

POSSIBILITIES OF COMPRESSION ELASTOGRAPHY IN EARLY DIAGNOSTICS OF FOCAL LESIONS OF THE PROSTATE GLAND

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Abstract: The article presents the results of diagnostics and treatment of 84 patients with focal lesions of the prostate gland. Based on the conducted comprehensive ultrasound examination of patients, the authors determine the main specific diagnostic criteria, the use of which allows detecting prostate cancer at early stages.

Key words: prostate cancer, compression elastography, Dopplerography, innovative technology, modern ultrasound examination.

Introduction. One of the most important modern medical and social problems is prostate diseases. 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 lung cancer among causes of death. Mortality in the first year of life after diagnosis is about 26-30%, which indicates an extremely low detection of the disease in its early stages [1]. Currently, according to various authors, from 10 to 20% of prostate cancers are "non-visualized" forms are not visible during transrectal scanning [2]. The problem of prostate cancer (PC) has become especially relevant today due to the steady increase in morbidity and mortality, as well as due to the difficulties of timely diagnosis. New opportunities in ultrasound diagnostics of PC are opened by ultrasound elastography - a non-invasive technique that makes it possible to assess the rigidity (elasticity) of soft tissues. Ultrasound examinations are the leading method in the comprehensive examination of patients with prostate pathology. The high information content of ultrasound allows using ultrasound imaging to diagnose diseases at preclinical stages of their development. Ultrasound is chosen as the method of choice at different stages of therapeutic interventions, after surgery, radiation therapy, and during dispensary observation for early detection of relapse of the disease.

The aim of the study. To improve early and differential diagnostics of focal lesions of the prostate gland by using innovative compression elastography technology.

Materials and methods. The work is based on data from 84 (100%) patients referred for ultrasound to clarify the nature of nodular formations in the prostate gland. The patients were divided into 2 groups:

Transrectal ultrasound examination using compression elastography was performed in 84 patients who were divided into 2 groups: Group 1 included 46 patients, including 18 patients with prostate cancer (mean prostate volume 59.8 ± 31.2 cm³, mean PSA level 22.3 ± 18.6 ng/ml)

and 28 patients with benign prostate diseases (mean prostate volume 44.5 ± 23.2 cm³, mean PSA level 1.96 ± 3.5 ng/ml). Group 2 included 38 patients with suspected prostate cancer (mean prostate volume 79.8 ± 36.8 cm³, mean PSA level 16.9 ± 13.6 ng/ml).

The age of the patients in our study ranged from 49 to 81 years. Ultrasound was performed on modern expert-class ultrasound devices "MINDRAY DC-70" (China), "MINDRAY DC-80" (China), Logiq S 8 XD clear GE Healthcare (USA) with transrectal probe frequency range 4-10MHz, providing real-time grayscale visualization, obtaining Doppler study characteristics, and compression elastography.

The ultrasound was performed using a standard technique with gray-scale examination, color and power Doppler mapping (CDM, EDM, spectral Doppler), and the compression elastography mode was also used to assess the rigidity of focal lesions of the prostate gland.

Results of the study and their discussion. According to compression elastographic mapping, we 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 in shades of blue. In BPH, the 1st and 2nd types of elastograms were obtained significantly more often, in PCa, the 3rd and 4th types of elastograms corresponding to increased density of prostate tissue were obtained significantly more often ($p < 0.05$).

Of the 84 patients, 81 (96.4%) had a change in size, towards an increase in the gland, uneven contours were observed in 76 (90.4%) patients, uneven echogenicity was observed in 82 (97.6%) patients, an increase in the volume of the prostate gland in 83 (98.9%), fibrosis and calcifications in 79 (94.1%), and hypervascularization in 65 (77.4%) patients. According to the results of the study, we identified: asymmetry in the thickness of the peripheral zone, asymmetric hyperplasia of the transition 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 "border layer" of the prostate. Having compared the signs identified by TRUS, the sensitivity of the method was 92.9%, specificity - 88.6%, and the accuracy of the method - 91.3%.

