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THE ROLE OF TRANSRECTAL ULTRASOUND METHODS IN THE EARLY DIAGNOSIS OF PROSTATE CANCER

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Abstract: The purpose of the study: to study the diagnostic capabilities of transrectal USAng (TRUS) in combination with compression elastography and USAng angiography in the early diagnosis of prostate cancer.

Materials and methods: 120 men examined in the period from 2020 to 2021, who were treated at the oncourology department of the Republican Scientific and Practical Center of Oncology and Radiology of the Ministry of Health of the Republic of Uzbekistan. The data obtained in the study, along with the results of the studies, were displayed in a specially developed by us patient card, which included passport data, the results of clinical, laboratory and radiological studies.

Results: The contribution of the "TRUS+USAng+EG" complex to the diagnosis of prostate cancer is very significant, especially given the wide prevalence and economic availability, the possibility of assessing not only the prostate, but also the tissues of adjacent organs and formations beyond it.

Conclusions: The usage of the complex "TRUS+USAng+EG" has a specificity of PCa diagnosis of 78.25% (p<0.001), accuracy - 78.83% (p<0.001). Elastography plays a huge role in differentiating prostate cancer from inflammatory diseases of the prostate, so in 88% of cases, prostate cancer is characterized by types III and IV elastograms (p>0.05). Ultrasonic elastography and angiography for suspected prostate cancer are necessary as part of the diagnostic complex.

Introduction. Prostate cancer (prostate cancer) is the second most common malignant tumor in men worldwide and the fifth most common cause of male mortality [8].

The American Cancer Society in 2012 recorded 241740 new cases of prostate cancer and 28170 deaths from prostate cancer in the USA [20, 23]. Moreover, in the USA, the proportion of stages III-IV of detection of prostate cancer reaches 19%.

The relevance of early diagnosis of pancreatic pathologies is undeniable in modern medicine. It is known that the use of clinical laboratory and radiation diagnostic methods has practically not solved the problem of early diagnosis of prostate cancer [1, 3, 4]. The new millennium was marked by the widespread use of ultrasound and its various supplements for diagnostic purposes in prostate pathologies [10, 12].

Modern research in the field of visualization of foci of prostate cancer is focused on two directions: magnetic resonance imaging (MRI) and transrectal ultrasound (TRUS). In the Recommendations of the European Association of

Urologists (EAU) on prostate cancer in 2021 [11], multiparametric MRI (mpMRI) is recommended before performing a primary or repeated biopsy. However, MRI is a more expensive and less accessible method compared to TRUS [14, 15]. It should be noted that there are limitations associated with claustrophobia or the presence of a pacemaker in the patient. Therefore, it is currently relevant to consider the possibilities and prospects of various USAng research methods in the early diagnosis of prostate cancer. However, ultrasound modalities such as Microdoppler mapping, elastography, contrast enhancement, and micro-ultrasound examination give promising preliminary results: either individually or in combination within the framework of a multiparametric TRUS [11].

The use in practical medicine of modern ultrasound devices for the diagnosis of prostate diseases, visualizing small newly formed vessels with Doppler enhancement, and also provides an opportunity to highlight the heterogeneity of tissue stiffness during sonoelastography, which undoubtedly enhances the diagnostic value of echography [13].

The high prevalence of prostate cancer dictates the need to further improve early diagnosis and improve the effectiveness of diagnostic measures, because the prognosis of this pathology depends on the stage of prevalence during diagnosis [12, 13].

The purpose of the study: to study the diagnostic capabilities of transrectal ultrasound methods in combination with compression elastography and US angiography in the early diagnosis of prostate cancer.

Materials and methods of the study: 120 men examined in the period from 2020 to 2021, who were treated in the Department of oncourology of the RSSPCOR of the Ministry of Health of the Republic of Uzbekistan. The data obtained in the study, along with the results of the studies, were displayed in a specially developed patient card, which included passport data, the results of clinical, laboratory and radiological studies.

The main group included 120 (76.9%) men aged 39 to 78 years, the average age of patients was 47.6±3.84 years.

In our study, we identified 2 groups, the early stages of prostate cancer T≤2 – 65 (group 1) patients and T≥2 – 55 patients (group 2).

All patients with a directional diagnosis of prostate cancer (prostate cancer) before a specific examination, we performed prostate surgery and completely excluded any infectious pathology of the urinary tract and prostate using bacterioscopy and ELISA. With negative results of the preliminary examination, we performed a comprehensive study of the pancreas, including the determination of the total and free PSA fraction and their ratio, TRUS (with Doppler and compression elastographic enhancement), MRI of the pelvic organs and targeted biopsy with histological verification of the process.

