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ABSTRACT

The bodies of the human, whom influence low ambient temperatures in combination with the insufficient content in food products and drinking water of the hormone microcells, the processes of adaptation, are disrupted. The scarcity of the microcell of iodine leads to the development of the diseases of the thyroid gland. Region is located in the zone of the risk of the development of endemic goiter. The special risk groups this are children and is pregnant. Preventive measures for life support of the human body under the severe climate-ecological conditions, which include the methods of the group and individual protection of population, the development of the general regional program of the prevention of iodine defeatists (endemic) diseases in the Amur Region, are proposed.

Key words: the human body, cold, adaptation, microcells, risk, the preventive maintenance.

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BRACHYTHERAPY FOR PROSTATE CANCER CO-60

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Abstract: In this paper it was discussed brachytherapy for prostate cancer with the use of sources of ionizing radiation on the basis of the isotope cobalt 60 (Co60). For patients with localized prostate cancer, as well as for patients with locally advanced disease organ-saving alternative to surgery is a combined radiotherapy (CRT), one component of which is represented by brachytherapy. This technique allows achieving good results with minimization radiation complications and absence of post-operative complications.

Key words: brachytherapy, prostate cancer, irradiation, dose, dosimetric planning

Introduction. In the Russian Federation men prostate cancer takes the 4th place (6.1%) in the structure of oncological diseases after malignant neoplasms of lungs, stomach and skin, and it takes the 1st place among onkourological pathology. For the first time in 2014 there have been revealed 291 patients with prostate cancer in the Khabarovsk Region.

Therapeutic approach choice for prostate cancer treatment has always been a challenge. Traditional treatment mode for localized forms of prostate cancer is radical prostatectomy. However, it's a major, complex and traumatic operation which application is limited to high risk of complications (heavy bleeding, erectile dysfunction, urinary incontinence, etc.). For years, external beam radiation therapy (teletherapy) has served an alternative to surgical treatment. The method is rather effective but due to usage of high-dose irradiation (74-82 Gy) in radical programs there has been observed a high percentage of radiation complications (radiation ulcers, hemorrhagic prostates and cystitis), and their relief represents a long-term complicated task.

Thus, prostate cancer is a great medical and social problem. New approaches to treatment and mitigation of complications are constantly being looked for.

One of such methods is represented by brachytherapy. Brachytherapy (from the Greek «Brachios» - near, close to) deals with the delivery of radiation therapy directly into the tumor center. One of the main advantages of this method is the local dose distribution from one source and the ability to implement sources directly into the tumor, allowing minimizing errors due to patient positioning and internal organ motions.

In 2005, the Regional Clinical Oncology Center had set up two MultiSource® with Co-60 sources. This equipment was only used in treatment of gynecological patients.

In November 2009 equipment for HDR-irradiation of prostate was acquired. Specialists received specific training at various bases during the process of new technology introduction. More than ten ultrasound researches of prostate were conducted and two transperineal prostate biopsies were performed under trans rectal ultrasound (TRUS) control. The first patient was treated at 15/04/2010.

Module for HDR-irradiation prostate is equipped with: Gamma - therapeutic device “MultiSource”, working on the principle of sequential automatic introduction of sources (remote after loading);

Planning station with HDRplus software;

US - machine (GE Logiq p6);

Stepper unit- a device for stepwise introduction of ultrasonic transducer and matrix template for needles insertion;

a „prostate template“, which is a Matrix for the introduction of needles;

Steel needles $d = 1.7 \text{ mm}$ $L = 200\text{mm}$;

Transfer tubes to connect the needles to the MultiSource® afterloading system.

