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EVALUATION OF ROLE OF DIFFUSION WEIGHTED SEQUENCE IN (T) STAGING AND GRADING OF URINARY BLADDER CANCERS KEEPING THE CYSTOSCOPIC BIOPSY AS THE GOLD STANDARD

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Abstract:

INTRODUCTION: *Bladder cancer is the ninth most common cancer in the world with the highest recurrence rate of all malignancies. Cystoscopy, cytology and biopsy are the main diagnostic tests. Many recent studies have found that diffusion weighted imaging (DWI) on MRI can be a useful test in assessing the severity of bladder cancer with significantly strong compliance with the histopathological diagnosis of cystoscopic biopsy. Therefore, DWI can be used for preoperative diagnosis of cancer stage, and therefore can help in the proper planning of treatment. Although controversy has emerged in current literature, this study did not require publication at local level.*

OBJECTIVE: *The objective of this study was to evaluate the degree of agreement between DW1 and histopathology for 'T' staging of urinary bladder cancers.*

MATERIAL AND METHODS: *This cross sectional study was conducted at CMH Lahore from July 2018 to July 2019; included 100 patients aged 20 to 70 years diagnosed with bladder cancer. DWI MR was made for T-Staging. Histopathology of cystoscopic biopsy has been recognized as the gold standard. "*

RESULTS: *The age of the patients ranged from 35 to 70 years, and the average was 57.56 ± 9.79 years. The study group included 82 (82.0%) men and 18 (18.0%) women. The male to female ratio was 4.6: 1. ADC values ranged from 0.60 × 10–3 mm2 / s to 1.50 × 10–. On average 1.07 ± 0.28 × 10-3 mm2 / s at 3 mm2 / s. MRI diagnosis included stages T1, T2, T3 and T4 in 57 (57.0%), 22 (22.0%), 15 (15.0%) and 6 (6.0%) patients, while the true diagnosis in histopathology was T1, T2. T3 and stage T4 in 58 (58.0%), 21 (21.0%), 15 (15.0%) and 6 (6.0%) patients. The frequency of agreement between DWI and T on MRI was 80.0%. There was a significant correlation between DWI and T staging in MR in histopathology (kappa = 0.665, p <0.001).*

CONCLUSION: *The frequency of agreement between DWI and T MRI bladder cancer stage was 80.0%. There was a significant correlation between DWI and T staging in MR in histopathology (kappa = 0.665, p <0.001).*

KEYWORDS: bladder cancer, T-grade assessment, diffusion-weighted images, magnetic resonance imaging, cystoscopic biopsy, compliance.

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1.INTRODUCTION:

Bladder cancer is the ninth most common cancer in the world with the highest recurrence rate of all cancers [1]. It is the fourth most common malignant tumor in men and the eighth malignant tumor in women [2]. In Pakistan, bladder cancer is one of the ten most common malignancies in men and the most common urological cancer in both sexes. A study in Pakistan showed that the incidence of bladder was 2.29% [3]. One study found that grade T2 or higher was observed in 33.3% (24/72) of cases [4]. Painless macroscopic hematuria is a classic presentation of bladder cancer. Physical examination is often not noticed. Cystoscopy, cytology and biopsy are the main diagnostic tests. High-grade diseases are usually treated with radical cystectomy or a combination of radiation and systemic chemotherapy [1].

The diffusion weighted MR image (DWI) is increasingly being used to assess body cancer. DWI provides both qualitative and quantitative information reflecting changes at the cellular level with respect to tumor cellularity and membrane integrity. For most bladder tumors, an increase in cell density occurs as limited diffusion, an increase in signal intensity in diffusion weighted images with a significant diffusion coefficient (ADC) [5].

Gupta et al. showed in their studies that the degree of agreement between radiological and histopathological evaluation was relatively higher in the case of DW-MRI (K = 0.669) (6). M nice Abdel-rahman et al. Studies show that DWI is normal in 30 patients (75%), inadequate in 8 patients (20%), and 2 patients (5%) were over-assessed (7)

Mohamed et al. A similar study showed that an accurate assessment of the severity of bladder cancer can be performed by measuring DWI and ADC [8].

