

Proton magnetic resonance spectroscopy and diffusion-weighted imaging in the evaluation of musculoskeletal tumors

Espectroscopia de prótons e difusão na avaliação dos tumores do sistema musculoesquelético

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Musculoskeletal system neoplasms must be accessed by a multidisciplinary clinical team, comprised by an orthopedic oncologist, a pathologist and a radiologist. Most of times, the central question to be answered before treatment is whether the tumor has malignant characteristics or not. After treatment, the question shifts to whether the tumor has been completely resected or destroyed and if there is tumor recidive or not.

In order to answer these questions, each one of the specialists relies on appropriate methods. The radiologist begins the analysis with radiography, which provides significant contribution for the evaluation of bone tumors, but is limited in cases of soft tissue neoplasms. Computed tomography which provides better definition of bone lesions, particularly in the axial skeleton, also presents limitations in the definition of extraosseous lesions. Such limitations are being partially overcome with the utilization of multidetector equipment. However, magnetic resonance imaging (MRI) is the method that significantly improves soft tissue resolution, besides being able to provide early detection of bone lesions, in cases where a tumor replaces the bone marrow.

Even with the utilization of MRI, many times one cannot assure whether a lesion is malignant or not. In some cases there is an overlap of imaging findings between malignant and benign tumors. Kransdorf et al. have presented an extensive list of differential diagnosis for soft tissue lesions, classifying them in accordance with age and site, but in general, with no pathogno-

monic imaging finding for the differentiation between benign and malignant lesions^(1,2).

With the above mentioned limitations in mind, novel MRI techniques have been researched for a better evaluation of musculoskeletal tumors. Diffusion-weighted imaging has already been described in some studies, with the objective of differentiating pathological fractures from those caused by vertebral insufficiency⁽³⁾. Other methods originating from other areas of research have started to be utilized, such as proton magnetic resonance spectroscopy and perfusion magnetic resonance imaging, originally utilized for investigating the central nervous system^(4,5). In an interesting article published in the present issue of **Radiologia Brasileira**, Costa et al. describe the utilization of proton magnetic resonance spectroscopy and perfusion magnetic resonance imaging in the detection and differentiation of benign and malignant tumors, with spectroscopy demonstrating sensitivity, specificity and accuracy of 87.5%, 92.3% and 90.9%, respectively, while the perfusion curve showed a statistically significant difference between benign and malignant tumors⁽⁶⁾. This article corroborates other studies published in specialized journals, showing that such advanced MRI techniques may be instrumental in increasing the diagnostic accuracy in the differentiation of benign from malignant lesions, aiding the radiologist in the analysis of images acquired with conventional methods⁽⁷⁾. Additionally, in the near future such techniques may be useful in the post-treatment follow-up.

There are challenges to be surpassed until these techniques become a part of the daily routine. One of these challenges is the availability of equipment that must be able to support examinations starting at 1.5 T,

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besides the availability of softwares to allow data analysis. And last, but not least a committed and well trained clinical staff for the perfect performance and reproducibility of the protocol, with the required knowledge and common sense to identify the diagnostic pitfalls that advanced techniques in development may present.

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