Stages of prostate brachytherapy session conduction:

1. Preliminary ultrasonic scanning - a patient is scanned during session conduction;
2. Determination of the amount of exposure - prostate volume to be irradiated and critical organs (bladder, urethra, rectum) are being contoured according to the ultrasound scan data;
3. Creation of preliminary irradiation plan - virtual needles is positioned in such a way as to adequately irradiate the prostate volume, and the exposure time is calculated at the points of positioning;
4. Spinal anesthesia is performed;
5. Needles are inserted according to pre-coordinates obtained
6. Amount of exposure and location of critical organs are specified;
7. Actually positioned needles are captured;
8. Planning is implemented based on actually positioned needles and irradiation plan obtained is assessed;

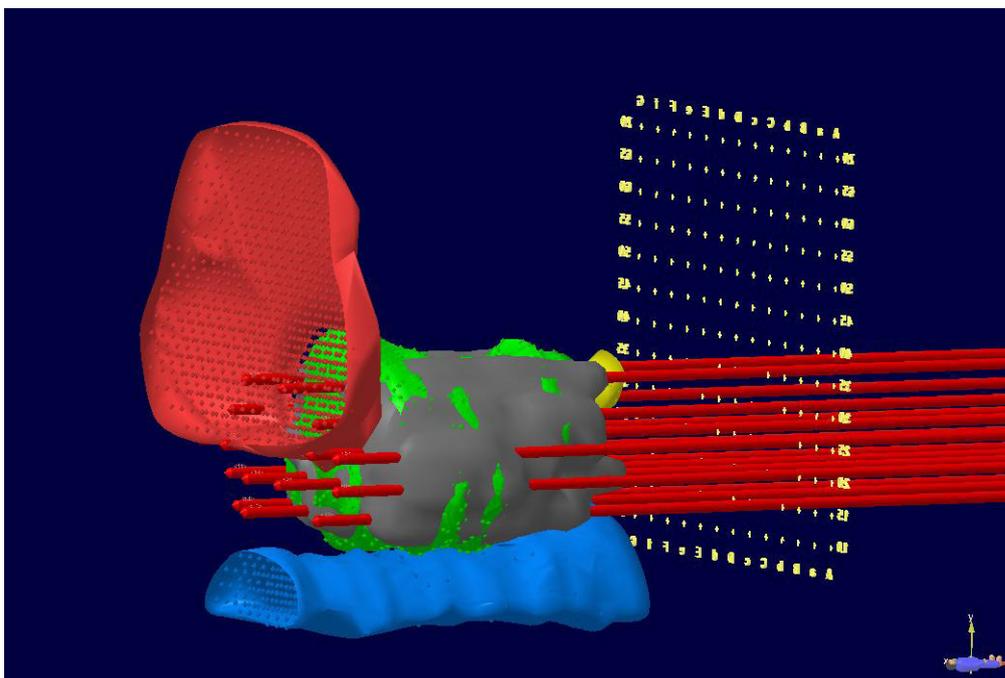


Figure 1. 3D model of dosimetric planning brachytherapy for prostate cancer.

9. Correction takes place when necessary;

10. The patient is transported into the canyon (treatment room, where MultiSource® afterloading system is located);

11. Needles are attached to the apparatus using connectors and irradiation session is carried out during which the source sequentially passes all the points of positioning across all channels. During irradiation procedure the patient is monitored by screen (vital signs - pulse, blood pressure, etc) and audio-video system.

Own data.

We performed treatment of 114 patients with diagnosis of prostate cancer T2N0M0 during the period from April 2010 to May 2015, performed 195 sessions of brachytherapy. The average patient's age was 67 years (56-78 years). Adenocarcinoma of the prostate, Gleason score 2 – 7 has been morphologically diagnosed for all the patients. Prostate volume constituted 19-62 cm³ during the examination according to TRUS data prior to brachytherapy. PSA indicators prior to treatment ranged from 1.68 to 26.4 ng/ml. The following irradiation conditions were provided during treatment - the first step was prostate brachytherapy (10 Gy, 2 fractions in 14 days), followed by radiotherapy interval up to 3 weeks and the second stage included teletherapy in the region of prostate and regional lymph nodes 44-46 Gy.