In our work, prostate US was supplemented with transabdominal US. The TASHIBO APLIO 500c device was used with a 3.5 MHz convexal transabdominal

sensor and a TRUS in In-mode with USAng and sonoelastography with an endorectal sensor with a frequency of 3.5-8 MHz.

The procedure was carried out as follows: "... after a cleansing enema with moderate filling of the bladder by inserting a rectal sensor into the rectum of the subject, who was on the left side with his knees brought to his stomach, wearing a condom and gel on the scanning surface, in order to avoid a layer of air in front of the sensor surface, he was pressed against the front wall of the rectum" [6].

On the TRUCK in the "gray scale" mode, they evaluated: "...the volume of the pancreatic tissue and its contours, the state of its own capsule, seminal vesicles, periprostatic tissues, the echo structure of the central and peripheral part of the pancreas and the presence of focal changes" [6].

Elastograms were performed as follows: "...by providing a small compression and decompression of the pancreas with a transrectal sensor, the adequacy of compression was assessed visually, focusing on the indicators of the compression scale in real time, when providing adequate compression, the indicator on the sonoelastographic image was a complete display of the capsule and a uniform distribution of the elasticity of the pancreas (in the absence of adenomatous changes in the central part), at the same time, the amplitude curve demonstrating the degree of compression effect, it did not go beyond the reference (restrictive) lines located horizontally in the upper and lower sections of the scale" [8].

The assessment of the elasticity of the pancreas was carried out according to the classification of sonoelastograms by Panfilova E.A.: "... type I mapping is characterized by homogeneous mapping in green, and reflects the average values of elasticity of unchanged pancreatic parenchyma, type II is displayed on sonoelastograms by a combination of green and red color areas, displaying medium and high elasticity of tissues, with type III mapping on sonoelastographic images, mosaically arranged areas combining fragments of green and blue color, indicating the presence of areas of increased rigidity (density), and type IV mapping is characterized by a homogeneous dense area, totally colored dark blue" [8].

Results and their discussion

With standard diagnostic methods, 48.3% (58 patients) had an early stage of breast cancer (T <2). When included in the diagnosis of TRUS+EG+USAng, 66 patients (55.0%) were assigned to T≤ 2 stage of prostate cancer, and 54 patients (45.0%) to T≥2 (Pic. 1).
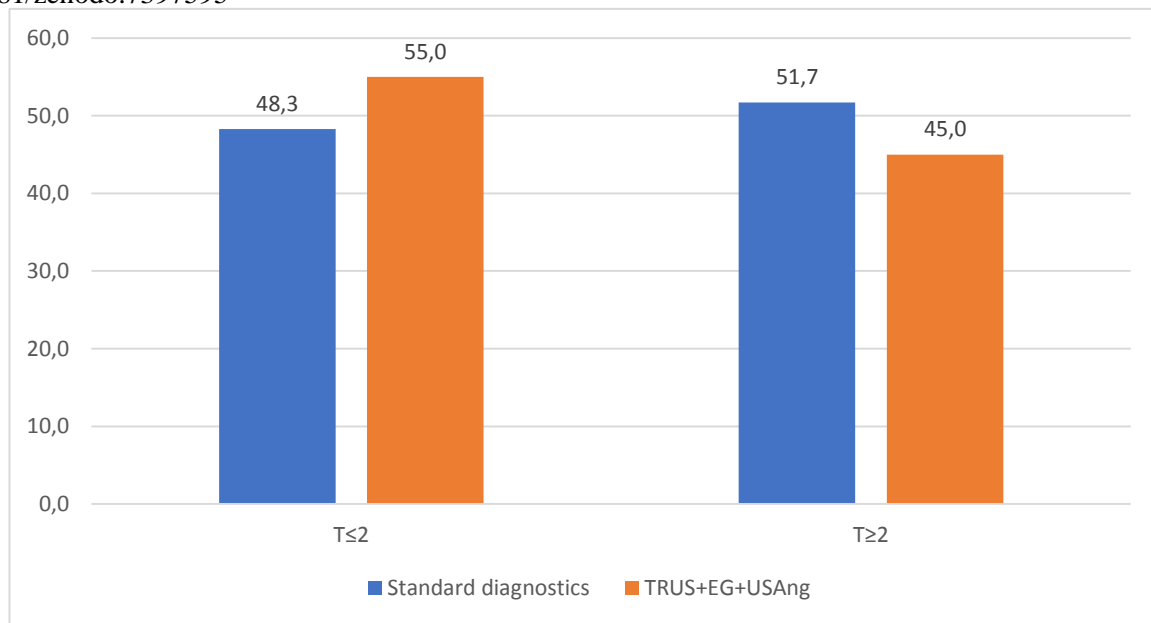
Pic. 1. Comparative assessment of the detectability of the stage of prostate cancer with the use of "TRUZI+ USAng+ EG" and with standard methods (%)

Thus, when adding TRUZI+USAng+EG in patients with and BPH, the stage increases from 48.3% to 55.0%, which in turn contributes to an increase in the proportion of patients with early stage of prostate cancer by 66.7%.

