Multiparametric magnetic resonance imaging of prostate: the evolution of a technique

Ressonância magnética multiparamétrica de próstata: a evolução de uma técnica

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Prostate cancer is the neoplasia most commonly diagnosed in men and the second cause of cancer deaths in the male population worldwide. In Brazil, the Instituto Nacional de Câncer (INCA) estimates that about 68,800 new cases will be diagnosed in 2014, which makes it the most common type of cancer, except for cutaneous neoplasms[(1)].

The diagnosis of prostate cancer is based on serum specific prostatic antigen (PSA) levels and on digital rectal examination[(2)]. In cases where at least one of such parameters is altered, biopsy is indicated, generally under transrectal ultrasonography (TRUS) guidance[(2)]. This diagnostic method presents low complication rates[(3,4)], despite some recognized and significant limitations related to a less than ideal sensitivity and underestimation of the tumor volume and grade[(5)]. Besides TRUS in prostate biopsy, magnetic resonance imaging (MRI) is other fundamental imaging method for assessing prostate cancer.

Early in the nineties, MRI was a poorly promising method[(6)], as it was limited to the utilization of endorectal coils, generating images with low spatial and contrast resolution. With the development of the hardware, incorporating the use of multichannel pelvic coils, either in association or not with endorectal coils, and the addition of functional techniques to the standard morphological analysis, the MRI role for approaching patients with prostate cancer has considerably changed[(7)].

The indications for MRI in cases of prostate cancer have continuously increased[(8)]. Currently, one can mention several applications of MRI in the management of patients with prostate cancer, as follows: 1 – in the **diagnosis,** particularly for patients with high suspicion of cancer and repeated US-guided prostate biopsies with negative results[(9)]; 2 – in the **staging** of prostate tumors – MRI has been recognized as the most promising method for determining the extent of extracapsular tumors[(10)]; 3 – In several situations, the **therapy planning** may be changed as a function of information provided by MRI[(11,12)]. Even in cases where MRI would not be usually indicated, for example, in cases of low-grade tumors (due to the low probability of extraglandular extension), with the development of new therapeutic options such as "watchful waiting", where one must be certain about the tumor grade and extent, its use has been defended[(13)]; 4 – in the **follow-up and evaluation of tumor response**, in cases of surgical approach and, principally, in cases of non-surgical management, chemo-, radio- and hormone therapy[(14)], situations where the use of quantitative MRI techniques has been fundamental[(15,16)]; and 5 – **characterization of the tumor aggressiveness potential**, particularly by means of the diffusion-weighted technique[(17)], that is still being developed, but at principle might result in a better selection of patients, avoiding unnecessary aggressive treatments, taking the indolent nature of prostate tumors into consideration.

One of the main criticism about the use of MRI in prostate cancer was always related to the lack of imaging protocols standardization[(18)]. In 2012, the European Society of Uroradiology (ESUR) published recommendations for the use of MRI when assessing prostate cancer[(19)]. In addition to the proposition of differentiated protocols, the experts' panel recommended the utilization of at least two functional techniques in association with high-resolution T2-weighted sequences, namely, diffusion weighted imaging, dynamic contrast-enhancement and proton spectroscopy. Such a combined approach is called multiparametric MRI (mpMRI) of prostate. It is important to highlight that, in association with the recommendations regarding the technique[(20)], ESUR has proposed the standardization of the process of interpretation and reporting of mpMRI findings, which is known by the acronym PI-RADS (Prostate Imaging Reporting and Data system).

The excellent article published in the present issue of **Radiologia Brasileira** by Bittencourt et al.[(21)] plays a significant role contributing to the dissemination of this method. The text describes and illustrates the techniques utilized in mpMRI of the prostate, emphasizing the essential requirements that should be met by each functional technique, diffusion-weighted imaging, dynamic contrast-enhancement, and proton spectroscopy protocols, as well as by high-resolution T2-weighted imaging protocols. The authors highlight the main imaging findings of prostate cancer considered in both the diagnosis and staging of the disease. Finally, the authors approach the main mpMRI applications, including those that are already accepted and those that, although described in several studies, still lack a greater amount of data to achieve the level of evidence required for dissemination of the method in the clinical practice.

Both the mpMRI technique and the standardization proposed by the PI-RADS are in constant evolution and probably, in the near future, a new classification could already incorporate changes

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resulting from studies developed to evaluate such an attempt to standardize the technique, the interpretation and reporting of findings[21,22].

Finally, it is important to highlight the future directions of mpMRI, including its utilization in focal prostate cancer therapy as well as the utilization of image fusion techniques in order to speed the diagnosis of the disease.

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