Pro Index | Journal of Science in Medicine and Life
Volume: 2 Issue: 11 Year: 2024
ISSN: 2992-9202 | http://journals.proindex.uz

Practical Significance of Transrectal Doppler Ultrasonography and Ultrasonography in Prostate Cancer

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Abstract: Brachytherapy allows most patients to maintain potency and reduces the risk of urinary incontinence. But, again, there are a number of nuances that do not allow brachytherapy to become the "gold standard", some of which are:

the impossibility of correctly staging the tumor process and determining the radicality of the treatment (there is no removed sample of the prostate and lymph nodes);

the method is suitable only for patients with a minimal degree of the tumor process (not even all cases of local prostate cancer);

restrictions on the size of the prostate gland - the procedure is not suitable for patients with severe urinary disorders (difficulty urinating, slow urine flow, frequent urination, strong urges, repeated night trips to the toilet, urinary incontinence departure etc.);

The postoperative period is often complicated by problems such as acute urinary retention, which requires additional therapeutic measures.

Key points: HIFU (High Intensity Focused Ultrasound) - high intensity focused ultrasound.

One of the relatively new methods of local prostate cancer treatment. The essence of the method is that through a sensor located in the patient's rectum, under ultrasound control, a targeted thermal effect is applied to the prostate tissue, which leads to the death of tumor cells.

Despite being "young", this approach is very common in the world. This is because the least invasive (traumatic) of all methods of prostate cancer treatment is highly effective (in experienced hands).

It should be noted that HIFU is a very capricious procedure that requires very careful selection of "suitable" patients. This choice largely depends on whether the procedure will be effective (only suitable for patients with very early forms of cancer) and how high the probability of complications will be, unfortunately, not so low (acute urinary retention, stricture of the prostate gland). urethra, urinary incontinence, etc.). In any case, the technique is promising, but it is too early to talk about its role in the treatment of prostate cancer.

Hormonal therapy for prostate cancer

Prostate cancer is a disease whose development depends on the level of male sex hormones (androgens) in the blood. The lower their level, the slower the tumor develops. Therefore, another method of prostate cancer treatment is hormonal therapy, which constitutes maximum androgen "blockade". For local cancer, this approach is used only as an adjunct to the main treatment.

The simplest, cheapest and relatively safe way to reduce the level of sex hormones is bilateral removal of testicular tissue (surgical castration). Today, it is the "gold standard" of antiandrogen therapy. It is clear that this approach is very unpleasant for many patients, because in their opinion they are "deprived of masculinity". There is another method of treatment - medical "castration",

when drugs that block the production of androgens are prescribed. Modern drugs in this group are close to the removal of testicular tissue in terms of effectiveness and safety.

Prostate cancer treatment plan

Locally advanced prostate cancer extends beyond the organ, but does not affect neighboring structures and does not metastasize.

