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Research Article

Anteriorly located prostate cancer: a particular diagnosis

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Abstract. Objective: The aim of the study is to evaluate prostate cancer (PCa) diagnosis in case of lesions localized in the anterior part of the gland. When PCa is localized anteriorly it is harder to be diagnosed, due to the fact that digital rectal examination (DRE) identifies only lesions localized in the PZ which is in the posterior part of the gland, and also systematic biopsies are not usually obtained from the area. Therefore, MRI-TRUS Fusion biopsy is the optimal technique to evaluate anterior lesions, due to the possibility to obtain bioptic samples from all prostate regions. Material and method: We analyzed our prospective maintained database of patients who presented in our department with biochemical, clinical and imaging suspicion of PCa between November 2017 and July 2021. Out of the 758 patients, we identified 30 patients with the suspect lesion localized in the anterior part of the gland at the mpMRI. Results: Prostate cancer was confirmed in 76.7% of patients, 91.3% of the patients could have been diagnosed only with the help of the targeted cores. The percentage of prostate cancer found on the targeted biopsies was significantly greater than the percentage found on the systematic biopsies. Also a correlation between the PIRADS v2.1 score and PCa diagnosis was established. Conclusion: Even though PCa situated anteriorly is a challenging diagnosis, by performing MRI-TRUS Fusion biopsy, the limitations of the systematic biopsy are overcome.

Key Words: prostate cancer, mpMRI of the prostate, targeted biopsy, MRI-TRUS Fusion biopsy, anterior lesions of the prostate

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Introduction

Prostate cancer (PCa) remains an important health issue being the second most frequent malignancy (after lung cancer) in men worldwide and accounting for 3.8% of deaths caused by cancer in men (Bray et al 2018, Feral et al 2019). Usually originating from the peripherical zone (PZ) it is easily identified by digital rectal examination (DRE). Despite this, studies performed on the specimens of radical prostatectomy have shown that 21% of cancers originate from the anterior part of the gland (Bott et al 2002). Anterior prostatic region is not available to clinical evaluation and PCa diagnosis is delayed (Greene et al 1995; Demura et al 2005).

Also the anterior region of the prostate is not part of the systematic biopsy template (Bott et al 2002) so patients require several biopsies until diagnosis. Repetitive prostate biopsies increase the risk for complications such as hematuria, urinary retention and urinary infection (Loeb et al 2011).

Trans-rectal ultrasound (TRUS) is helpful to guide the prostate biopsy, but it has a low accuracy for the PCa diagnosis due to its heterogenous ultrasound appearance (Ghai et al 2012; Dudea et al 2011). Less than half of the lesions visible on TRUS are confirmed malignant (Dyke et al 1990). As a result, new imaging modalities were developed for prostate evaluation and mpMRI has become the new standard for the PCa diagnosis (Ahmed et al 2017).

According to the EAU guidelines, prostate biopsy is recommended in each of the following situations elevated PSA, positive DRE or mpMRI suspicious lesions. Optimal moment for mpMRI evaluation is before the prostate biopsy (Mottet et al 2021). Prostate mpMRI contains two main anatomic sequences (T1 and T2 weighted imaging – WI) and functional sequences such as diffusion weighted imaging – DWI, apparent diffusion coefficient-ADC and dynamic contrast enhancement – DCE (Wu et al 2021). According PIRADS v2.1, prostate lesions are classified on a scale from 1 to 5 in dependance with the risk of clinically significant PCa (PIRADS 1: very low - PIRADS 5: very high) (Turkbey et al 2019). Biopsy is recommended for all lesions with a score of 3 or higher. In case of biopsy naive patients, a combination of both targeted (TBx) and systematic biopsy (SBx) is recommended, while for those with prior negative biopsies, SBx may be omitted (Mottet et al 2021).

In this study we evaluated MRI-TRUS Fusion accuracy of PCa diagnosis in case of lesions located in the anterior fibromuscular stroma (AFMS) with or without extension in the anterior transitional zone (TZa).

Materials and methods

We analyzed our prospective maintained database of patients referred to our clinic with the PCa suspicion (elevated PSA, positive DRE a PIRADS 3,4,5 lesion on mpMRI) and were evaluated by MRI-TRUS Fusion biopsy. Among the 785 patients evaluated between November 2017 and July 2021, 30 patients had anterior lesions situated in the AFMS or TZa. Patient approval for participation in medical research was obtained by signed consent in the admission day. And the study was approved by the ethical committee of our hospital. Multiparametric MRI was performed in our center in 10 cases, while the rest of the patients in secondary centers.

Prebiopsy preparation protocol was detailed before (Andraș et al 2019). The procedure was performed in an outpatient setting and after discharge the patient only had to continue the antibiotic prophylaxis for another 3 days.