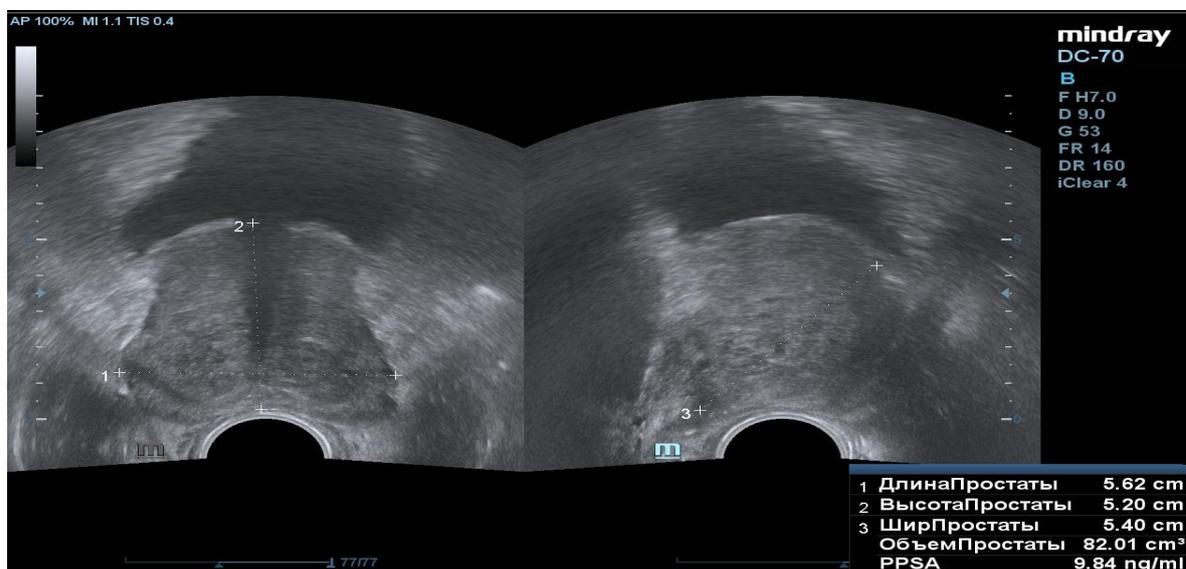


Fig.№1 BPH. With TRUS in grayscale mode

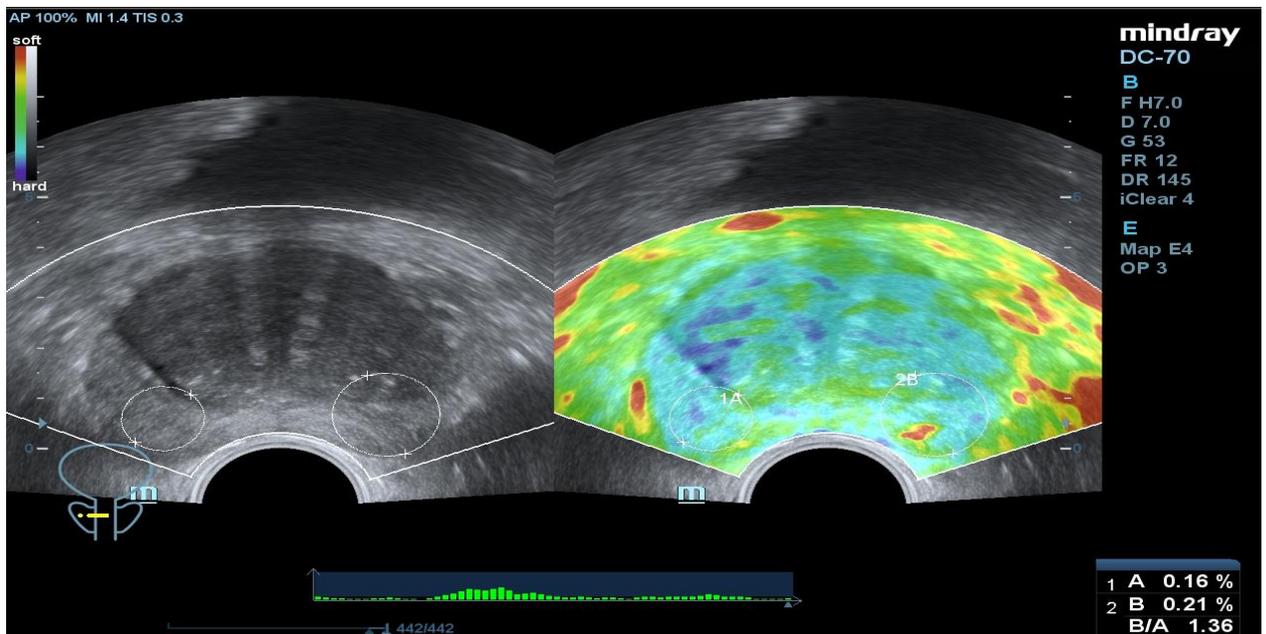


Fig.№2 BPH. With TRUS in compression elastography modes

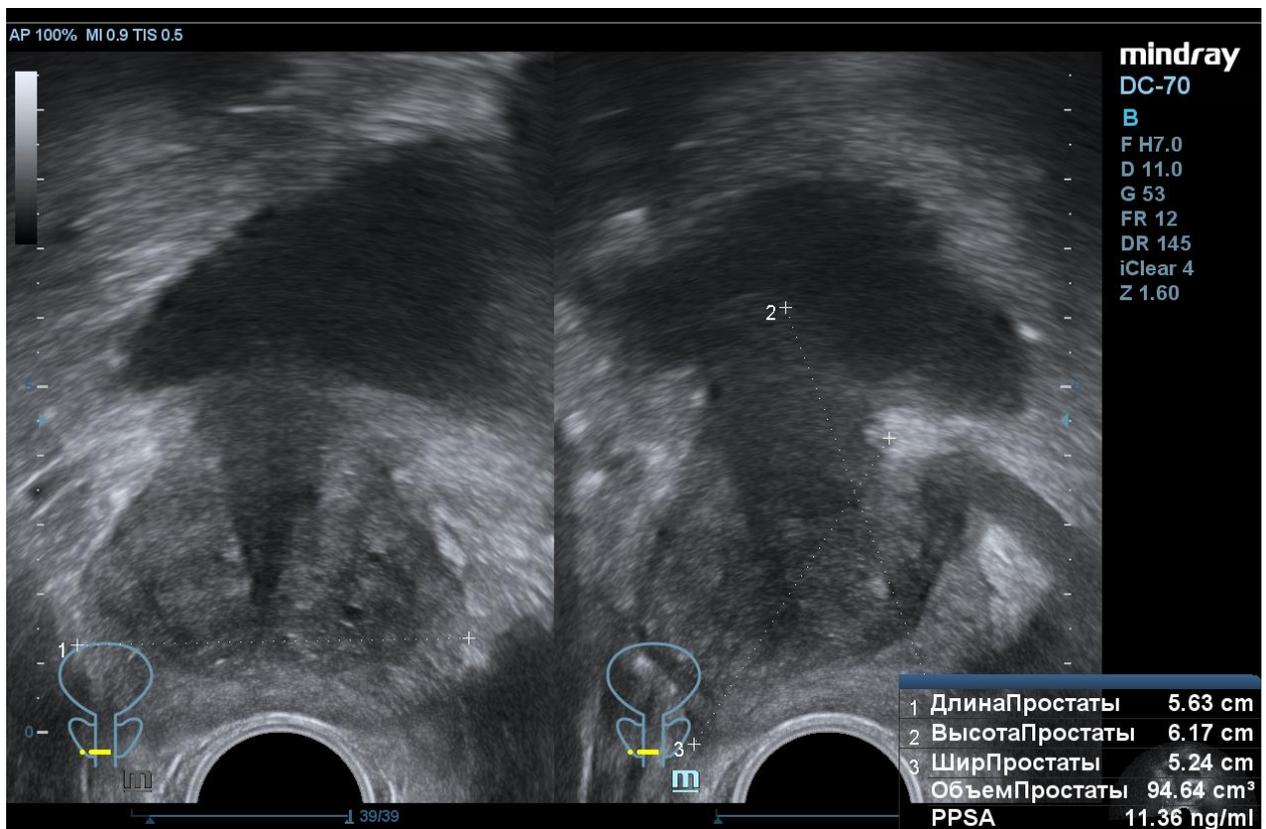


Fig.№3 BPH. With TRUS in grayscale mode

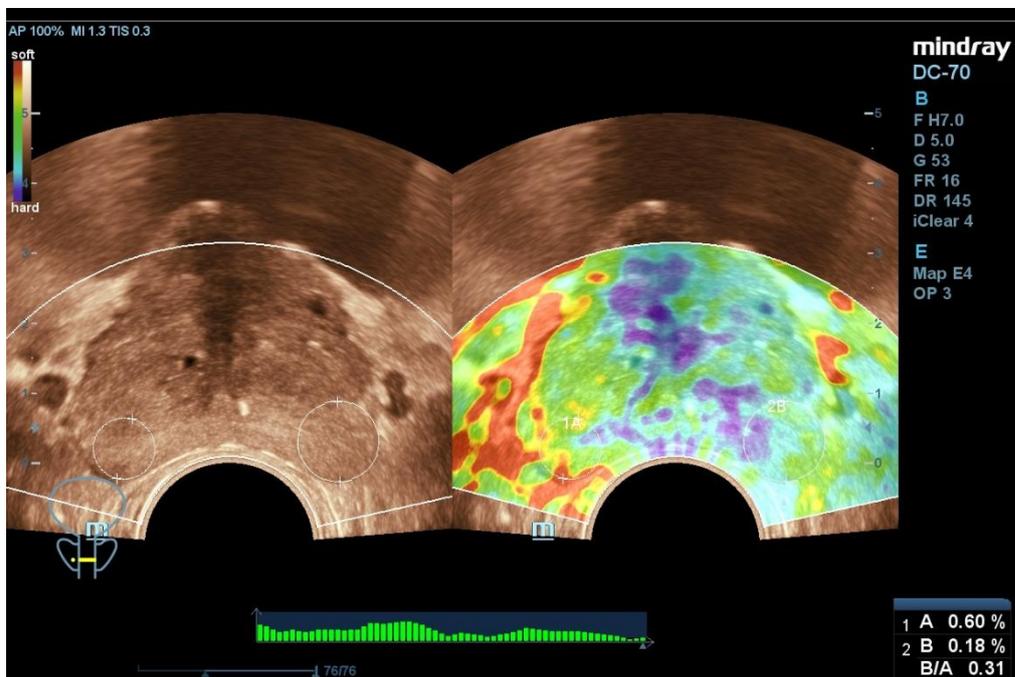


