FRONTLINE MEDICAL SCIENCES AND PHARMACEUTICAL JOURNAL
(ISSN – 2752-6712)
VOLUME 02 ISSUE 12 Pages: 20-28
SJIF IMPACT FACTOR (2021: 5.14) (2022: 5.605)
OCLC – 1272874727 METADATA IF – 6.986
Publisher: Frontline Journals

Journal Website: https://frontlinejournals.org/journals/index.php/fmspj

Research Article

THE ROLE AND SIGNIFICANCE OF COMPRESSION ELASTOGRAPHY IN THE EARLY DIAGNOSIS OF PROSTATE CANCER

Submission Date: December 20, 2022, **Accepted Date:** December 25, 2022,
Published Date: November 30, 2022
Crossref doi: https://doi.org/10.37547/medical-fmspj-02-12-02

Khushnazarov Khasan Khalikovich
Assistant Of The Phd Department "2-Department Of Ultrasound Diagnostics", Center For The Development Of Professional Qualifications Of Medical Workers, Tashkent, Uzbekistan

ABSTRACT

The research paper presents the results of diagnostics and treatment of 96 patients with focal formations of the prostate. Based on the conducted complex ultrasound studies of patients, the authors define the main specific diagnostic criteria, the use of which allows to detect prostate cancer in the early stages.

KEYWORDS

Prostate cancer, compression elatography, modern complex ultrasound examination

INTRODUCTION

Prostate cancer (PC) is one of the most common malignant neoplasms in men and occupies a leading place among oncological diseases in developed countries and the second place after

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lung cancer among causes of death. Mortality in the first year of life after diagnosis is about 25-30%, which indicates an extremely low detection rate of the disease in its initial stages [1]. Currently, according to various authors, from 10 to 19% of prostate cancer are "non-visualized" forms, i.e. not visible on transrectal scanning [2]. The problem of prostate cancer (PC) has become of particular relevance today due to the steady increase in morbidity and mortality, as well as due to the difficulties of timely diagnosis. New opportunities in the ultrasound diagnosis of prostate cancer are opened by ultrasound elastography , a non-invasive technique that makes it possible to assess the stiffness (elasticity) of soft tissues . Ultrasound examinations are the leading method in the complex examination of patients with prostate pathology. The high information content of ultrasound allows the use of ultrasound imaging for the diagnosis of diseases at the preclinical stages of their development. Ultrasound is chosen as the method of choice at different stages of therapeutic interventions, after surgery, radiation therapy, during dispensary observation for early detection of disease recurrence.

Purpose of the study. Improving the early and differential diagnosis of prostate cancer with the use of modern compression elastography technology .

MATERIALS AND METHODS

The work is based on the data of 96 (100%) patients referred for ultrasound to clarify the nature of nodular formations in the prostate gland. The patients were divided into 2 groups:

A transrectal ultrasound examination using compression elastography technique was performed in 96 patients who were divided into 2 groups: Group 1 included 46 patients, including 18 patients with prostate cancer (mean prostate volume 68.9±26.7 cm3, average level PSA (Prostatic specific antigen) 19.9 ± 15.8 ng / ml) and 28 patients with benign diseases of the pancreas (mean prostate volume 59.4 ± 22.9 cm^3, mean PSA level 2.96 ± 3.1 ng / ml). Group 2 included 50 patients with suspected prostate cancer (mean prostate volume 78.5±27.4 cm^3, mean PSA level 16.1±12.4 ng/ml).

The age of the patients in our study ranged from 40 to 86 years. Ultrasound was performed on modern expert-class ultrasonic devices MINDRAY

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DS-70, MINDRAY DS-80, Logiq S8 XD clear GE Healthcare (USA) with transrectal sensor frequency range 4-12MHz, providing real-time gray scale imaging, characterization of Doppler studies, compression elastography.

