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Magnetic Resonance Imaging-Transrectal Ultrasound Fusion Biopsy of the Prostate—An Update

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Introduction

Prostate cancer (PCa) is amongst the most common malignancies in males. Based on the recent Surveillance, Epidemiology, and End Results Programme (SEER) data for 2017, PCa accounts for 9.6% of all the newly diagnosed cancers and 4.4% of all the cancer-related deaths.[1] A large majority of the biopsy-proven PCa are indolent and do not result in increased mortality, as indicated by the high 5-year survival rate of 98.6%.[1] This translates into the need for vigorous follow-up care and active surveillance, which potentially adds to the expense and emotional burden on the patient.

Routine systematic transrectal ultrasound (TRUS)-guided biopsy has a low detection rate for PCa and tends to miss tumors located anteriorly, in the lateral peripheral zone and those in high volume prostates. Additionally, a large number of the detected tumors tend to be indolent and clinically insignificant. Hence the need of the hour is the detection of clinically significant PCa, a significant step towards which has been acquired with the utilization of high-resolution magnetic resonance imaging (MRI) and MRI-targeted biopsies. MRI-TRUS fusion biopsies carry the advantages of MRI which include higher contrast resolution and detail, at the same time not compromising on the advantages of ultrasound, i.e., portability, real-time guidance, and patient comfort apart from saving valuable MRI gantry time for other purposes. The evidence with fusion biopsies is growing along with expertise of the operators and these biopsies may have a bigger role to play in the future. This article aims to provide a detailed description of the technique, advantages as well as the disadvantages of MRI-TRUS fusion biopsies.

TRUS-guided Systematic Biopsies: The Current Status and Pitfalls

Screening for PCa is done by digital rectal examination and serum prostate specific antigen (PSA) levels. Patients with abnormal digital rectal examination findings or elevated PSA (>4 ng/mL) undergo systematic 12-core TRUS-guided biopsy (the number and location of the cores vary depending on the institutional preference) to confirm the diagnosis, provide pathologic grade (Gleason score) for prognostication and risk stratification, as well as for localizing the tumor.

Ultrasound has poor sensitivity in the visualization of isoechoic peripheral zone and fares poorly in differentiating central zone proliferative nodules from PCa. Systematic TRUS-guided biopsies are not aimed at identifying and targeting PCa specifically for biopsy. These procedures are targeted at obtaining cores from all the prostatic zones with the presumption that the tumor focus also gets included in the biopsy sample. However, systematic TRUS-guided biopsies sample only approximately 1% of the gland. Hence, not surprisingly, they have poor sensitivity in the detection of PCa, especially for low volume tumors. Anterior, lateral peripheral zone, and apical tumors are frequently missed because of inaccessibility and poor visualization. The sensitivity further drops in case of high volume glands. This results in the need for multiple repeat biopsies, which increases patient anxiety and cost. A large observational study of 10,429 biopsies observed a detection rate of 34% for systematic TRUS-guided biopsy. The detection rate declined progressively for each of the subsequent repeat biopsies.[2,3] The detection rate is around 25% for sextant biopsies and upto 40% for the extended biopsy schemes.[4] Often saturation biopsies (extensive sampling >20, usually

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