



ORIGINAL ARTICLE

Value of diffusion weighted magnetic resonance imaging in diagnosis and characterization of scrotal abnormalities



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KEYWORDS

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Abstract *Background:* MRI of scrotal lesions represents an important diagnostic tool in the evaluation of scrotal diseases. Diffusion weighted (DW) MR imaging is a promising technique which proved to improve tissue characterization.

Aim: To assess the diagnostic value and role of DWMR imaging in the detection and characterization of scrotal lesions.

Results: A prospective study included 50 scrotal lesions (35 intratesticular and 15 extra testicular) with 50 normal testes used as control. DW sequences were obtained using a *b* factor of 0, 500 and 900 s/mm². The accuracy of conventional sequences, DW images alone and DW imaging combined with conventional images in differentiating benign from malignant scrotal lesions was calculated. There was significant difference between apparent diffusion coefficient (ADC) values of testicular malignancies, normal testis and benign intratesticular lesions, and the ADC values of benign extra testicular lesions from those of normal epididymis. The overall accuracy of conventional imaging, DW imaging alone and DWMR combined with conventional sequences in the characterization of intratesticular lesions was 90%, 87% and 100%, respectively.

Conclusion: Our findings suggest that DWMR imaging and ADC values may provide valuable information in the diagnosis and characterization of scrotal diseases.

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1. Introduction

Correct diagnosis and characterization of scrotal and testicular masses are important for optimal treatment, including resection planning to avoid orchiectomy for some subtypes of benign tumors for which enucleation is an alternative. A confident preoperative characterization of the lesion in

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question is needed to spare the patient from the drastic procedure (1,2). Imaging has an important role in the investigation of testicular masses. Sonography, although the primary imaging technique for the evaluation of scrotal contents, do not always allow confident characterization of the nature of a testicular mass (3–6). Magnetic resonance (MR) imaging of the scrotum provides valuable information in the detection and characterization of various scrotal disorders and differentiating intratesticular and extratesticular lesions. The advantages of MRI are simultaneous imaging of both testicles and both sides of the inguinal region, acquisition of adequate anatomic information, and satisfactory tissue contrast (7–14).

Recently, DWMR technique proved useful in the detection of malignant neoplasms and the histological characterization of focal lesions in the abdomen (15,16). Lesion detection and characterization largely depended on the extent of tissue cellularity, and increased cellularity is associated with restricted diffusion and reduced apparent diffusion coefficient (ADC) values (15,16). The ADC values of malignancies are reported lower than those of benign lesions or normal tissues (15–28). In this study we are aiming to rule out the value of DWI and the ADC values of normal scrotal contents and the pathological conditions and trying to certain a cut off value for prediction of malignancy.

2. Materials and methods

The study was performed on 50 patients, age ranged from 14 to 65 years. 35 patients show intratesticular lesion; 15 were malignant and 20 were benign, the remaining 15 patients show extra-testicular lesions which were all benign.

2.1. MR imaging protocol

All patients were scanned in the supine position on a 1.5-T MR system (Intera; Philips Medical System), using a pelvic phased-array coil. The MR protocol used is illustrated in Table 1. Axial spin echo T1-weighted sequences and axial, sagittal and coronal fast spin echo T2-weighted images were obtained without and with fat suppression (FS). Axial fat-suppressed T1-weighted sequences were repeated when a lesion with high T1 signal intensity was noted. DWI was performed in the axial plane, using a single shot, multislice spin echo planar diffusion pulse sequence and b values of 500 and 900 s/mm^2 . The time required to acquire DW sequences was 29 s. In patients with scrotal pathology, gadolinium-DTPA (Omniscan

0.2 mmol kg⁻¹; Amersham Health, Oslo, Norway) was administered intravenously. Dynamic contrast-enhanced MR imaging in the coronal, transverse and sagittal plans in spin echo contrast-enhanced, fat suppressed T1-weighted images were subsequently obtained.

2.2. MR imaging data interpretation

Three observers (radiologists) have read the MR imaging data independently, the three radiologists were blinded to the clinical data and histopathological diagnosis. Every radiologist evaluated: (1) the signal intensity of the lesion on conventional and contrast-enhanced MR images, and (2) the signal intensity of the lesions on DWI and comparing it to that of the normal testicular parenchyma and the epididymis. (3) DWI was read in conjunction with the axial T2-weighted images and created ADC maps. (4) For the quantitative analysis, a single radiologist defined a circular region of interest (ROI) within the scrotal and/or extrascrotal lesions, excluding areas of hemorrhage or necrosis revealed by the corresponding conventional MR images. Three measurements were obtained and their average was taken. Another ROI placed in the normal testicular parenchyma to calculate the ADC values of the normal testis. Calculations of the normal values of the epididymis were obtained when the epididymal parts were readily identifiable in the corresponding transverse T2-weighted images. (5) MR imaging data were interpreted on the conventional sequences and a possible diagnosis of benignity or malignancy was obtained. (6) DWI and ADC map alone were interpreted. (7) DWI, ADC maps in conjunction with the plain and contrast-enhanced MR sequences were evaluated. The accuracy of conventional MR imaging data alone, DW imaging alone and conventional sequences combined with DW sequences in the characterization of scrotal lesions was calculated. The standard included clinical diagnosis and imaging follow-up for non-surgical cases, surgical and histopathological findings in surgical cases. Statistical analysis was performed. A P value of less than 0.05 was considered statistically significant. The sensitivity, specificity and accuracy of conventional MR images alone, DW images and DW imaging combined with the conventional sequences were calculated.

3. Results

MR evaluation included 100 testicular units, of which 50 testes (50%) were characterized as normal and used as the control

Table 1 The MR protocol used in our study.

Sequences	SE T1	FSE T2 and FSE-FS T2	DW	T1-FS dynamic post contrast
Plane	Transverse	Transverse, sagittal coronal	Transverse	Transverse, sagittal coronal
TR (ms)	500–650	4000	3900	500–650
TE (ms)	13–15	100–120	115	13–15
Slice thickness (mm)	3–4	3–4	3–4	3–4
Gap (mm)	0.5	0.5	0.5	0.5
Matrix (mm)	180 × 256	180 × 256	180 × 256	180 × 256
FOV (cm)	24 × 27	24 × 27	24 × 27	24 × 27
b value (s/mm^2)	–	–	500 and 900	–
IV CM	–	–	–	0.2 mmol/kg

IV CM (intravenous contrast media).

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