Ultrasound was performed according to the standard technique with a gray scale research, color and power Doppler mapping (color doppler mapping, energetic doppler mapping, spectral Doppler), and also the compression elastography mode was used which was used to evaluate the stiffness of focal formations of the prostate gland.

Results of the study and their discussion. According to the compression elastographic mapping, we have identified 4 main types of images: type 1 - homogeneous mapping in green, type 2 - a combination of green and red color fragments, type 3 - heterogeneous staining in green and blue, type 4 - homogeneous mapping shades of blue. In BPH, the 1st and 2nd types of elastograms were significantly more often obtained, in prostate cancer, the 3rd and 4th types of elastograms corresponding to increased density of the pancreatic tissue were significantly more often obtained ($p < 0.05$).

Of 96 patients, a change in size, towards an increase in the prostate was in 90 (94%) patients, uneven contours were observed in 88 (91%) patients, uneven echogenicity was observed in 92 (96%) patients, an increase in prostate volume in 94 (98%) , fibrosis and calcifications in 78 (81%), and hypervascularization in 81 (84%) patients. According to the results of the study, we identified: asymmetry in the thickness of the peripheral zone, asymmetric hyperplasia of transient zones, areas of accumulation of microcalcifications, deformation of the "surgical capsule" of the prostate, local deformation of the vascular pattern in the gland zone, local deformation of the capsule and the "boundary layer" of the prostate. Comparing the signs revealed by TU (transrectal ultrasound), the sensitivity of the method was 92.5%, specificity - 9 0.3%, accuracy of the method - 91.9%.

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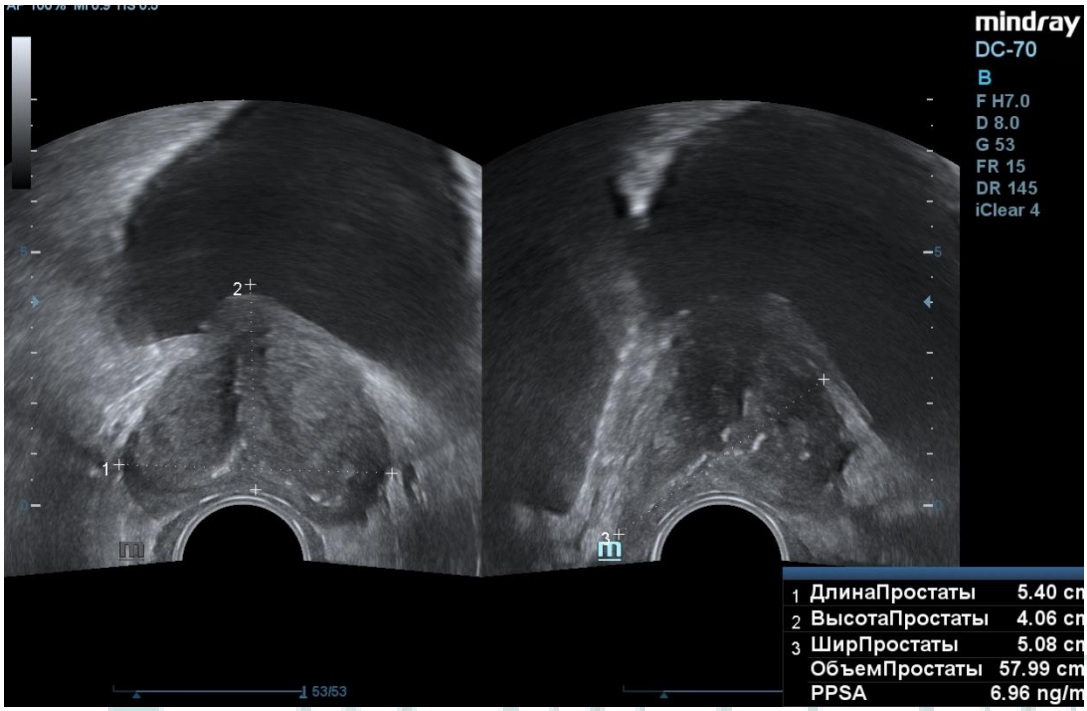