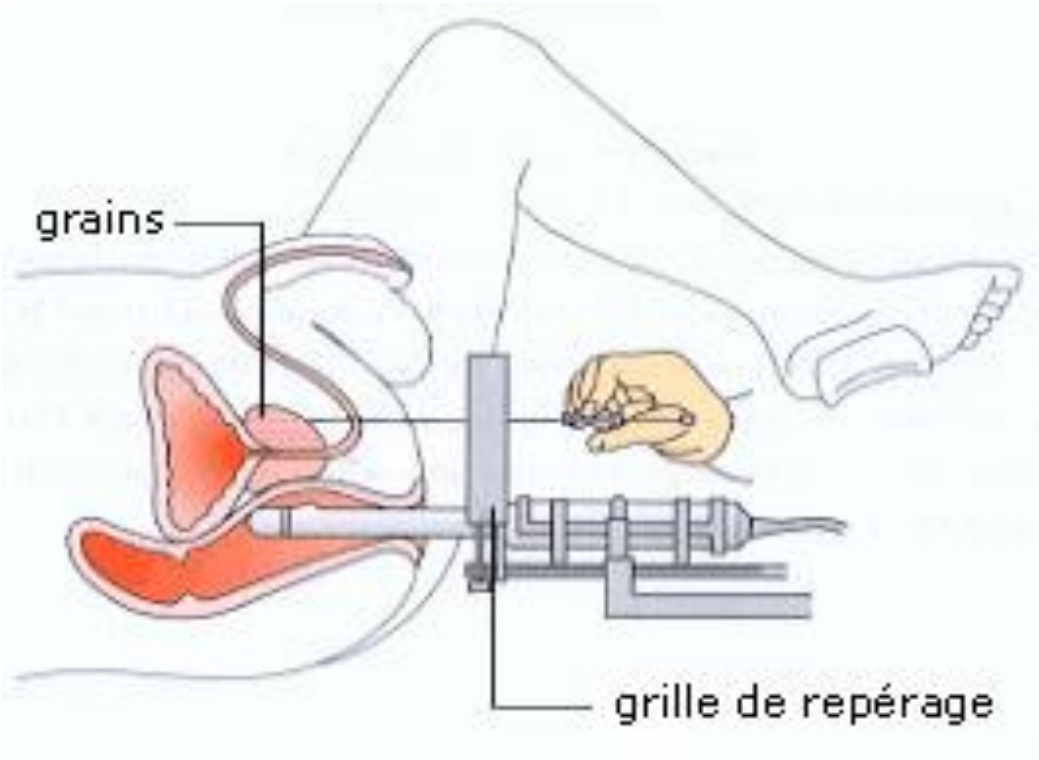
Treatment of this form of prostate cancer is a very complex and controversial problem. The decision on the method of treatment should be made strictly individually and on the basis of a comprehensive examination. In any case, the treatment of patients with locally advanced prostate cancer should be comprehensive. For operable patients, this may be followed by radical prostatectomy (adjuvant) with radiation therapy and/or a combination of hormonal therapy. Or independent use of radiation therapy, then hormonal therapy, etc. The use of modern methods of treatment of this category of patients allows us to ensure a 5-year survival rate of 70-80%.

Metastatic (common) prostate cancer, despite the 21st century, entered our country a long time ago, unfortunately, it is rare. Most often, the advanced malignant tumor of the prostate gland is the result of the imperfection of the health care system, the illiteracy of a certain doctor and the carelessness of the patient. We hear from many patients that they went to the doctor "5 years ago" with symptoms of "prostatitis" or "adenoma" and since then they have been receiving constant (and not so much) treatment. And when you ask such a patient: "Did you donate blood for PSA?" You get the traditional answer: "What is it?" Until the situation changes radically, urological oncologists will have to diagnose every fourth patient.

The main feature of common prostate cancer is the presence of metastases in lymph nodes, bones, lungs, liver and other organs. With this form of the disease, it is useless to remove the prostate gland or expose it to radiation. A competent doctor can only do two things (not including spiritual support):

slowing down the development of the tumor process and thereby prolonging the patient's life (hormonal therapy, if it is ineffective, cytotoxic therapy);

improving the patient's quality of life and / or combating life-threatening complications of prostate cancer (improving urine flow, stopping bleeding, relieving pain, preventing bone fractures due to metastases, etc.).



Our work was aimed at identifying people with prostate cancer, checking the diagnosis using both well-known diagnostic methods (prostate-specific antigen PSA, digital rectal examination, transrectal ultrasound, transrectal dopplerography of prostate vessels) and a new method - histoscopy. . During the work, a comparative analysis of standard research methods and diagnostic capabilities of histoscan for prostate cancer and hyperplasia was carried out. In addition, the diagnostic value of the method related to early detection of cancer, the accuracy of staging the process, and the impact of the obtained results on the planning of polyfocal prostate biopsy and the choice of subsequent treatment tactics were determined.

First of all, a retrospective group of patients (hereinafter referred to as the first group) was identified and examined - 67 patients with suspected prostate cancer underwent prostate biopsy from 2009 to 2011. He conducted a standard diagnostic complex for a patient with suspected prostate cancer, consisting of clinical and biochemical blood tests, detection of prostate specific antigen (total share and, according to the instructions, free (PSA total > 4 ng / ml), PSA density), general urinalysis, 3-cup test, uroflowmetry, transabdominal and transrectal ultrasound examination of the prostate gland, as well as Doppler ultrasound examination of the vessels of the prostate gland, after which a transrectal polyfocal biopsy was performed.

Next, to directly address the goals and objectives of our study, we examined 701 patients using the Histoscan device. All these patients underwent the above-mentioned standard diagnostic complex. The distribution of prostate-specific antigen levels in them was from 1.09 to 209 ng/ml.

