



# CURRENT ROLE OF MAGNETIC RESONANCE IMAGING IN THE SCREENING, DIAGNOSIS, AND TREATMENT OF PROSTATE CANCER

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**ABSTRACT:** Prostate cancer is the most common cancer in men. Diagnosis of prostate cancer poses a significant challenge, due to several different key parameters that need to be evaluated, such as age, history of prostate specific antigen (PSA), clinical examination and more recently magnetic resonance imaging (MRI). The current diagnostic pathway for prostate cancer has resulted in overdiagnosis and overtreatment as well as underdiagnosis and missed diagnoses in many men. Multiparametric MRI (mp-MRI) of the prostate has been identified as a test that could alleviate these diagnostic errors. Before prostate cancer treatment pathological confirmation is mandatory. Prostate biopsy is an invasive procedure with rare but not negligible potential complications. There are several methods of prostate biopsy of which most common are systemic or planar prostate biopsy and cognitive or targeted MRI-guided prostate biopsy. Multiparametric MRI has demonstrated better accuracy and reproducibility in detecting, locating and evaluating prostate cancer and also sparing some men unnecessary biopsies. Recent studies have shown a mpMRI benefit for better procedure planning regarding prostate cancer location, extent of disease and length of the urethra. There are still some challenges ahead, such as ensuring high-quality execution and reporting of mpMRI and ensuring that this diagnostic pathway is cost-effective. According to the latest urological clinical guidelines mpMRI became fundamental tool in management of prostate cancer. The aim of this study is to give a brief insight in use of mpMRI in prostate cancer diagnosis and treatment

**Key words:** *prostate cancer, mpMRI, prostate biopsy, prostate cancer diagnosis and treatment*

## Introduction

Prostate cancer (PC) is the most common cancer in men and as such has important consequences for healthcare systems accounting for around 9 billion eu-

ros annually in EU. According to the “White paper on prostate cancer” yearly around 450,000 men in Europe are diagnosed with PC. In last few years it has become the most common cancer among men and is now the second commonest cause of male cancer death. It has killed 107,000 men in Europe in 2018 and thus is more deadly than breast cancer in women (1). Diagnosis of prostate cancer poses a significant challenge, due to several different key parameters that need to be evaluated, such as age, history of prostate specific

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antigen (PSA), clinical examination and more recently magnetic resonance imaging (MRI). The current diagnostic pathway for prostate cancer has resulted in overdiagnosis and overtreatment as well as underdiagnosis and missed diagnoses in many men. Multiparametric MRI (mp-MRI) of the prostate has been identified as a test that could alleviate these diagnostic errors (2,3,4,5).

## Discussion

The primary goal of prostate cancer (PC) assessment is disease characterization and precise staging. Precise stage determination is therefore crucial in treatment method selection and the extent of therapy. Before any treatment of PC prostate biopsy is mandatory. Prostate biopsy is an invasive procedure with rare but not negligible potential complications. There are several methods of prostate biopsy in which mpMRI has demonstrated better accuracy and reproducibility in detecting, locating and evaluating prostate cancer and also sparing some men unnecessary biopsies. In the FUTRE trial authors found no significant differences in the detection rates of prostate cancer among the different techniques of guided biopsy (6). When and in which men biopsy is needed has been a question in years. One of the problems of the systematic biopsy is overdiagnosis or detection of clinically insignificant prostate cancer insignPCa. There has been a direct comparison of systemic vs targeted biopsy published by Marloes van der Leest *et al*, which showed that in biopsy-naïve men, the MRI pathway compared with the TRUS pathway resulted in an identical detection rate of csPCa, with significantly fewer cases of insignPCa. Not performing immediate TRUS biopsy after negative MRI is at the cost of missing csPCa only in 4% (7). Similar data has also been shown by Olivier Rouvière *et al* in "MRI-FISRT" trial (8). Recently more than ever topic of PSA screening has been discussed. According to EAU guidelines PSA testing is advocated in well informed men after counseling them about potential risks and benefits. In 2021 a study published by David Eldred-Evans *et al* compared the PSA testing, MRI, and ultrasonography as screening tests for prostate cancer. The study disclosed that using MRI score of 4 or 5 to outline a positive test in screening for prostate cancer compared with PSA alone at 3 ng/mL or higher was linked with more men diagnosed with clinically significant cancer. This did not increase the number of men warned to undergo