When compared with pathomorphological studies of the removed organ in 1 case (0.8%), an increase in the stage was noted (Pic. 2)
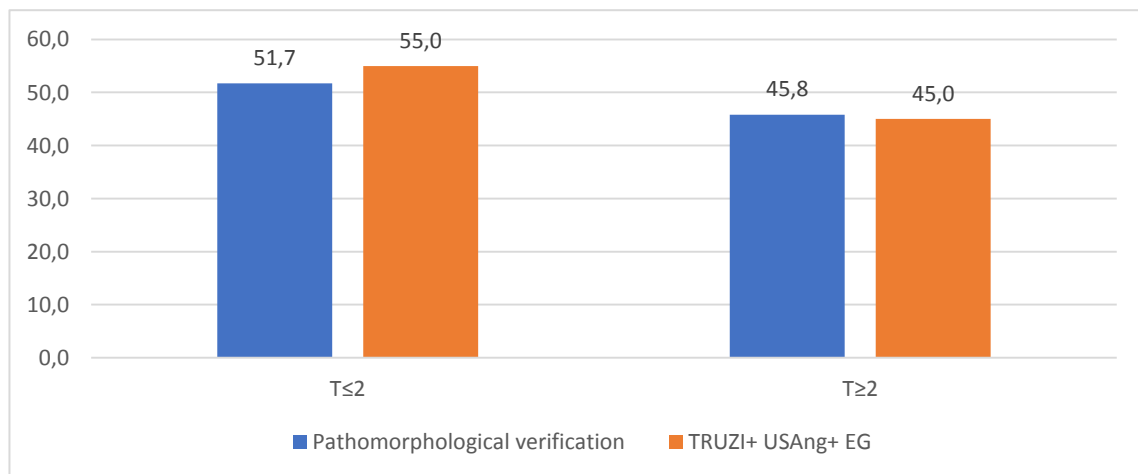
Pic. 2. Comparative assessment of the detectability of the stage of prostate cancer with the use of "TRUZI+ USAng+ EG" and with pathomorphological examination (%)

Erroneous determination of the stage of prostate cancer in the direction of growth of T2 to T3 and in the direction of decrease of T3 to T2 was found in 0.8% of the studied.

According to pathomorphological verification in 65 patients with early stage of prostate cancer, TRUS +EG+ USAng correctly identifies 78% of the affected lobes,

skips 22%, mistakenly determines the affected healthy in 6 lobes at an early stage of prostate cancer. In 55 patients with T <2, respectively – 85% and 15% (Table 1).

Table 1

Pathomorphological verification of lesions of the pancreatic lobes by "TRUS+EG+USAng"

