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قسم

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Role of Diffusion weighted MRI in characterization of musculoskeletal soft tissue tumors

A Thesis

Submitted for Partial Fulfilment of Master Degree in Radio-diagnosis

By

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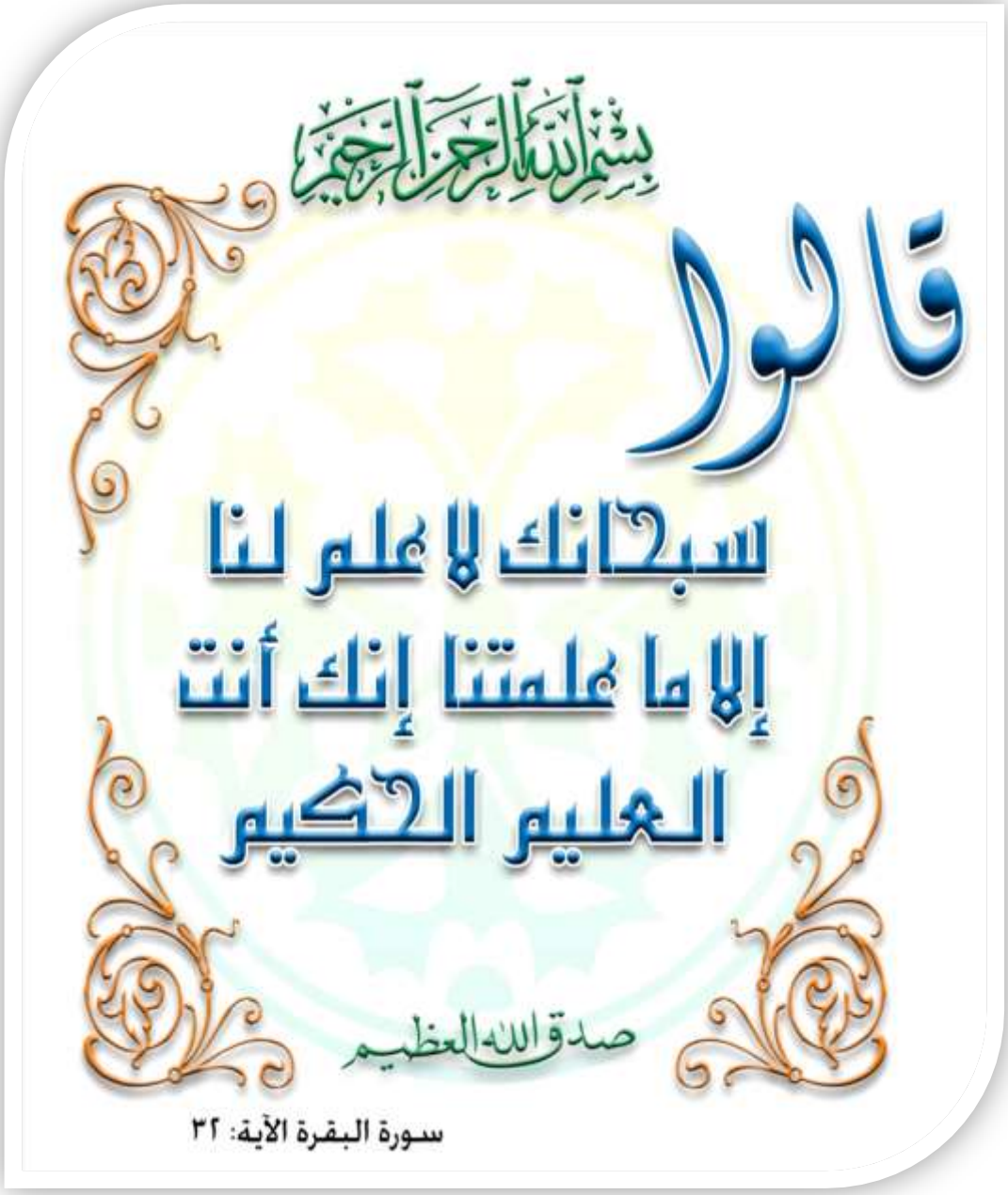
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List of Abbreviations

Abbr.	Full-term
ADC	**:** Apparent diffusion co-efficient
AJCC	**:** American journal cancer commission
CT	**:** Computed tomography
DWI	**:** Diffusion weighted imaging
FNAB	**:** Fine-needle aspiration biopsy
GIST	**:** Gastrointestinal stromal tumors
MRI	**:** Magnetic resonance image
PET	**:** Positron emission tomography
SEER	**:** Surveillance, Epidemiology, and End Results
STSs	**:** Soft tissue sarcomas
US	**:** Ultrasound
WHO	**:** World health organization

