprod Update. 2010;16(3):231-245.
22. Roberts M, Jarvi K. Steps in the investigation and management of low semen volume in the infertile man. Can Urol Assoc J. 2009;3(6):479-485.
23. De Miguel Criado J, Del Salto LG, Rivas PF, *et al*. MR imaging evaluation of perianal fistulas: spectrum of imaging features. Radio Graphics. 2012;32(1):175-194.
24. Jungwirth A, Giwercman A, Tournaye H, Diemer T, Kopa Z, Dohle G, *et al*. European Association of Urology Working Group on Male Infertility. Eur Urol. 2012;62:324-32.