Patients with high PSA levels who underwent histoscopy were divided into 3 groups based on the degree of its increase. Thus, 67 patients (to compare the results of prostate biopsy with and without histoscopy) and two control groups were identified.

In the first four groups (patients with suspected prostate cancer), all patients underwent prostate biopsy.

With the introduction of Histoscan, every patient who came to our clinic with a high PSA level (or with a normal PSA level, but prostate cancer was suspected by other examination methods) was assigned to one of the above groups. Then, the patients were examined according to the scheme developed for this study. This was a classic examination of a patient with suspected prostate cancer. The first step was a digital rectal examination (DRE). Seven (1.5%) of 456 patients in the second group had suspicious areas for prostate cancer. In the third group of 112 patients, 17 (15.3%) DREs were suspicious for cancer. In the fourth group, during DRE, 63 out of 70 patients had suspicious areas, that is, 87.5% of patients in this group. In the fifth group - a conditional control group - none of the 20 patients had suspicious areas detected during digital rectal examination. In the sixth group, none of the subjects had suspicious areas during DRE.

In the first group of 67 patients, 15 (22.3%) had areas suspicious for prostate cancer during digital rectal examination (Table 2).

Identification of suspicious areas during DRE in patients of research groups.

After that, a classic gray ultrasound examination - transabdominal and transrectal examination was performed, after which a Doppler examination was performed. According to the examination data, the presence or absence of suspicious foci for prostate cancer was recorded (Figure 6). It should be mentioned here that we did not take into account the changes according to TRUS and Doppler data, which are characteristic of prostatitis and prostate adenoma.

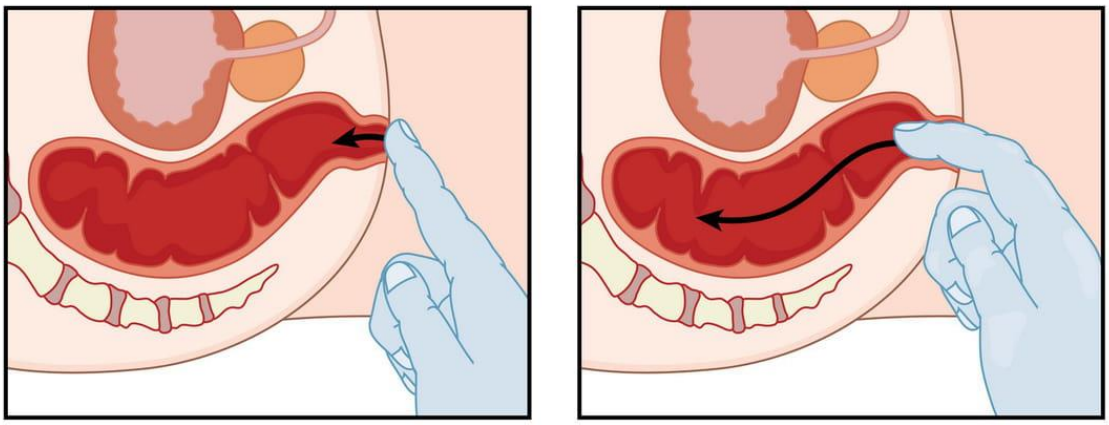
In none of the 456 patients in the second group, we found changes characteristic of prostate cancer according to TRUS and Doppler examination of blood flow of prostate vessels. In the third group with PSA thresholds of 10-20 ng/ml, ultrasound signs of prostate cancer were not found in any of the patients, as in the second group. In the fourth group, 30 out of 70 patients, i.e. 43.8%, have ultrasound signs characteristic of prostate cancer. In the fifth group, TRUS and Doppler ultrasonography of the prostate gland did not reveal changes specific to prostate adenocarcinoma in any of the patients. No changes were found in the youth of the sixth (control) group.

In the first group of 67 patients, 11 had classic hypoechoic areas suspicious for prostate cancer, which is 16.4% of all patients in the group.

The second stage of the study was to conduct a histoscope with mapping of the prostate gland for biopsy. Histoscopy begins with transrectal ultrasound.