Fig. 1. BPH (Benign prostatic hyperplasia) with TU in grayscale mode

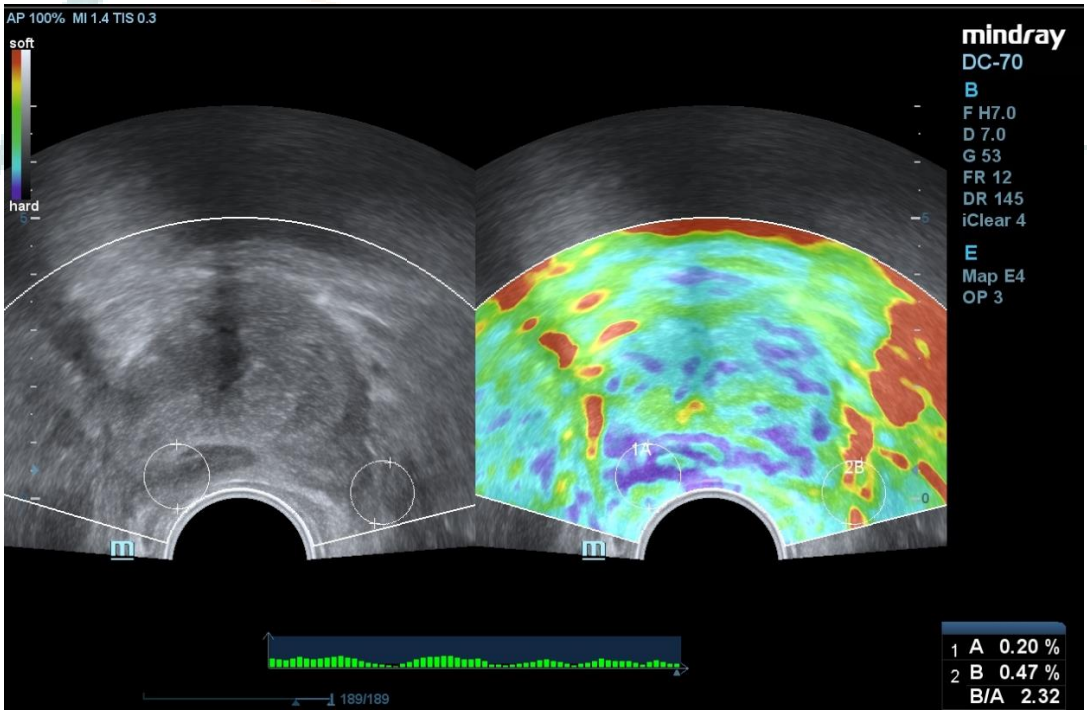

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Fig. 2. BPH. With TU in compression elastography modes