Many recent studies have shown that DWI has high reliability after TUR in distinguishing inflammatory changes from recurrent bladder cancers. To support this view, Wang et al. The presented study showing the use of DWI images of bladder tumors, the main goal was to assess the DWI value in the therapeutic response of tumors after chemotherapy and in EC magnetic resonance imaging (18%) and 33%) greater specificity and accuracy (92% and 80%) of DWI images compared to weighted MR images. As expected, this approach prevents the problem of local swelling, fibrosis and misdiagnosis of inflammation as a residual tumor or tumor recurrence (9) Bozgeyik, et al. He also showed that the average enemy ADC values (grades b-0, b-500 and b-1000s / mm2) of the control group and bladder cancer walls were 2.08x10-3 and 0.94. stated that measuring x10-3 mm2 / s and ADC can adequately separate cancer from the normal bladder wall (10)

The logic of this study is to assess the role of the DWI sequence in assessing the severity of bladder cancer using histopathology as the gold standard. It has been shown in the literature that DWI can be proposed as a promising MRI sequence in assessing the severity of T bladder. However, in the literature controversial results regarding the assessment of the severity of bladder cancer using the DWI MRI method have been observed. According to some studies on the severity assessment, it is a common mistake to assess the severity of bladder cancer by MRI. In addition, in this context, there is no local evidence that would help you decide whether to trust the DWI sequence in assessing the stage of T cancer. It has also been found in the literature to be reliable enough to replace any surgery or intervention, including cystoscopy. This study will help assess the compatibility between the DW1 sequence and histopathology in defining the severity of bladder cancer to prevent the need for an invasive cystoscopic biopsy method, and is also useful in patients with I / V contrast.

2.OBJECTIVE:

The objective of this study was to evaluate the degree of agreement between DW1 and histopathology for 'T' staging of urinary bladder cancers.

3.OPERATIONAL DEFINITIONS:

- **Staging of urinary bladder Ca. on**
  - **DWI:**

The bladder wall was identified as a thin line of slight hyper-intensity on DWI.

- Stage T1: Hyperintensity of tumor within the bladder lumen
- StageT2: Hyperintensity of tumor partially seen in the bladder wall
- StageT3: Hyperintensity of tumor disrupting the bladder wall
- StageT4: Hyperintensity of tumor extending into the adjacent organs, abdominal or pelvic wall.

- **Histopathology Primary Tumor (T)**
- T1 Tumor invades subepithelial connective tissue
- T2 Tumor invades muscularis propria
- T3 Tumor invades perivesical tissue
- T4 Tumor invades any of the following: prostatic stroma, seminal vesicles, uterus, vagina, pelvic wall, abdominal wall

- **Agreement:** Agreement was seen when both DWI and histopathology agreed upon the staging of urinary bladder cancers. Diagnosed cases of urinary bladder cancer

on medical record were included in the study.

▪

4.MATERIALS AND METHODS:

It was cross sectional study, conducted at CMH Lahore from July 2018 to July 2019.
The sample size of 100 cases was calculated with a 95% confidence level and a 10% margin of error, assuming the expected degree between DWI and histopathology in assessing the severity of bladder cancer. 66.9% (k = 0.669%). [6] Patients were subjected to further incredible tests.

Bladder cancer (in medical records), the study included patients aged 20-70 years of any sex with recurrent / residual tumor planned for cystoscopy in histopathological examination. Patients who did not want to undergo cystoscopy or MRI were excluded from the study.

DATA COLLECTION PROCEDURE:

100 patients meeting the selection criteria were included in the study. Informed written consent was obtained for each subject. Then all patients were DWI using a 1.5T MRI system with pelvic phase array coil. Image protocols for all patients involved the use of multi-sections spin echo sequences with different repetition times (TR) and echo delay (TE) to obtain a T1 weighted image (T1 WI). (TR / TE - 400-600 / 10-20 m / s), weighted image in T2 (T2 WI) (TR / TE = 2000-4000 / 100-120 m / s). With contrast, diffusion-weighted MR1 (DWI) with 6 values of (6-0, 6-500) s/mm^2 images were obtained in die axial and sagittal planes (according to the site of the mass), using ADC. A sagittal view of the T1 weighted image was taken to confirm the patient's exact position and locate the posterior incisions. Then, multiple pulse sequences were applied in three orthogonal planes to obtain axial images, followed by coronal and sagittal images. The T1WI contrast study was performed after injection of Gd-DTPA at a dose of 0.1 ml / kg. Reports were evaluated and the stage was registered according to the ADC value (according to the operational definition). Later, patients underwent cystoscopy and histopathological reports were obtained.

