ROLE OF DIFFUSION WEIGHTED MAGNETIC RESONANCE IMAGING IN ASSESSMENT OF THE GRADING OF URINARY BLADDER CARCINOMA

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INTRODUCTION

- Bladder cancer is the most common malignant tumor in the urinary tract among both men and women.
- The diagnosis of bladder cancers is often delayed due to the similarity of their symptoms to those of benign disorders that can lead to a worsened prognosis.
- Diffusion weighted imaging (DWI) is a form of magnetic resonance imaging (MRI). It is highly sensitive in the detection of the random motion (Brownian motion) of water molecules. Thus, in cases of cellular overcrowding such as in malignancies, this motion will be restricted. DWI visualizes this motion; the more restricted the molecular motion inside the tissue, the higher the signal intensity on imaging will appear.
- A value can be obtained for the degree of diffusivity of the displayed tissue, which is called apparent diffusion coefficient (ADC). It provides a quantitative parameter derived from DWI. As for any other malignant tissue, bladder cancers also present high signal intensity on DWI, as well as low ADC value, which reflects restriction to motion inside the tissue.
- ADC value is a noninvasive reliable modality for predicting histopathological grading and the aggressiveness of cancer. ADC can play an important role for guiding therapeutic decisions.

AIM OF THE WORK

The aim of current study was to assess the ability of diffusion weighted magnetic resonance imaging in urinary bladder cancer grading in comparison to histopathological grading as a gold standard reference data.

PATIENTS AND METHODS

PATIENTS

The study included twenty adult patients with urinary bladder carcinoma were referred from the urology department to the radio-diagnosis department of Alexandria University hospital.

METHODS

Each patient included in the study will be subjected to:

- Full history taking.
- Full clinical examination
- Laboratory investigations
- MRI scanning techniques including TI, T2, DWI as well as ADC maps with different axial, sagittal and coronal views.
- Transurethral cystoscopy and biopsy.
- Histopathological examination.

RESULTS

- The study included 20 patients, 70% of them were males (14) and 30% were females (6) with urinary bladder cancer.
- The age of the patients ranged from 20-80 years. The highest incidence was in the 5th and 7th decade. The mean age was 63.7 years.
- Fourteen patients out of twenty had solitary lesions (70%) while six patients out of twenty had multiple lesions (30%) with total number of lesions examined 33 lesions.
- The ADC values are measured three times for each lesion and the mean of ADC value for the three measurements was recorded, the mean ADC value of low-grade lesions is 1.125×10^{-3} mm²/s while that mean ADC value of high-grade lesions 0.9837×10^{-3} mm²/s.
- 1×10^{-3} mm²/s is the cut-off point for ADC value, considering low ADC value as being less than 1×10^{-3} mm²/s which suggesting high histopathological grade while high ADC value as being more than 1×10^{-3} mm²/s which suggesting low histopathological grade.
- There was a statistically significant difference between the mean ADC value according to the grading prevailed by histopathological grading of the endoscopic biopsy.
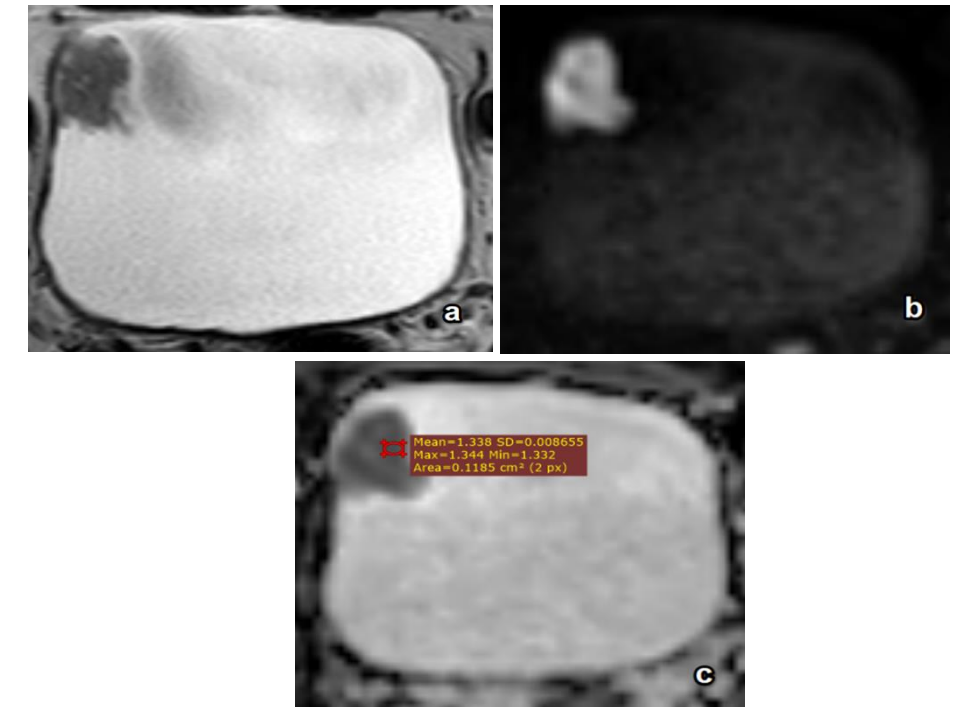

Figure:

(A) Axial T2WI shows hyperintense endophytic soft tissue mass lesion arising from the right upper lateral wall of the UB.

(B) DWI-MRI shows restricted diffusion.

(C) ADC map shows a mean value of 1.3×10^{-3} mm2/sec.

According to histopathological assessment; the lesion was found to be of low-grade type.

CONCLUSION

- DW-MRI exhibits a high level of diagnostic performance in detecting and grading of bladder cancer.
- ADC value in DW-MRI can serve as a radiological marker to predict the clinical aggressiveness of bladder cancer.
- DW-MRI is accepted as an important marker of tumor cellularity, it may be used as an alternative in future diagnosis and follow-up of bladder tumors.