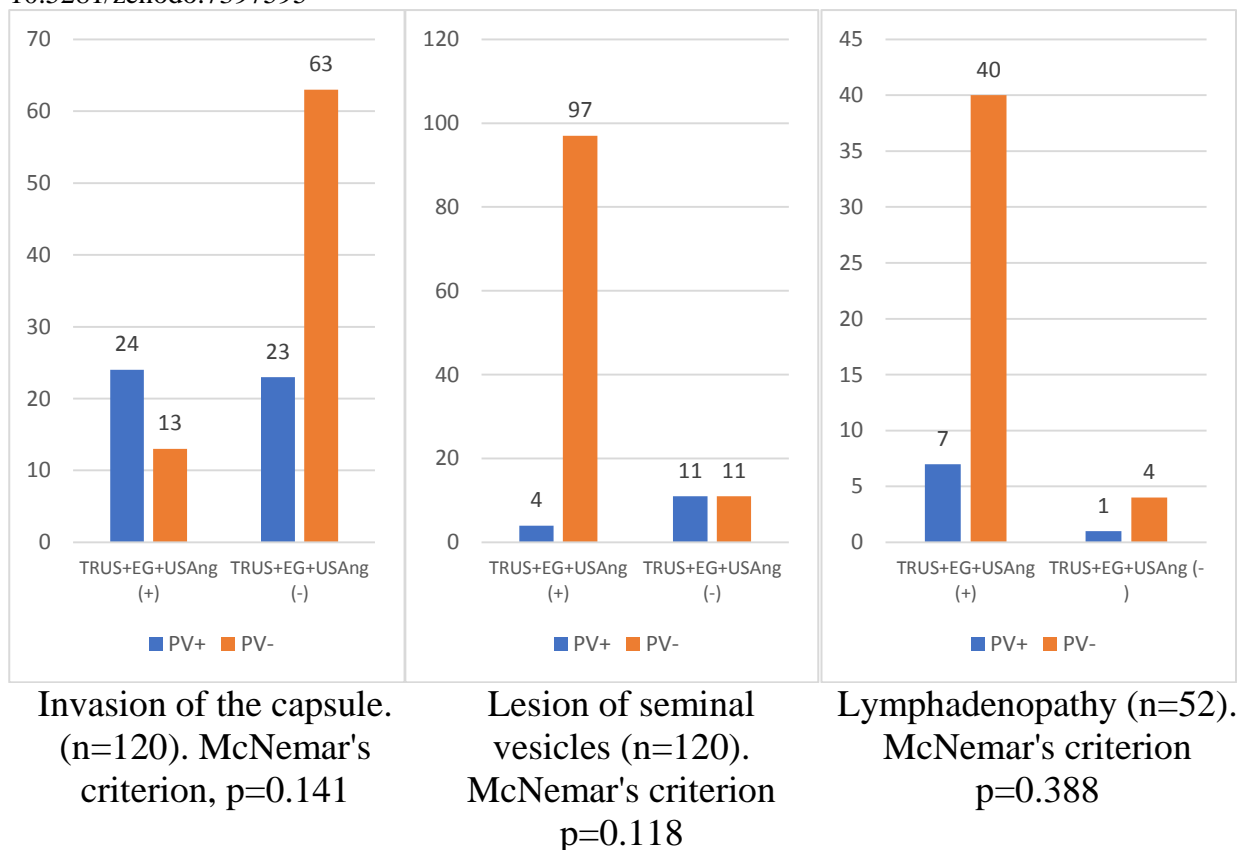|	Defeat of the pancreatic lobes by TRUS +EC+USAng (%)	
	T≤2	T≥2
Truly positive	78	85
False negative	22	15

According to pathomorphological verification, with an increase in the stage of prostate cancer, the proportion of affected prostate lobes missed by "TRUZI+UZ+EG" decreases almost twofold, the erroneous definition of prostate lesion decreases, and at developed stages is absent.

The results of the analysis of the diagnosis of invasions into the capsule and seminal vesicles, involvement of lymph nodes in the pathological process in prostate cancer, according to "TRUZI+USAng+EG" and pathomorphological verification in groups are shown in Figure 3.

The analysis of specificity, sensitivity, accuracy and positive prognostic significance of "TRUZI+USAng+EG" in the diagnosis of capsule invasions is 87%, 83%, 86% and 85%, respectively.

For invasions into seminal vesicles, sensitivity is 82%, specificity is 96%, overall accuracy is 88%, positive prognostic significance is 73%, lymph node involvement sensitivity is 80%, specificity is 85%, overall accuracy is 89%, positive prognostic significance is 93%.

According to pathomorphological verification with an increase in the stage of prostate cancer, the accuracy of the diagnosis of lesions according to "TRUZI +USAng+EG" increases, and omissions decrease, the erroneous definition was stated only at an early stage of the RPJ.

Invasion of the capsule. (n=120). McNemar's criterion, p=0.141

Lesion of seminal vesicles (n=120). McNemar's criterion p=0.118

Lymphadenopathy (n=52). McNemar's criterion p=0.388

Fig. 3. The frequency of diagnosis of invasions into the capsule and seminal vesicles, involvement of lymph nodes in prostate cancer, according to "TRUZI+USAng+EG" and pathomorphological verification in groups of patients with prostate cancer

In objectifying the stage of RPJ, the complex "TRUZI + USAng + EG" has an ambiguous meaning, excessively overestimating and underestimating the stage of the process. The number of localized and locally common stages diagnosed by the "TRUZI+USAng+EG" complex and pathomorphological verification differ only by 10%, which significantly exceeds the standard methods of diagnosis of prostate cancer.

Contribution of the complex "TRUS+USAng+EG" in the diagnosis of prostate cancer is very significant, especially given the wide prevalence and economic accessibility, the availability of the possibility of assessing not only the prostate, but also the tissues of adjacent organs and formations outside it. Of great importance is the fact that with an increase in the stage of prostate cancer, the number of erroneous estimates decreases sharply, which should be used to diagnose or exclude clinically significant prostate cancer.