Our MRI-TRUS Fusion biopsy technique was described in detail before (Andraș et al 2021). As a summary, the procedure begins with a software synchronization the sagittal and axial mpMRI images and marking of the suspect lesion and urethra. After the performing the fusion of the MRI and TRUS images, 2-4 targeted biopsy core are obtained, followed by 12 cores of the systematic biopsy. The systematic biopsy was tailored in dependance with the suspect lesion location, with 2-3 cores being obtained from the vicinity of the nodule.

Pathologic analysis was performed by two specialized uro-pathologists, with an experience of more than 5 years. PCa diagnosis was made on finding an adenocarcinoma of the prostate with a Gleason score of 6 or more.

We analyzed the data of the patients using the MedCalc statistical software, applying the adequate tests for nominal and continuous data. A P-value of <0.05 was considered statistically significant. The Chi square test has been used to emphasis the correlation between PIRADS score and the histopathological results.

Results

Patients baseline characteristics are listed in table 1. The mean age of patients was 64.06±7.61 years, mean PSA level was 16.67±16.69 ng/mL and 26.7% patients had a suspicious DRE. Patients had a mean prostate volume of 53.20±24.04 cc. The mean size of the lesion was 20.38±7.30 mm. Ten (33.3%) patients had previously undergone a prostatic biopsy without a diagnosis of malignancy, out of them one had 4 biopsies, 3 patients had 2 and 6 had one.

Seventeen (56.7%) lesions were located strictly in the AFMS while 13 (43.3%) both in AFMS and ipsilateral TZa. The PIRADS score had the following distribution: 6 (20%) patients had a PIRADS 3 lesion, 6 PIRADS 4 and 18 (60%) a PIRADS 5.

The results of the biopsy are seen in table 2. Prostate cancer diagnosis was made for 23 (76.7%) of the patients, 4 (17.4%) of them were diagnosed only on the targeted cores, 2 (8.7%) only on the systematic cores and the rest -17 (73.9%) from both the targeted and systematic positive cores. For 21 (91.3%) of the patients diagnosed with prostate cancer the diagnosis could have been done only by performing the targeted biopsies.

The mean number of positive fragments per procedure was 5, while for TBx was 2 and for SBX 3.

Table 1. Baseline characteristics of study population

Patients (n)		30
Age (years) mean±SD		64.06±7.61
PSA (ng/mL) mean±SD		16.67±16.69
Positive DRE n (%)		8 (26.7%)
Prostate volume (cc) mean±SD		53.20±24.04
Anterior lesion size on MRI (mm) mean±SD		20.38±7.30
No.of patients with prior negative PB		10 (33.3%)
Overall PIRADS score n (%)		
	3	6 (20.0%)
	4	6 (20.0%)
	5	18 (60.0%)
Total		30

SD-standard deviation; PSA-prostate specific antigen; DRE-digital rectal examination; MRI- magnetic resonance imaging; PB- prostate biopsy; PIRADS prostate imaging reporting and data system

Table 2. Pathological results of the prostate biopsy

PCa (n/%)		23 (76.7%)
HBP (n/%)		5 (16.7%)
Other (n/%)		2 (6.6%)
No.positive fragments median (CI)		5.0 (3.0-6.0)
No.positive targeted fragments median (CI)		2.0 (1.0-2.6)
No.positive sistematic fragments median (CI)		3.0 (1.0-4.0)
% targeted positive fragments/total targeted fragments (%)		56.52%
% sistematic positive fragments/total sistematic fragments (%)		25.72%
		P=0.0017
PIRADS score and no. of PCa diagnosed		
	3	1 (4.3%)
	4	5 (21.7%)
	5	17 (73.9%)
Total		23

PCa- prostate cancer; BPH- benign prostatic hyperplasia; PIRADS prostate imaging reporting and data system

Percentage of positive tissue on the targeted cores (56.52%) was significantly higher (P=0.0017) than the percentage of positive tissue from the systematic cores (25.72%).

A positive correlation between the PIRADS score and the PCa was observed (P = 0.0008). Out of the patients diagnosed with PCa 17 (73.9%) had a PIRADS score of 5, 5 (21.7%) a score of 4 and only 1 (4.3%) a score of 3 (table 2).