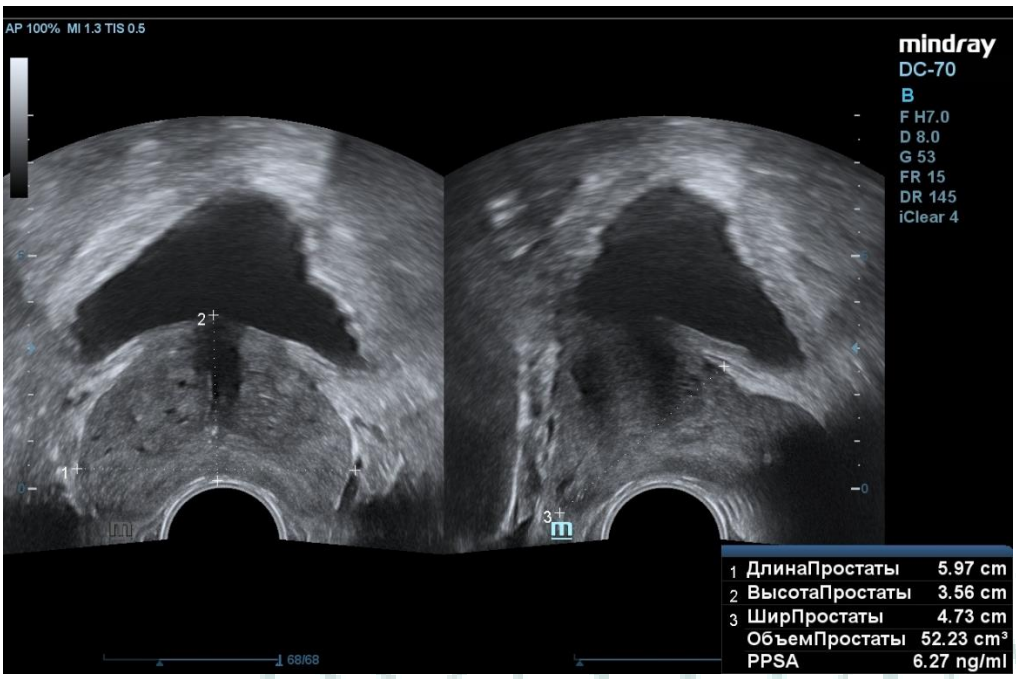

Fig.3. BPH with TU in grayscale mode

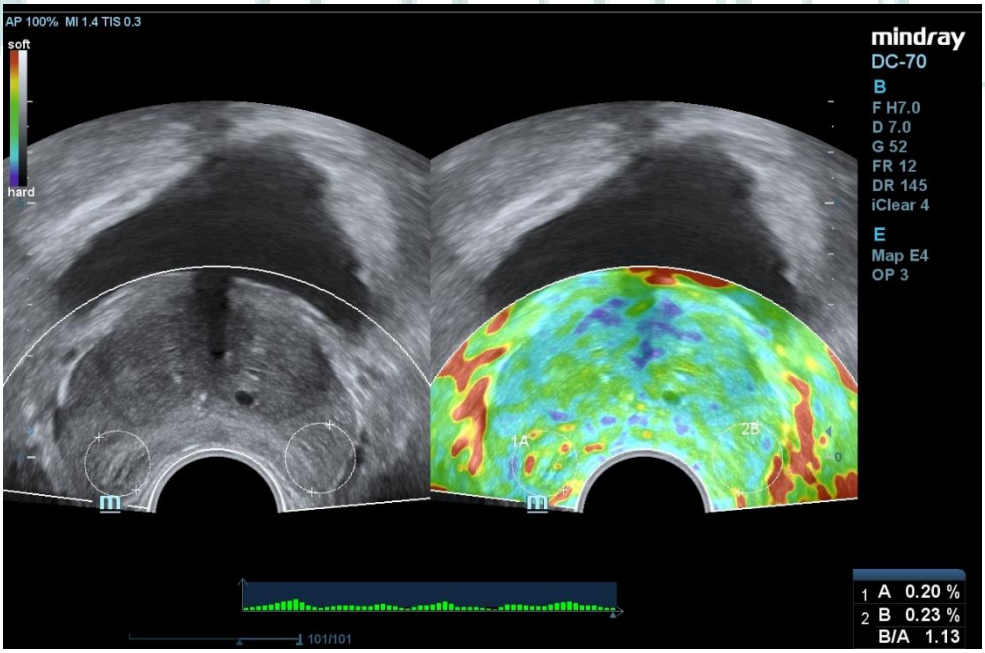

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Fig.4. BPH with TU in compression elastography modes