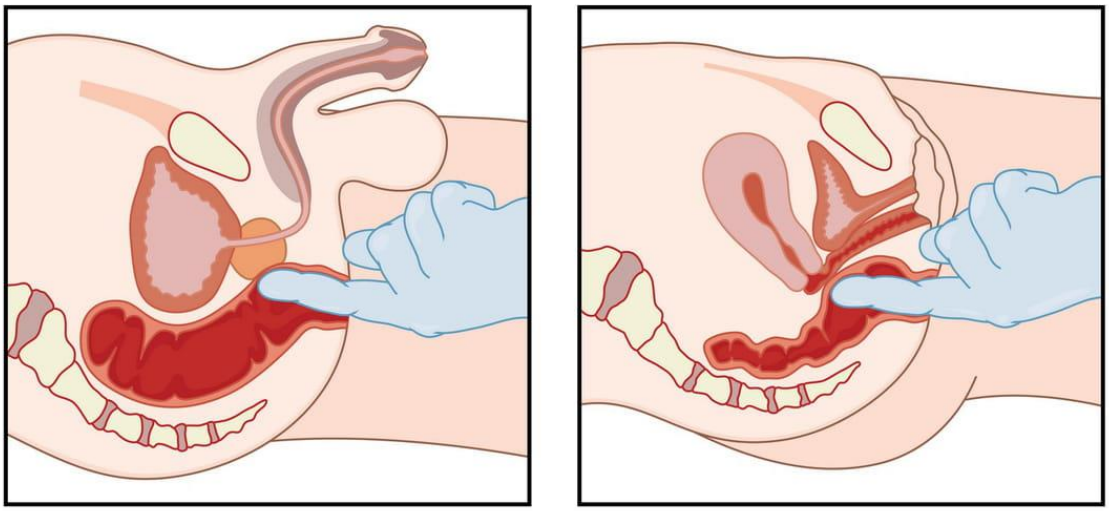
Transrectal ultrasound examination is performed in two projections: the prostate gland is shown in a transverse projection, then in a sagittal one. After that, the prostate gland is scanned in the sagittal plane. This is possible due to the fact that the sensor is mounted on a special magnetic coil that rotates 180 ° when it is in the rectum.

After that, the prostate ultrasound data is processed by HistoScan's device. During processing, histoscan creates three projections of the prostate gland. The first two: sagittal and transverse - are obtained by ultrasound scanning.



1. Insérer le bout de l'index ganté dans l'anus.

2. Le doigt doit suivre la courbe naturelle de l'anus.



3 and 4. Faire pivoter le doigt en avant pour palper les parois antérolatérales et latérales ainsi que la prostate (à gauche) ou le col de l'utérus (à droite).

Prostate gland with construction of a 3D model in 3 projections.

Prostate gland in 3 projections and 3D model with histoscopy tissue (suspicious for prostate cancer) shown in green.

In the 3D model, histoscan tissue (suspicious for prostate cancer) is shown in green.

Then the device of HistoScan (hereinafter referred to as histoscan) based on these data, independently constructs the third, virtual plane of the prostate - frontal (cranial). Based on the

information obtained from the three projections, the histoscan creates a 3D model of the prostate gland, which can be oriented in space as needed by the researcher.

After creating all the projections of the prostate gland and creating a 3D model, the researcher further defines the boundaries of the prostate, which he first independently defines. The prostate ultrasound data is then processed by the Histoscan device. Thus, in the 3D model, we obtained suspicious areas for prostate cancer. Then a map of the prostate gland was created for biopsy, where suspicious areas for prostate cancer were also marked.

In the third stage of the study, some patients with a high risk of cancer, that is, some patients in groups 3 and 4, underwent MRI with an endorectal coil, and several of them additionally underwent CT of the pelvic organs.

The fourth stage of the examination was transrectal polyfocal prostate biopsy under ultrasound control for patients of groups 2, 3 and 4 (groups 1, 5 and 6 - control).

It should be noted here that, unlike the patients of the first group, in this case prostate biopsy was performed according to the maps of the prostate gland obtained by histoscanning. For the convenience of evaluating the results of the technique, each studied prostate gland is divided into 6 zones - sextants. Histoscan provides information in cubic centimeters on the volume of each of these sextants, as well as the volume of pathological tissue in a given sextant. The device then adds and displays the total volume of the gland, as well as the total volume of lesions that are suspicious for prostate cancer in the specific prostate gland being studied. This information, due to computer processing, is more accurate than the size of the gland measured during ultrasound examination.