While performing the RT in this mode the critical organs (urethra, rectum, and bladder) received radiation exposure within acceptable levels. No complications were detected in all the patients treated during case follow-up period after prostate brachytherapy.

Regional Clinical Oncology Center (Khabarovsk), together with the Amur Medical Academy (Blagoveshchensk) began a series of studies aimed at are:

Comparison of effects of radiotherapy radiobiological depending on the method of fractionation and summarizing.

Determining individual sensitivity to radiotherapy.

During the session, brachytherapy is performed a biopsy of the prostate (Figure 2.).

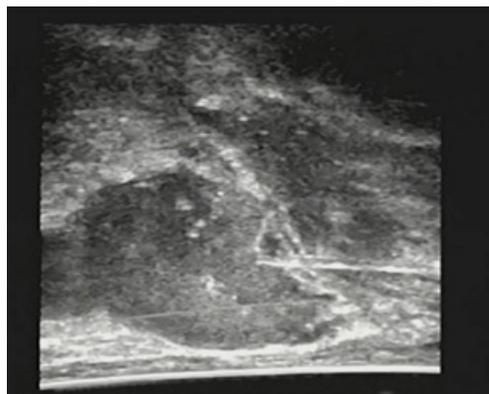
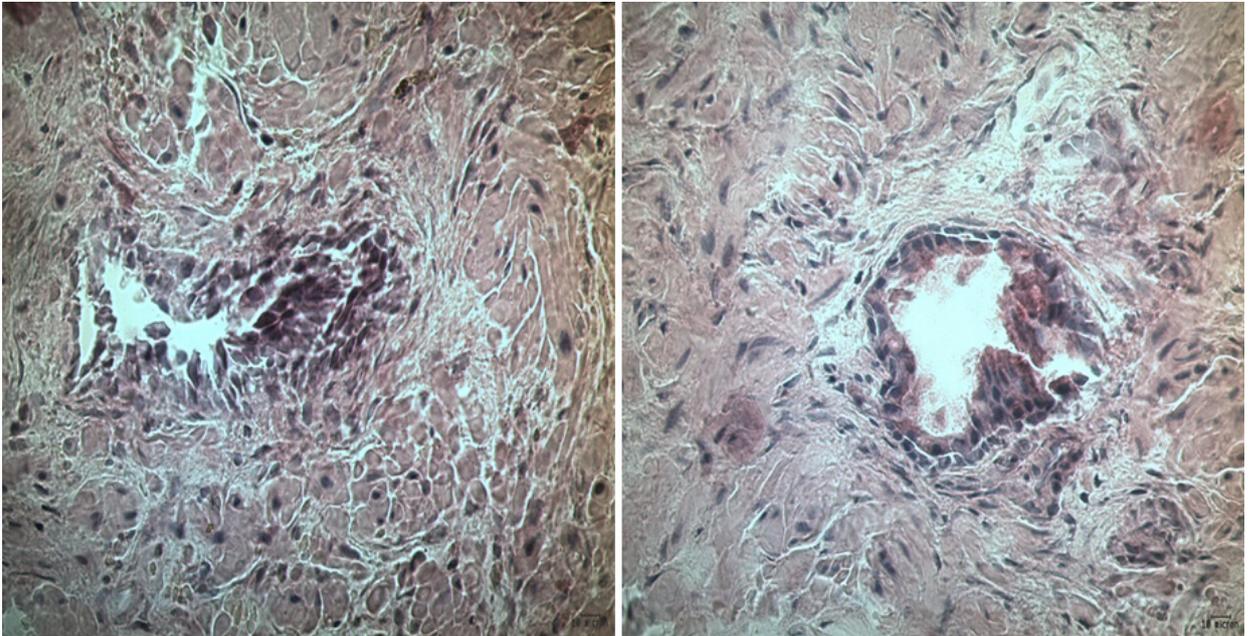


Figure 2. A biopsy of the prostate under ultrasound guidance

The analysis of the data a prostate biopsy before irradiation and after irradiation (Figure 3.).



before irradiation

b) after irradiation

Figure 3. Image biopsy material.

