STHLM3-MRI study: Role of magnetic resonance imaging-targeted biopsy in prostate cancer screening

Abhay S. Gaur*

Department of Urology, AIIMS, Bhubaneswar, Odisha, India

*E-mail: abhay.vibhugaur@gmail.com

SUMMARY

The role of magnetic resonance imaging (MRI) for the screening of prostate cancer (PCa) is not yet defined. A recent population-based, prospective, randomized, and noninferiority trial compared the efficacy of MRI-targeted prostate biopsy (MRIPB) with standard 10–12 core transrectal ultrasound-guided prostate biopsy (TRUSPB).49,118 men of the age group of 50–74 years were screened of whom 12,750 participated in the study. All the participants underwent two screening tests: the prostate-specific antigen (PSA) test and the Stockholm3 test. The Stockholm3 test assesses variables such as age, first-degree family history of PCa, previous biopsy, blood biomarkers, and a polygenic risk score to predict the risk of PCa of Gleason score (GS) ≥7. Cutoff values for screening tests were PSA ≥3 or Stockholm3 scores (SS) ≥11%. Patients who met the inclusion criteria (n = 2293) were randomly assigned in a 2:3 ratio to either the standard biopsy (SB) group (n = 603) or to the experimental biopsy (EB) group (n = 929). The EB group underwent biparametric-MRI. Those who had prostate imaging reporting and data system (PIRADS) scores of 3–5 underwent both MRIPB and TRUSPB. Biopsies were reported according to the international society of urological pathology (ISUP) 2014 guidelines. The trial’s primary outcome was to detect the percentage of participants with clinically significant cancer (CSC) (ISUP grade ≥2) in both the groups. The secondary outcomes were the detection of benign biopsies (BB), clinically insignificant cancers (CIC) (ISUP Grade 1), cancers of ISUP Grade ≥3, and serious adverse events in each group. If the lower boundary for the 95% two-sided confidence interval (CI) in the absolute difference in CSC between the two groups was >−4, then the experimental strategy would be deemed noninferior. If the lower boundary was greater than 0, then the experimental design would be considered superior.

CSC was significantly higher in the EB group than the SB group (21% vs. 18%; 95% CI, −1–7; P < 0.001). The experimental study was deemed noninferior to the standard strategy in an intention-to-treat analysis. The EB group also had lower CIC and BB than the SB group (4% vs. 12% and 11% vs. 43%, respectively). Patients with a negative MRI but SS ≥25% underwent biopsy to reveal 6 CSC and 5 CIC. Ignoring the additional TRUSPB in the EB group decreased the probability of detecting CSC to 17% and did not meet the noninferiority criteria. For every CIC avoided, it would have delayed the detection of 1.7 CSC. There was no statistically significant difference in the correlation of biopsy GS to GS obtained after radical prostatectomy between the EB and SB groups. To conclude, MRIPB + SB is noninferior to SB for detecting CSC and results in lower detection of CIC.

COMMENTS

There has always been a dilemma in screening for PCa and virtually no screening program exists for one of the most common cancers among males. The PLCO[2] and the ERSPC[3] trials reported contradictory results [Table 1]. The PRECISION[4] and PROMIS[5] studies established the role of MRI in PCa and prostate biopsy [Table 2]. Furthermore, superior results with combined biopsy (MRIPB + TRUSPB) for the detection of PCa have already been demonstrated.[6]

The STHLM3MRI study uses PSA, Stockholm3, and MRI for screening. It is the first to infer the role of MRI for systematized screening. It has successfully shown that combining MRIPB with TRUSPB is noninferior to the standard TRUSPB but failed to show the same as a stand-alone entity. A novel risk stratification test, Stockholm3, has also shown good results. However, its long-term efficacy and global acceptance are yet to be determined.

Biparametric-MRI (BPMRI) was used in this study instead of the standard multiparametric-MRI. BPMRI was initially considered less effective for the detection of CSC and was mainly used for follow-up, but recent studies have shown that BPMRI is equivalent to MPMRI for the detection of CSC. In addition, BPMRI reduces the acquisition time, reading time, cost, and the gadolinium accumulation in the body.[7,8]

In developing countries like India, where most of the population does not have health insurance, MRI will surely
help avoid unnecessary biopsies. However, bearing the additional cost of MRI and MRPB would be an issue, especially when MRI is often not readily available. In such scenarios, risk stratification models can be more helpful. Robust randomized controlled trials are required to validate the role of MRI in PCa screening and until then, PSA, digital rectal examination, and SB remain the method of choice for the screening and detection of PCas.

REFERENCES

1. Eklund M, Jäderling F, Discacciati A, Bergman M, Annerstedt M, Aly M, et al. MRI-targeted or standard biopsy in prostate cancer screening. N Engl J Med 2021;385:908-20.
2. Pinsky PF, Miller E, Prorok P, Grubb R, Crawford ED, Andriole G. Extended follow-up for prostate cancer incidence and mortality among participants in the prostate, lung, colorectal and ovarian randomized cancer screening trial. BJU Int 2019;123:854-60.
3. Hugosson J, Roobol MJ, Månsson M, Tammela TL, Zappa M, Nelen V, et al. A 16-yr Follow-up of the European randomised study of screening for prostate cancer. Eur Urol 2019;76:43-51.
4. Kasivisvanathan V, Rannikko AS, Borghi M, Panebianco V, Mynderse LA, Vaarala MH, et al. MRI-targeted or standard biopsy for prostate-cancer diagnosis. N Engl J Med 2018;378:1767-77.
5. Ahmed HU, El-Shater Bosaily A, Brown LC, Gabe R, Kaplan R, Parmar MK, et al. Diagnostic accuracy of multi-parametric MRI and TRUS biopsy in prostate cancer (PROMIS): A paired validating confirmatory study. Lancet 2017;389:815-22.
6. Ahdoot M, Willbr AR, Reese SE, Lebastchi AH, Mehralivand S, Gomella PT, et al. MRI-targeted, systematic, and combined biopsy for prostate cancer diagnosis. N Engl J Med 2020;382:917-28.
7. Wallström J, Getterud K, Kohestani K, Maier SE, Mansson M, Pihl CG, et al. Bi- or multiparametric MRI in a sequential screening program for prostate cancer with PSA followed by MRI? Results from the Göteborg prostate cancer screening 2 trial. Eur Radiol 2021;31:8692-702. [doi: 10.1007/s00330-021-07907-9].
8. Wang B, Gao J, Zhang Q, Zhang C, Liu G, Wei W, et al. Investigating the equivalent performance of biparametric compared to multiparametric MRI in detection of clinically significant prostate cancer. Abdom Radiol (NY) 2020;45:547-55.