It should be noted that the number of sextants for each patient is constant and equal to 6 (Figure 2). But the number of sites taken during the biopsy varied and depended on the size and number of suspicious sites according to histoscopy. Biopsies from these areas were considered suspicious. We evaluated the presence or absence of a suspicious lesion based on the histoscopic data in a certain sextant and then the morphological picture of this area - this is the first way to compare the histological examination data and the morphological conclusion. Morphological findings in the study were the gold standard for prostate cancer detection. Then, the data of all studies were compared with each other.

Sextants in the prostate gland.

Prostate sextants - sagittal projection on the left, cranial on the right (tissue suspected of prostate cancer is shown in pink)

Sagittal projection of the prostate gland on the left, cranial projection on the right. Pink in both projections indicates tissue suspicious for prostate cancer. Arrows in the cranial projection of the prostate indicate sextants.

Also, in order to optimize and simplify the calculation of patient examination results using histoscan, a second method for evaluating the sensitivity and specificity of histoscan was developed. First, we counted the number of tissue cores obtained from suspicious areas during polyfocal prostate biopsy for each patient and summed their number. These were standard sutures of tissue taken from suspicious areas and additional sutures taken from suspicious areas. For example, the total number of suspicious columns of prostate tissue in the second group of patients was 2684.

Second, in the same way, we calculated for each of these patients the number of tissue columns obtained during polyfocal prostate biopsies from areas that were not changed according to histoscan. The number of these prostate tissue columns was 3700. That is, the number of columns of non-suspicious prostate tissue was 3700. This number constitutes the standard column of prostate tissue.

Sampling scheme for tissue columns for prostate biopsy.

Sampling scheme for tissue columns for prostate biopsy

Map of the prostate gland, arrows indicate sites for additional tissue sampling during prostate biopsy. Thus, a total of 16 prostate tissue columns were obtained from this patient: 12 standard and 4 from suspicious sites.

Histoscan map.

Histoscan map - locations of additional columnar collections are indicated by arrows

Grid locations for additional posts are indicated by arrows.

Next, we evaluated the morphological picture in all columns of prostate tissue and compared it with the results of histoscan.

After receiving these data, we calculated the sensitivity and specificity of the prostate cancer detection method using the Histoscan device.

In addition to the above, we developed a third method to evaluate the morphological picture in suspicious areas according to histoscopic data, which consists in conducting an additional postoperative biopsy after radical prostatectomy, in which both suspicious areas and also taken from unchanged places. tissues according to histoscopic data. For this purpose, the removed gland is specially marked in quadrants of 5 × 5 mm size. This feature made it possible to spatially correctly project suspicious areas from histoscopy data into the prostate gland. Having numbered the tissue columns, we sent them for morphological examination, which was carried out blindly, that is, the morphologists did not know which areas of the prostate they were examining (Figure 3).

Comparison of prostate mapping for blinded postoperative biopsy.

Photo of the removed prostate gland on the left, histoscopy map on the right

On the left is a photograph of the removed prostate gland (specially marked 5x5 mm), on the right is a map taken from a histoscan (also marked 5 × 5 mm).

The morphological study data were then compared with the histoscopy data. This comparison was made together with expert morphologists after radical prostatectomy. It should be noted here that there are several methods of postoperative evaluation of the prostate gland. We used the following method: first, the entire prostate was cut by a morphologist like an "open book": sections of the organ were made from the base to the apex with a 2-3 mm thick slice and were incomplete. end, that is, compared to an open book, the zone became "the binding of this book". The results of the morphological study fully confirm the histoscan data: according to the histoscan data, the node is macroscopically located in the right lobe, and during the morphological study, the node is adjacent to the prostate capsule in the right lobe (Fig. 5); .

Macroscopic specimen and prostate map.

A macroscopic sample of the prostate gland - part of the tumor tissue is surrounded by red color

A. Macroscopic preparation of the prostate gland in open-book view, with some tumor tissue circled in red.

Prostate schematic map - blue arrow indicates dashed line

B. Prostate map with dashed line indicated by blue arrow.

Thus, using histoscan data, 638 prostate biopsies were performed, their morphological findings were compared with the data of 67 prostate biopsies performed without histoscopic data, as well as with the data of 53 morphological studies after prostatectomy.

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