Fig.№4 BPH. With TRUS in compression elastography modes

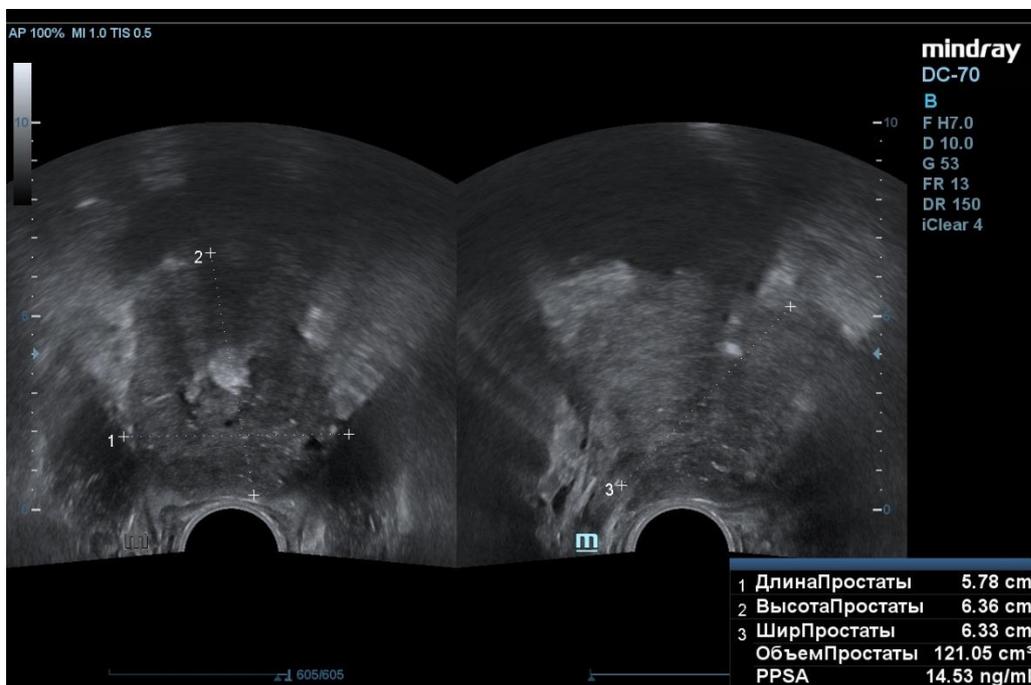


Fig.№5. PCa. With TRUS in grayscale mode

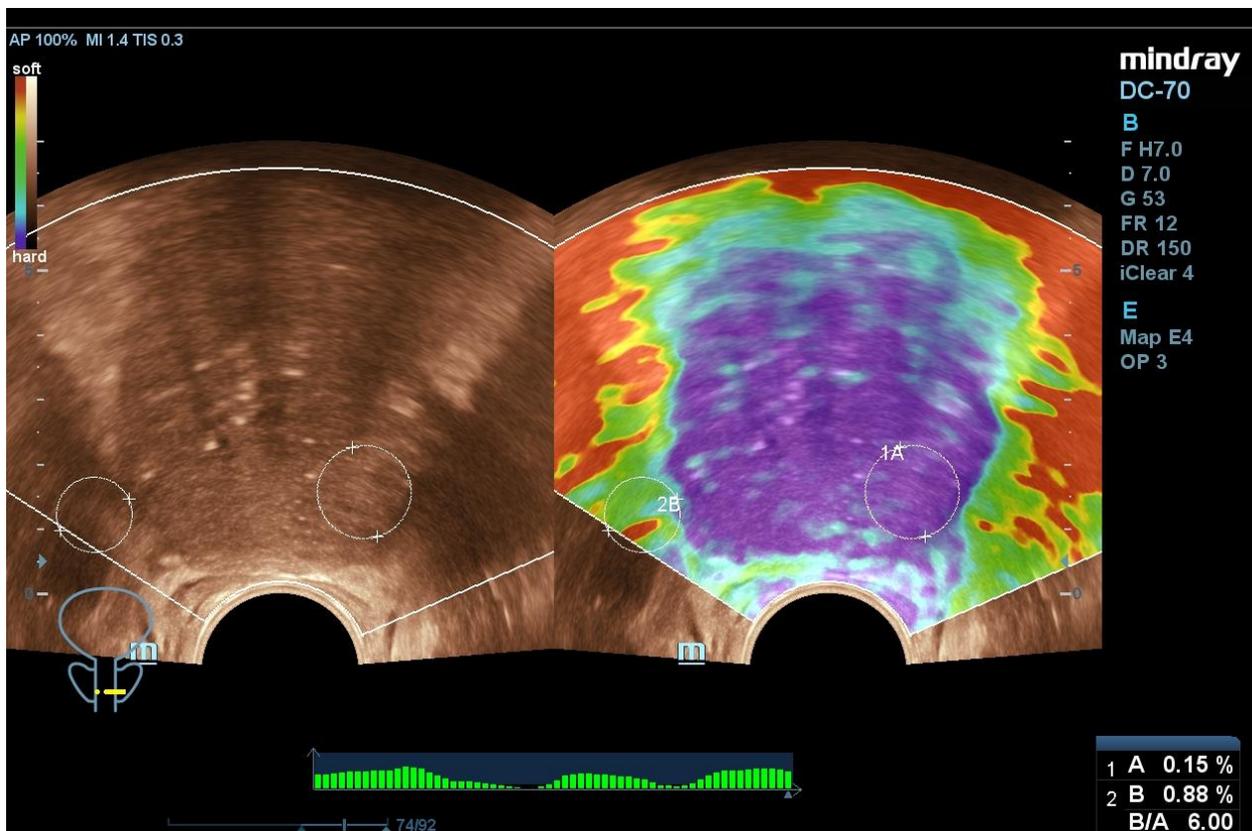


Fig.№6 RP. With TRUS in compression elastography modes

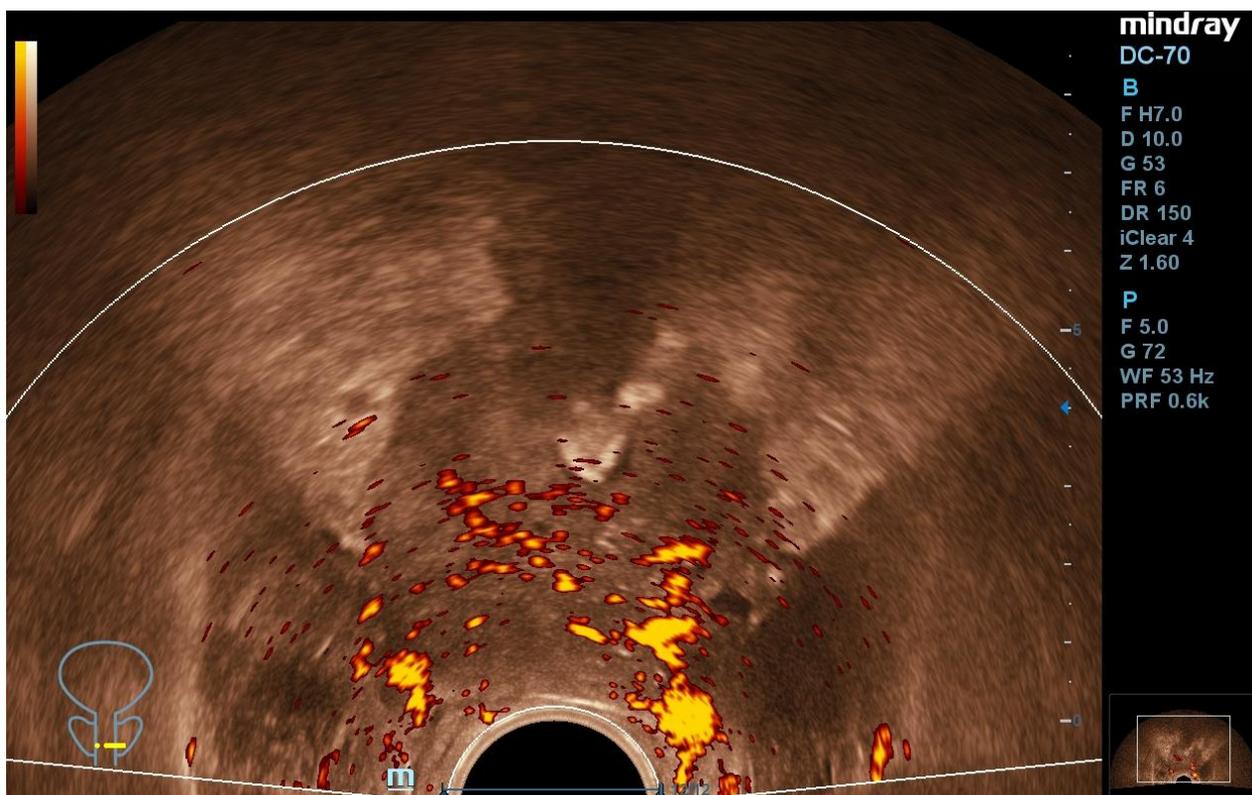