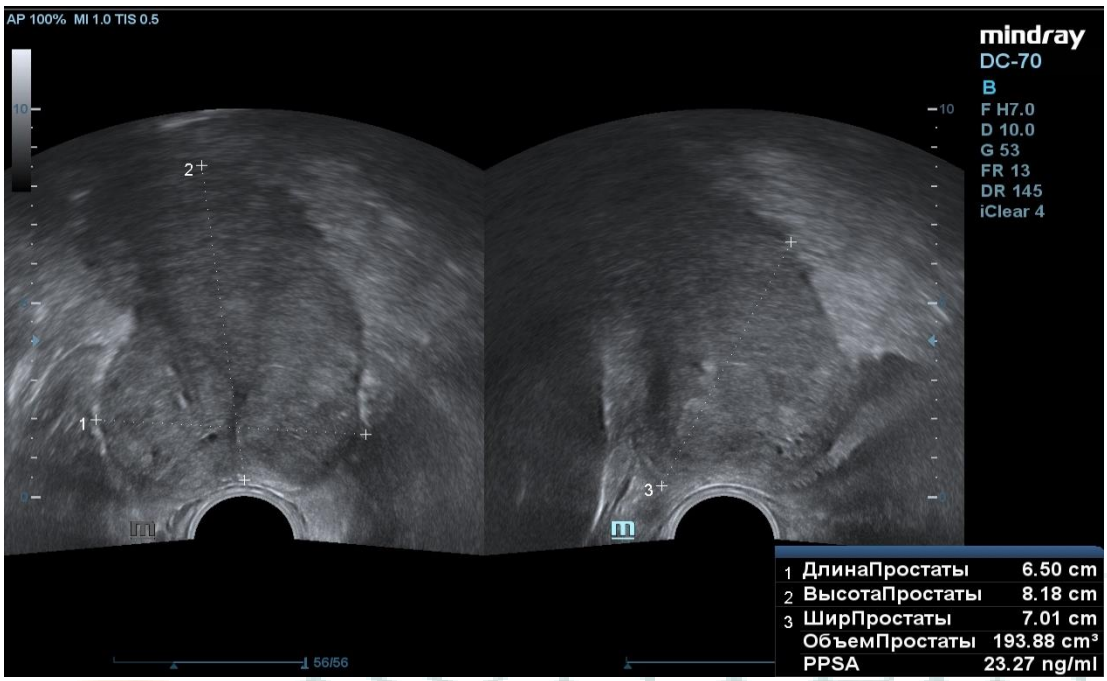

Fig.5. PCa with TU in grayscale mode

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Fig. 6. Pca with TU in compression elastography modes