The advantages of this technology

Very high dose gradient (the figure shows the acus with 1.7 mm diameter, in comparison with this dimension dose drop is 20% between red and blue lines, i.e. extremely locally) (Figure 4.);

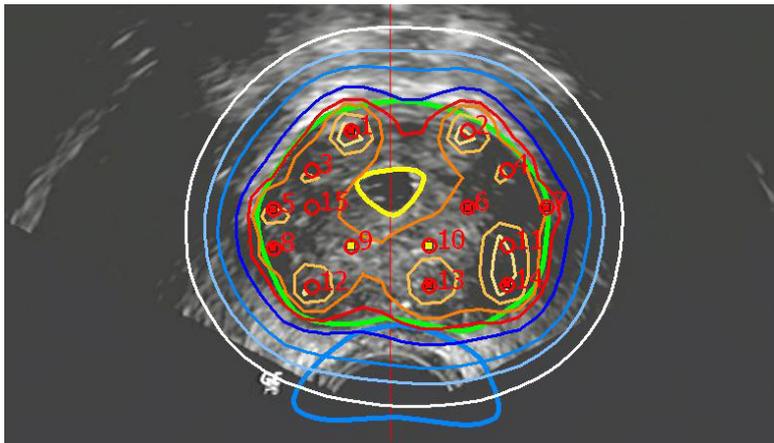


Figure 4. Very high dose gradient.

Lack of organ displacement during the treatment (prostate is permanently fixed in one position);

Minimal complications after the session;

Clinical researches show that the complications of the urinary system after Brachytherapy HDR may be lower than after the seeds LDR (I-125);

Thanks to fully automated sequential introduction of radiation source the problem of personnel's protection was solved (in comparison with grains therapy I-125);

It is possible to adjust the position of acus after assessing dosimetry plan (compared with grains therapy I-125);

Long term use of Co-60 sources (compared with grains therapy of I-125 and HDR therapy Ir-192).

Disadvantages of the Technology

invasiveness of procedure (compared to external beam radiation therapy);

Need for qualified personnel for treatment.

Conclusions. Discussion.

For patients with localized prostate cancer, as well as for patients with locally advanced disease (with a favorable prognosis) organ-saving alternative to surgery is a combined radiotherapy (CRT), one component of which is represented by brachytherapy. This technique allows to achieve good results with minimization radiation complications and absence of post-operative complications. Brachytherapy is an advanced, high-tech, effective and sparing method of radical radiotherapy of prostate cancer for patients of the favorable prognostic group.

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PHYSICAL CULTURE IN THE FAMILY.

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Exercises help to maintain health and high efficiency. Different diversity, dosage and volume of exercises develop skeletal muscles, cardio - vascular and respiratory systems. They strengthen ligaments, tendons and improve peripheral circulation.

It is desirable to take up the regular physical training through morning hygienic gymnastics. Moreover, it is better when this phenomenon becomes a family habit. A simple set of physical exercises with a gymnastic stick, a hoop, a rope, dumbbells or without items promotes quick transition from a state of the rest during sleeping, when the physiological processes are slowed down to wake and active muscle activity. The meaning of morning gymnastics is elimination of lethargy, drowsiness and stiffness. When a person is doing exercises, streams of pulses from the sensory nerve endings, located in the muscles, joints and skin, rush to the brain, increasing muscle tone. During exercises circulation, blood oxygen saturation and metabolism increase. The complex of morning exercises should begin with low-intensity exercises. Volume and intensity of the load better to be increased gradually, exercises should be alternated every 10 days.

We have conducted surveillance of a family, which consists of 4 people: a middle-aged man and a middle-aged woman of the second period, the boy 20 years old, girl 18 years old. Every member of the family performed individually tailored exercise program, which included 10 exercises with a skipping rope, walking, stretching, flexibility exercises and jumping, the program was easy and short.

The ensuing observations were performed: the measurement of blood pressure, pulse, the drawing