Fig.№7. PCa. With TRUS in energy Doppler modes

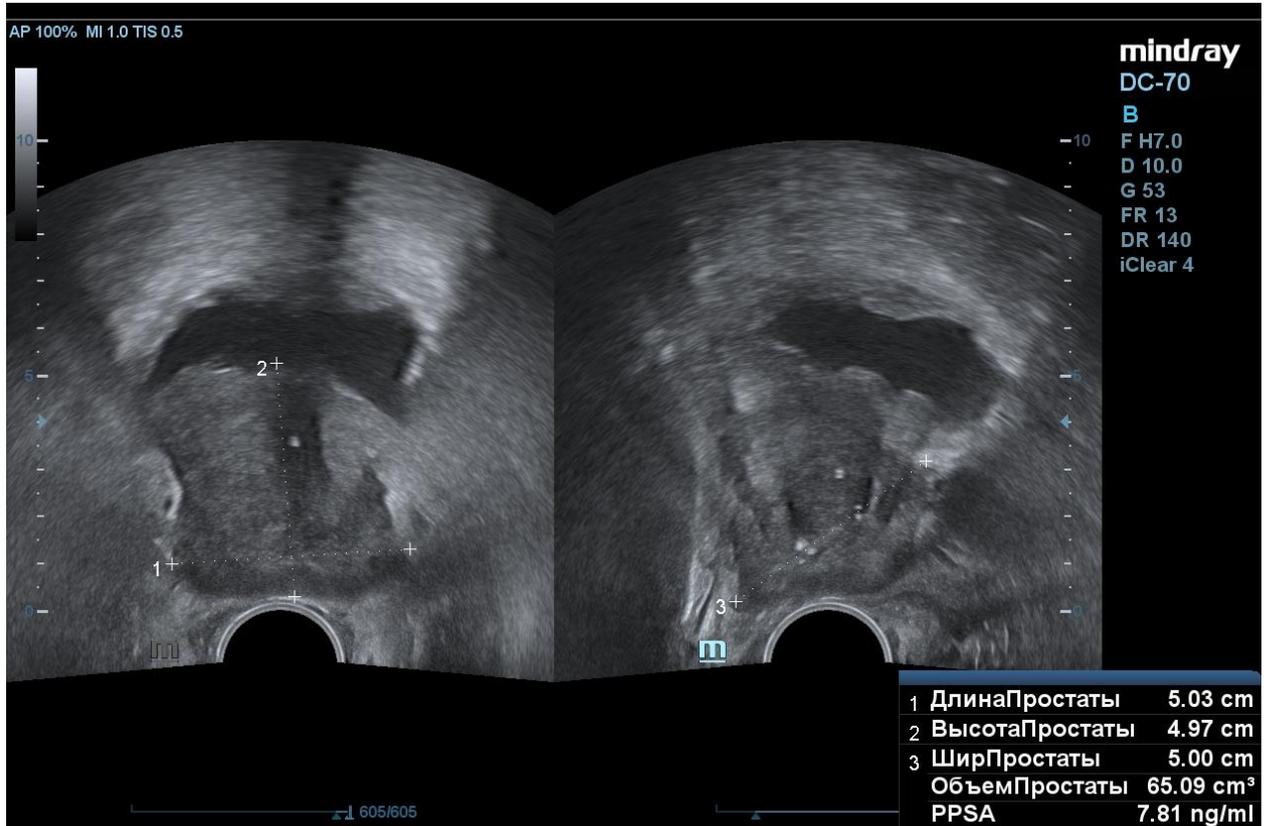


Fig.№8. PCa. With TRUS in grayscale mode



Fig.№9. PCa. With TRUS in energy Doppler modes

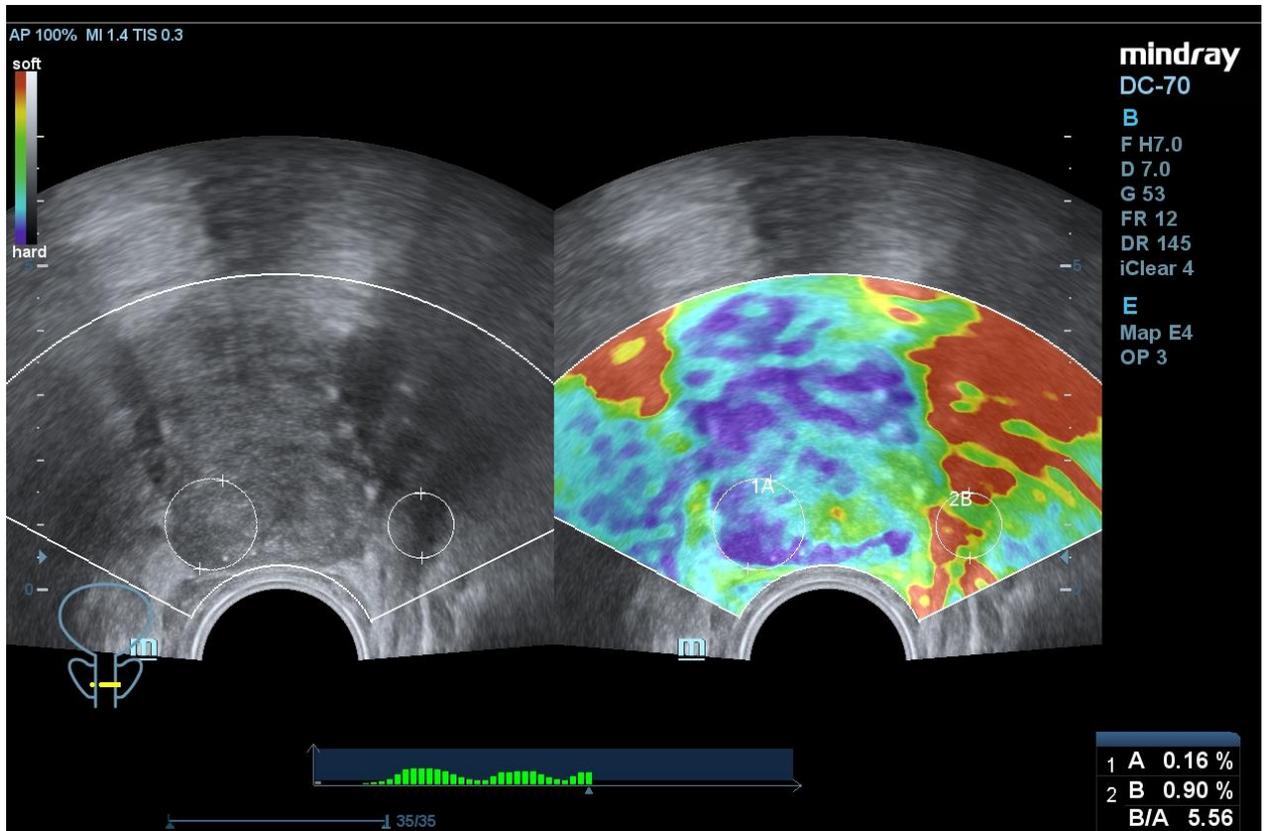


Fig.№10 RP. With TRUS in compression elastography modes

Conclusion. Thus, the TRUS technique using modern compression elastography technology allows identifying areas with a high stiffness coefficient, performing differential diagnostics of prostate cancer, and selecting patients for targeted multifocal puncture biopsy. Compression elastography enables qualitative and quantitative assessment of stiffness in PCa foci ($B/A > 4$ y . e .). Indirect signs of prostate cancer have been identified and systematized, of which the most common companions of early prostate cancer are: asymmetry of the thickness of the peripheral zone, asymmetric hyperplasia of the transition zones, areas of accumulation of microcalcifications, deformation of the "surgical capsule" of the prostate, local deformation of the vascular pattern in the power Doppler mapping mode in the projection of hypo and even isoechoic foci in the gland, local deformation of the capsule and the "border layer". Modern complex TRUS including B-mode, EDC, CDC, 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 diagnostics of malignant degeneration of nodular formations of the prostate gland.

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