Conclusions

1. The use of the complex "TRUS +USAng+ EG" has a specificity of diagnosis of prostate cancer 78.25% ($p < 0.001$), accuracy – 78.83% ($p < 0.001$), predictability of a positive test – 62.24% ($p < 0.001$), and sensitivity for stages $T \leq 2$ – 72.74% ($p < 0.02$)

2. Elastography plays a huge role in the differentiation of prostate cancer from inflammatory diseases of the prostate, so types III and IV elastograms ($p > 0.05$) are

characteristic of prostate cancer in 88% of cases, which does not allow reliably differentiating prostate cancer with adenomatous changes in the prostate parenchyma. Prostate cancer in 68% has a high stiffness of the tissue – type IV elastogram (p < 0.002).

3. Ultrasound elastography and angiography in case of suspected prostate cancer are necessary as part of the diagnostic complex, they are used after determining the PSA concentration as a technique to clarify the stages of prostate cancer.

References:

1.   Apolikhin O.I. Screening for prostate cancer: assessment from the standpoint of clinical and economic efficiency // Experimental and clinical urology. - 2015. - No. 1. - P. 12 - 14.

2.   Vasiliev A.O., Shiryaev A.A., Govorov A.V. Biomarkers in the early diagnosis of prostate cancer // Pathogenesis. - 2018. - Volume 16. - No. 1. - P. 4-10. (3)

3.   Vorobyov A.V. Prostate cancer: evolution of views // Problems of oncology. - 2009. - T. 55. - No. 2. - P. 241-250.

4.   Prilepskaya E.A. Histological features of prostate cancer // Experimental and clinical urology. - 2016. - No. 4. - S. 56-58.

5.   Rasner P.I. Accuracy of preoperative grade and staging of prostate cancer // Consilium Medicum. - 2017. - No. 7. – P. 15 - 19.

6.   Boehm K. Shear wave elastography for localization of prostate cancer lesions and assessment of elasticity thresholds: implications for targeted biopsies and active surveillance protocols // J Urol. – 2015. – Vol. 193. – №3. – P. 794–800.

7.   Bryant R.J. Predicting high-grade cancer at ten-core prostate biopsy using four kallikrein markers measured in blood in the protect study // J Natl Cancer Inst. – 2015. – Vol. 107. - №7. – p. 95-101.

8. Sung H., Ferlay J., Siegel R.L., Laversanne M., Soerjomataram I., Jemal A., Bray F. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J. Clin.* 2021; 71 (3): 209–249. https://doi.org/10.3322/caac.21660.

9.Cui T., Kovell R.C., Terlecki R.P. Is it time to abandon the digital rectal examination? Lessons from the PLCO Cancer Screening Trial and peer-reviewed literature // Curr Med Res Opin. – 2016. – Vol. 32. – №10. – P. 1-7.

10. Del Rosso A., Di Pierro E.D., Masciovecchio S. et al. Does transrectal color Doppler USAng improve the diagnosis of prostate cancer? // Arch. Ital. Urol. Androl. - 2012. - 84(1). - P. 22-5.

11. Mottet N., van den Bergh R.C.N., Briers E., et al. EAUEANM-ESTRO-ESUR-SIOG guidelines on prostate cancer-2020 update. Part 1: screening, diagnosis, and local treatment with curative intent. *Eur. Urol.* 2021; 79 (2): 243–262. https://doi.org/10.1016/j.eururo.2020.09.042.

12. Tsutsumi M., Miyagawa T., Matsumura T. et al. Real-time balloon inflation elastography for prostate cancer detection and initial evaluation of clinicopathologic analysis. // American Journal of Roentgenology. - 2010. - vol. 194. - no. 6. - pp. W471-W476.

13.Vinnik YY, Andreichikov AV, Klimov NY. Contemporary concept of the diagnosis of prostate cancer. // Urologiia. 2017 Jun; (2):110-115.

14.Walz J. The "PROMIS" of magnetic resonance imaging cost effectiveness in prostate cancer diagnosis? *Eur. Urol.* 2018; 73 (1): 31–32. https://doi.org/10.1016/j.eururo.2017.09.015.

15.Willis S.R., van der Meulen J., Valerio M., Miners A., Ahmed H.U., Emberton M. A review of economic evaluations of diagnostic strategies using imaging in men at risk of prostate cancer. *Curr. Opin. Urol.* 2015; 25 (6): 483–489. https://doi.org/10.1097/mou.0000000000000220.