



Optimal approach for MRI-targeted prostate biopsy in detecting clinically significant prostate cancer: transperineal or transrectal?

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Prostate cancer (PCa) remains one of the most significant contributors to male morbidity and mortality worldwide. Advancements in diagnostic approaches have played a pivotal role in improved clinical outcomes for affected patients. Among these, the emergence of magnetic resonance imaging (MRI)-targeted biopsy represents a significant breakthrough, with numerous studies reporting its superior efficacy compared to conventional systematic biopsy in detecting clinically significant prostate cancer (csPCa) and identifying high-risk cases (1,2). However, whether the transrectal (TR) or transperineal (TP) approach is more effective for cancer detection remains a subject of ongoing debate. To date, ten systematic reviews or meta-analyses have addressed this question; however, definitive conclusions remain elusive (3-12). A notable limitation of these studies is the inclusion of both retrospective and prospective designs, often without focusing exclusively on randomized controlled trials (RCTs). Furthermore, heterogeneity in MRI-targeted biopsy techniques adds to the challenge of reaching a consensus. Given the limited number of RCTs on this topic, the study by Mian *et al.*, which directly compares these two approaches through an RCT, provides valuable Level 1 evidence (13).

In their primary outcome of csPCa detection, TR-Bx achieved a detection rate of 47.1%, compared to 43.2% for

TP-Bx, showing no significant difference between the two approaches. While some studies have suggested that TP-Bx may be superior for detecting anterior lesions, Mian *et al.* did not observe such a difference. Similarly, the overall PCa detection rates were comparable—72.1% for TR-Bx and 70.4% for TP-Bx. These findings are supported by a meta-analysis that included three RCTs, which also concluded that overall cancer detection rates as well as the identification of csPCa do not significantly differ between the two approaches (*Table 1*) (12).

Hu *et al.* conducted a comparative analysis of RCTs involving 287 TP cases and 280 TR cases, reporting overall cancer detection rates of 70% for TP and 72% for TR, with no statistically significant difference (14). Similarly, the csPCa detection rates were 53% for TP and 50% for TR. Another RCT by Ploussard *et al.*, which evaluated 134 TP and 136 TR cases and focused on targeted biopsy outcomes due to the exclusion of systematic biopsies, reported overall cancer detection rates of 47% for TP and 54% for TR, again without a significant difference (10). Collectively, these three RCTs indicate that MRI-targeted biopsy yields comparable detection rates for both overall PCa and csPCa, regardless of the approach used.

When comparing MRI-targeted biopsies, it is crucial to consider not only the biopsy approach but also the

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Table 1 Characteristics and oncological outcomes of prospective randomized studies on MRI-targeted biopsy comparing transrectal and transperineal

| Characteristics | RCT 1 | RCT 2 | RCT 3 |
|--------------------------------|--------------------------------|-----------------------------------|--------------------------------|
| Authors | Hu <i>et al.</i> (14) | Ploussard <i>et al.</i> (10) | Mian <i>et al.</i> (13) |
| Year of publication | 2024 | 2024 | 2024 |
| Patient recruitment | Multicenter | Multicenter | Multicenter |
| Biopsy facility | Multicenter | Multicenter | Single center |
| Biopsy type | Targeted and systematic biopsy | Targeted and/or systematic biopsy | Targeted and systematic biopsy |
| Patient population (TP vs. TR) | 287 vs. 280 | 134 vs. 136 | 398 vs. 384 |
| MRI fusion methods | | | |
| TP | Commercial platform | Software | Software |
| TR | Commercial platform | Software | Software |
| Anesthesia | | | |
| TP | NA | Local or general | Local |
| TR | Local | Local or general | Local |
| Overall PCa detection* | | | |
| TP | 200 (70%) | 60 (47%) [†] | 70% |
| TR | 203 (72%) | 71 (54%) [†] | 72% |
| csPCa detection [†] | | | |
| TP | 151 (53%) | NA | 43% |
| TR | 140 (50%) | NA | 47% |

*, Overall PCa and csPCa detection outcomes are presented as number (rate); [†], csPCa detection defined as \geq ISUP 2; [‡], PCa detection rates derived from target biopsy. cs, clinically significant; MRI, magnetic resonance imaging; NA, not available; PCa, prostate cancer; RCT, randomized controlled trial; TP, transperineal; TR, transrectal; US, ultrasound.

technique used to translate MRI findings into ultrasound (US)-guided targeting. Cognitive targeting, where the operator mentally maps the lesion from MRI, and software-assisted targeting, where MRI data are fused with US imaging, represent two distinct techniques. Some studies have employed different targeting methods depending on whether the TR or TP approach was used (15). Notably, in Mian *et al.*'s study, both approaches utilized software-assisted targeting, a methodological consistency worth highlighting.

It is important to acknowledge potential limitations regarding the generalizability of their findings. Key factors influencing generalizability include operator expertise and institutional resources. Stabile *et al.* reported that the detection rate of csPCa using MRI-fusion biopsy is 1.7 times higher when performed by experienced operators compared to non-experts (16). Furthermore, Halstuch *et al.* demonstrated that

the learning curve for detecting cancer in PI-RADS 3 lesions via MRI-fusion biopsy requires 110 cases for the TR approach and 125 cases for the TP approach, underscoring the significant role of operator proficiency in biopsy accuracy (17). Additionally, it is important to note that this study employed the UroNav 3.0 image fusion platform. Variability in imaging platforms may influence diagnostic performance, and differences in equipment should be considered when interpreting the study's results. These raise the question of whether these results can be applied broadly across different clinical settings. Future studies should evaluate MRI-targeted biopsy in multicenter settings to confirm the reproducibility and external validity of these findings.

This study is particularly valuable in that both biopsy approaches were performed under local anesthesia. Typically, TR biopsies are conducted using a caudal block or spinal anesthesia, allowing the procedure to be performed in

an outpatient clinic without the need for inpatient facilities. Additionally, regarding antibiotic use, prophylaxis was limited to a single day for the TR approach, while routine antibiotics were not administered for the TP approach. If this strategy proves effective, as the authors suggest, it is possible that factors other than antibiotic resistance and prophylaxis play an important role in the development of post-biopsy infections. Given the anesthesia and antibiotic protocols employed in this study, this approach may enhance patient acceptance of biopsy procedures.

In conclusion, Mian *et al.* conducted a RCT comparing csPCa and overall PCa detection rates in MRI-targeted biopsies performed via TP and TR approaches. The study found no statistically significant differences in detection rates between the two approaches.

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Footnote

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