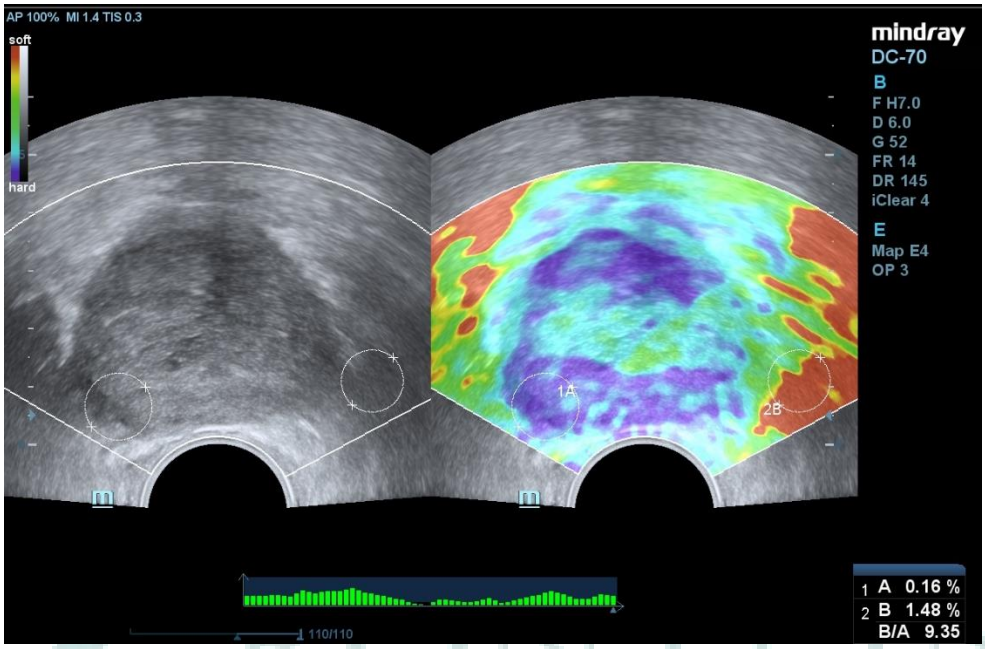

Fig. 7. Pca with TU in compression elastography modes

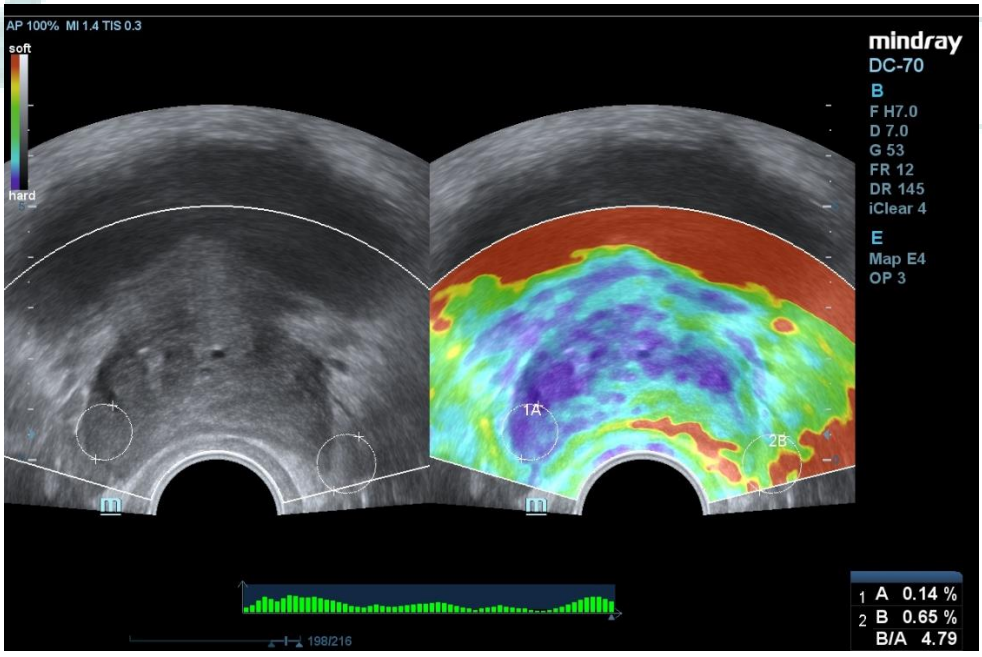

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Fig. 8. Pca with TU in compression elastography modes

CONCLUSION

Thus, the TU technique using modern compression elastography technology makes it possible to identify areas with a high stiffness coefficient, to carry out differential diagnosis of prostate cancer, and to select patients for targeted multifocal puncture biopsy. Compression elastography makes it possible to qualitatively and quantitatively assess the stiffness in the foci of prostate cancer (B / A >4 y . e .). Indirect signs of prostate cancer were identified and systematized, of which the most common companion of early prostate cancer are: asymmetry of the thickness of the peripheral zone, asymmetric hyperplasia of transient zones, areas of accumulation of microcalcifications , deformation of the "surgical capsule" of the prostate, local deformation of the vascular pattern in the mode of power Doppler mapping in the projection of hypo and even isoechoic foci in the gland, local deformation of the capsule and the "boundary layer". Modern complex TU including B-mode, EDC, CFD, Doppler and compression elastography is a highly informative diagnostic method in the early detection of prostate cancer . Elastography is a modern method that can significantly improve the results of ultrasound diagnosis of malignant degeneration of prostate nodules.

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