Mini Review of Prostate Cancer Diagnostics
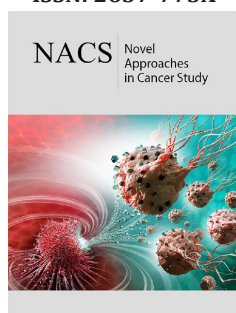
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Introduction

According to the World Health Organization (WHO) prostate cancer is the second cause of cancer death in men worldwide [1,2]. Some advanced prostate cancers have well known symptoms. However non-cancerous diseases of the prostate, such as benign prostatic hyperplasia (BPH) cause same symptoms. On the other hand, at very early stages, prostate cancer has no symptoms, the tumor dimension is quite small, and it is extremely difficult to detect it. If prostate cancer is detected at an early stage, it can be successfully cured by different methods. At the later stages, treatment or surgery has very low efficiency. Prostate cancer can often be found by measuring the amount of PSA in the blood. Most healthy men have levels under 4 nano-grams per milliliter (ng/mL) of blood. When prostate cancer develops, the PSA level usually goes above 4. However, for determination of the existence of cancer, some additional methods are used: for example: PSA velocity [3,4] and/or PSA density. Besides, measurement of the ratio of free to total PSA is additional tool in prostate cancer diagnosis [5]. However, the major drawback of PSA determination is its relative lack of specificity. The PSA level can also be increased by benign prostate hyperplasia (BPH) - a non-cancerous enlargement of the prostate, prostatitis, etc.

Digital rectal examination (DRE) is one of methods for prostate cancer diagnosis. The vast majority of prostatic carcinomas arise in the peripheral zone of the prostate. This part of the gland is accessible by DRE [6,7]. The DRE screening test for prostate cancer requires to assess the size, shape, and texture of the prostate and nearby organs. The sensitivity and specificity of a DRE examination is subject to a physician's skill, the clinician's ability to interpret what is felt, and the nature of the patient's disease. Although DRE can detect prostate cancer, it has limited sensitivity. Unfortunately, many cancers detected using DRE are either locally or regionally advanced. Prostate cancer may be identified on Trans-rectal ultrasound (TRUS) as a hypoechoic lesion. However, only 60% of prostate cancers appear hypoechoic on ultrasound while most of the remaining cancers appear isoechoic with respect to the surrounding parenchyma [8]. Because other disease processes, such as BPH and prostatitis may have a similar appearance to prostate cancer, it is impossible to reliably differentiate these lesions from prostate cancer based on ultrasonographic characteristics alone. Consequently, TRUS should not be used as a first line screening study as it lacks acceptable specificity.

The biopsy. At early stage of cancer, the needle may not even go where a cancer exists. So, it is common to have repeated biopsy being performed. And still, any cancer may go undetected. Biopsy is efficient if other methods reliably detect and locate the presence of suspicious areas [9,10]. If a man actually does have prostate cancer, a prostate biopsy usually releases cancer cells into the blood stream. These cancer cells then travel through the body where they can potentially colonize and grow. Thereby, biopsy correlates with the risk of disease extension and cancer progression. Besides, biopsy might cause complications: Typical prostate biopsy complications include painful infection, bloody semen, inability to urinate, bleeding rectum [11].

Magnetic resonance imaging (MRI) uses a powerful magnetic field, radiofrequency (RF) pulses and a computer to produce detailed pictures. MRI requires a radiologist and a physician specifically trained to supervise and interpret radiology examinations. MRI cannot always distinguish between cancer tissue and inflammation or presence of blood products

within the prostate, which sometimes occurs related to a prostate biopsy [12]. Positron emission tomography (PET) is a technique that produces a three-dimensional image of functional processes in the body. The system detects pairs of gamma rays emitted indirectly by a positron-emitting radionuclide (tracer), which is introduced into the body on a biologically active molecule. Three-dimensional images of tracer concentration within the body are then constructed by computer analysis [13]. Prostate cancer antigen 3 (PCA3), also referred to as DD3 is a gene that expresses a non-coding RNA. But more research is needed to find exactly how much PCA3 in the urine is a sign of prostate cancer. The PCA3 test isn't yet accurate enough to be used on its own as a test for prostate cancer [14]. In recent years attention was directed to the possibility usage of infrared tomography as a new tool for prostate cancer visualization [15-17], however results are obtained on isolated prostates and there is a need for farther investigations on alive patients. .

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