Discussions

Anterior lesions represent a challenge for every urologist using standard screening methods like PSA and DRE. These lesions

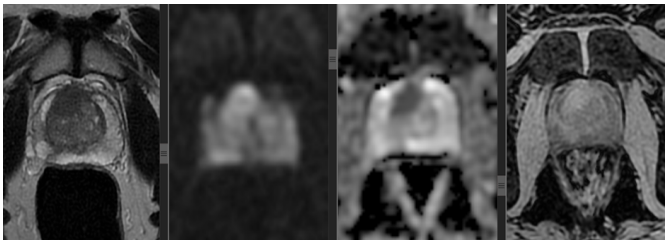

Fig.2 The mpMRI of a 61 years old patient, with a PSA level of 6.4 ng/ml, no prior prostate biopsy and an anterior lesion in the right lobe with a PIRADS score of 5.

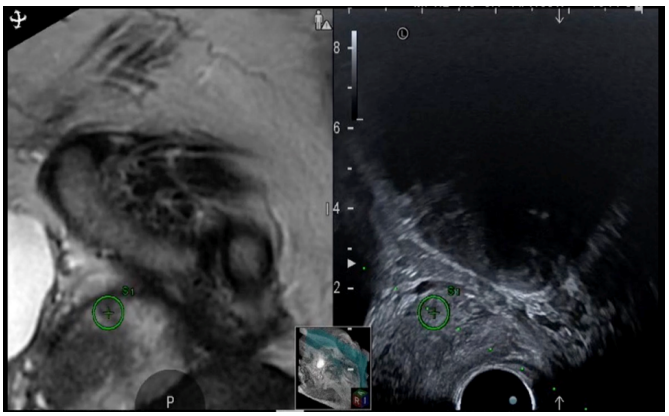

Fig.3 MRI-TRUS FUSION aspect after synchronization. Anterior located lesion marked on both the MRI and ultrasound image

are the ones at risk of being missed on a 12 core TRUS biopsy as shown by Numao et al (2012) and also by the fact that 33.3% of our patients had previously undergone one or several standard systematic biopsies. Anterior PCa is underdiagnosed and presenting larger dimensions as seen in our patients who had a PIRADS 5 (>15mm in diameter) lesion in 73.9% of cases.

By adding the mpMRI before every biopsy as a standard of care, anterior lesions get to be seen. Performing an MRI-TRUS Fusion improves detection rate of prostate cancer as shown by Volkin et al (2014) who achieved an improvement in the detection rate of Pca of 95% by adding MRI-US Fusion guided biopsies, having an overall positivity rate per anterior lesions of 50.2%. We managed to diagnose 76.7% of our patients, which is a large number and 91.3% of the patients could have been diagnosed only on the results of the targeted biopsies. This can be attributed to the fact that the great majority of patients had a PIRADS 5 lesion, and also because we are a tertiary center and the only ones offering this procedure in the northwest region of the country. Another reason is that we took into consideration all PCa the clinically significant and insignificant ones.

For highly suspicios lesions like PIRADS 5 we had a diagnostic rate of 73.9%, for the moderate suspicios ones – PIRADS 4 of 21.7% and for PIRADS 3 of 4.3%. This data resembles with literature findings (Volkin et al 2014; Murphy et al 2017). Murphy et al (Murphy et al 2017) who performed a cognitive fusion prostatic biopsy for the anterior lesions when they correlated the biopsy results with the PIRADS score they had a slightly higher diagnostic rate. They managed to have a correlation of 90% for PIRADS 5 lesions, 33% for PIRADS 4 and 29% for PIRADS 3 respectively, but a lower overall diagnosis yield of only 46.2%.

We also took into account the diagnostic rate of anterior lesions compared to other parts of the prostate were the diagnosis yield ranges between 49% (Benelli et al 2020) and 36% (Pepe et al 2018) depending on the fusion technique used and the definition for clinically significant cancer employed. The goal of our study was not to compare the diagnosis rate between clinically significant or clinically insignificant prostate cancers but to show that with the help of IRM-TRUS Fusion biopsy technique we can improve diagnosis even if it is to do active surveillance afterwards or a radical intent treatment.

The main advantages of MRI-TRUS Fusion biopsy are possibility to integrate and optimize the prostate biopsy in dependance of the mpMRI, short duration of the procedure which is done in an outpatient setting and under local anesthesia, minimal morbidity and without burdening the healthcare system. Alternative approaches like saturation biopsy or transperineal biopsy would require another form of anesthesia such as general or peridural and so prolonging hospital stay. Also, cognitive targeted biopsy does not allow a real-time use of mpMRI images, while in bore targeted biopsy has higher costs due to necessity to use MRI friendly material.

Our study has some limitations: patients underwent mpMRI of the prostate in different institutions and the interpretation was performed by various radiologists but still uniformity of the results is given by scoring the lesions with the PIRADS v2.1 system.

Conclusions

In conclusion, MRI-TRUS Fusion prostate biopsy enables accurate sampling of lesions in the anterior part of the prostate, allowing high tumor detection by only using the targeted biopsies.

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