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Role of Diffusion weighted MRI in characterization of musculoskeletal soft tissue tumors

Abstract

Background: Magnetic Resonance Imaging is the method of choice for the diagnostic work-up of soft tissue tumors. It is the modality of choice to evaluate such masses, because of its excellent soft tissue contrast. **Aim of the study:** to assess the efficacy of Diffusion weighted MRI in characterization of musculoskeletal soft tissue tumors. **Patients and Methods:** The current study enrolled 20 patients (11 female and 9 male) with musculoskeletal STTs with mean age was 41.08 ± 11.54 year. The most frequent affected site with the swelling was the thigh (48%) followed by the arm (20%). Four (16%) patients suffered from leg swelling while three (12%) patients had shoulder swelling. Our results revealed that malignant musculoskeletal soft tissue masses had significantly lower ADC value in comparison to those with benign masses (0.70 ± 0.09 vs. 1.58 ± 0.52 x 10^{-3} m^2/s; P< 0.001). **Results:** Patients with malignant lesions had significantly lower ADC value in comparison to those with benign lesions (0.70 ± 0.09 vs. 1.58 ± 0.52 (10^3 mm^2/s). Myxoma had the highest ADC value that was 2.44 ($10^3 mm^2/s$) while sarcoma had lowest value that was 0.54 ± 0.03 ($10^3 mm^2/s$). It was noticed that MRI had 100% sensitivity and 81.8% specificity for diagnosis of malignant musculoskeletal soft tissue masses with overall accuracy was 92% and area under curve was 0.91 at cut off value was < 1.14 ($10^3 mm^2/s$). Based on final diagnosis; MRI was successful in diagnosis of all cases with malignant musculoskeletal soft tissue masses but as the same time, MRI falsely diagnosed two cases with benign nature to be malignant. Those two cases were finally diagnosed to be lipoma. **Conclusion:** Based on the current study, DWI-MRI considered the method of choice for the characterization of musculoskeletal STTs; however, DW-MRI with ADC mapping is a rapidly, valuable, non-invasive, non-contrast tool for reliably differentiating between benign and malignant STTs. It's recommended to perform such study in large sample of patients and in more centers to confirm the great values of DWI-MRI in evaluation of such lesions.

Key words: Diffusion weighted MRI, musculoskeletal soft tissue tumors

Introduction

Magnetic Resonance Imaging (MRI) is the method of choice for characterization of soft tissue . The imaging characteristics of common benign lesions, such as lipoma and hemangioma, are often specific enough to allow a conclusive diagnosis. However, the imaging characteristics of a large number of soft tissue tumors are not diagnostic. Diffusion-weighted MRI have been mostly used for the diagnosis of early stroke, but applications in other fields such as oncological and musculoskeletal imaging are being explored **(Einarsdóttir et al., 2004).**

MRI is the modality of choice to evaluate such masses, because of its excellent soft tissue contrast. Although there are some findings on MRI which are indicative for malignancy, such as infiltration of adjacent tissues, destruction of bones and tendons, and the size of the mass, there are no criteria available to clearly distinguish benign masses from malignancies **(Andreas et al., 2007).**

On the contrary some very aggressive tumors present as an encapsulated mass without surrounding edema and only minimal contrast enhancement findings, which are in general indicative for benign processes. Thus, histopathologic work up is required for reliable characterization of soft tissue masses. As described DWI may reveal the microstructure of

such masses and may therefore be helpful to distinguish **(Andreas et al., 2007).**

The primary aim in soft tissue tumor imaging should be to reach a specific diagnosis or to narrow the differential diagnosis. This is to help decide whether biopsy, surgical intervention, or simple observation is required for further management, which leads to a cost effective method where we can reassure the patient and follow-up on the clearly benign lesions **(Afonso and Mascarenhas, 2015).**

Functional and metabolic imaging techniques such as diffusion-weighted imaging (DWI) are available for clinical use and can potentially improve soft tissue tumor characterization. Visual analysis of DWI can detect lesions but is generally not used to characterize them. Quantitative DWI with apparent diffusion coefficient (ADC) analysis differentiates well between solid and cystic masses and ADC values have been reported to be significantly higher in benign musculoskeletal tumors than in malignant ones **(Teixeira et al., 2016).**

The tissue contrast attained using diffusion-weighted imaging (DWI) is different from that attained using conventional MR techniques. The DWI technique involves the diffusion motion of water protons in tissue, which produces different contrasts in different kinds of tissue, because of this; the procedure provides different information about diseased