biopsy or over diagnosed with clinically insignificant cancer (9). Risk-adapted approach for the early detection of prostate cancer was also addressed in paper by Hendrik Van Poppel *et al* in which they conclude to be able to reverse current unfavorable trends and ultimately save lives (13). As mentioned earlier prostate cancer poses a great burden to healthcare systems due to high diagnostics and treatment costs. mpMRI as tool has been shown to be more cost effective in PC diagnosis when compared to standard diagnostics. A study published by Ivan Pezelj *et al* showed that mpMRI and subsequent mpMRI guided biopsies can reduce the overall cost in prostate cancer diagnostics despite the procedure itself being an additional cost. This is achieved by omitting prostate biopsies in patients with low malignancy risk (11). Rita Faria *et al* in PROMIS study presented similar data (10). Surgery as a treatment have several intents of which oncological outcome is of most importance. Continence level and erectile functions are also fundamental parts of surgery. Urethral length was thought to be one of the factors in achieving continence level. A paper by Kosuke Kitamura *et al* addressed this issue. This paper showed correlation between length of urethra on MRI and postoperative continence. So, planning and advising patients beforehand could be discussed before surgery (12).

## Conclusion

This promising data have shown benefit of mpMRI for better procedure planning regarding prostate cancer location, extent of disease and length of the urethra. There are still some challenges ahead, such as ensuring high-quality execution and reporting of mpMRI and ensuring that this diagnostic pathway is cost-effective. In recent years mpMRI has becoming fundamental tool in management of prostate cancer.

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### Sažetak

## TRENTNO MJESTO MAGNETSKE REZONANCE U PROBIRU, DIJAGNOSTICI I LIJEČENJU RAKA PROSTATE

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Rak prostate najčešći je karcinom u muškaraca. Dijagnoza raka prostate predstavlja značajan izazov zbog nekoliko različitih ključnih parametara koje je potrebno procijeniti, kao što su dob, povijest prostata specifičnog antigena (PSA), klinički pregled i u novije vrijeme multiparametrijski MRI (mp-MRI). Trenutna dijagnostika raka prostate rezultirala je prekomjernom dijagnostikom i liječenjem, kao i poddijagnozom i propuštenom dijagnozom kod mnogih muškaraca. Multiparametrijski MRI prostate identificiran je kao test koji bi mogao ublažiti ove pogreške. Prije liječenja raka prostate obavezna je patološka potvrda. Biopsija prostate je invazivan postupak s rijetkim, ali ne i zanemarivim potencijalnim komplikacijama. Postoji nekoliko metoda biopsije prostate od kojih su najčešće sistemska ili planarna biopsija prostate i kognitivna ili ciljana biopsija prostate vođena MRI-om. Mp-MRI pokazao je bolju točnost i reproducibilnost u otkrivanju, lociranju i procjeni raka prostate, a također je poštedio neke muškarce nepotrebne biopsije. Nedavne studije pokazale su korist mpMRI-e za bolje planiranje zahvata s podacima o lokaciji raka prostate, opsegu bolesti i duljini uretre. Pred nama su još neki izazovi, poput osiguravanja visokokvalitetne izvedbe i izvješćivanja o mpMRI-u te osiguravanja da je ovaj dijagnostički put isplativ. Prema najnovijim urološkim kliničkim smjernicama mpMRI je postao temeljni alat u liječenju raka prostate. Cilj ove studije je dati kratak uvid u upotrebu mpMRI-e u dijagnostici i liječenju raka prostate

Ključne riječi: *rak prostate, mpMRI, biopsija prostate, dijagnostika i liječenje raka prostate*