5.DATA ANALYSIS PROCEDURE

All collected data was entered and analyzed in SPSS 20.0.

1. Numeric variables; Tumor ADCs and age are presented as mean ± SD.
1. 2. Categorical variables; Gender and agreement between DWI and histopathology for staging have been presented by frequency and percentage.

3. Kappa statistics were calculated to measure the strength of agreement between DWI and histopathology to assess the severity of bladder cancer.

6. RESULTS:

Patient ages ranged from 35 to 70 years old and the mean was 57.56 ± 9.79 years. Most patients (n = 77, 77.0%) were over 50 years old. The study group included 82 (82.0%) men and 18 (18.0%) women. The male-female ratio was 4.6: 1. ADC values ranged from 0.60 × 10–3 mm2 / s to 1.50 × 10–. As shown in Table 8.1, on average 1.07 ± 0.28 × 10-3 mm2 / s and 3 mm2 / s.

MRI diagnosed T_1, T_2, T_3 and T_4 stage in 57 (57.0%), 22 (22.0%), 15 (15.0%) and 6 (6.0%) patients respectively while the actual diagnosis on histopathology was of T_1, T_2, T_3 and T_4 stage in 58 (58.0%), 21 (21.0%), 15 (15.0%) and 6 (6.0%) patients respectively as shown in Table 8.2.

The frequency of agreement between DWI and T staging in MR histopathology was 80.0%, as shown in Table 8.3. There was a significant correlation between DWI and T staging in MR in histopathology (kappa = 0.665, p <0.001).

Table 6.1 Baseline Characteristics of Study Sample

Characteristics	Participants n=100
Age (years)	57.56±9.79
• **<50 years**	77 (77.0%)
• **≥50 years**	23 (23.0%)
Gender	
• **Male**	82 (82.0%)
• **Female**	18 (18.0%)
ADC ($\times 10^{-3}$ mm^2/sec)	1.07±0.28

Table 6.2 Frequency of various Tumor Stages on DWI MR and Histopathology

n=100

Tumor Stage	DWI MR		Histopathology	
	Frequency	Percent (%)	Frequency	Percent (%)
T1	57	57.0%	58	58.0%
T2	22	22.0%	21	21.0%
T3	15	15.0%	15	15.0%
T4	6	6.0%	6	6.0%
Total	100	100%	100	100%

Table 6.3 Frequency of Agreement between DWI MR and Histopathology

n=100

Agreement	Frequency	Percent (%)
Yes	80	80.0%
No	20	20.0%
Total	230	100%

7.DISCUSSION:

Bladder cancer is the ninth most common cancer in the world with the highest recurrence rate of all malignancies. Cystoscopy, cytology and biopsy are the main diagnostic tests [1]. A number of recent studies have found that weighted diffusion (DWI) imaging in magnetic resonance imaging can be a useful test to assess the severity of bladder cancer with significantly strong compliance with the histopathological diagnosis of cystoscopic biopsy. Therefore, DWI can be used for preoperative diagnosis of the stage of cancer, and therefore may help in appropriate treatment planning [7-11]. Although controversy has emerged in current literature, this study did not require publication at local level.

The aim of this study was to evaluate the degree of agreement between DW1 and histopathology to assess the stage of "T" bladder cancer.

The average age of patients in this study was 57.56 ± 9.79. Mubarak et al. (2014) reported a similar average age of 57.5 ± 8.6 years in patients with bladder. (12) Naeem et al. (2015) observed a similar average age of 57.5 ± 12.91 years in a social security hospital in Lahore (13). Ghafoori et al. In 2012 (59.7 ± 12 years) and Al-Bazzaz et al. They reported a similar age in 2009 (61.8 ± 9.7 years) (14.15) Sathya et al. (2014) reported a relatively higher average age of 67.87 ± 8.4 years among these Indian patients (16). In this study, most patients (n = 77, 77.0%) were over 50 years

old. A similar high rate in this age group in patients with bladder around ca. In addition, Ahmed et al. (2015) reported that 89.1% of patients who came to the Institute of Pathology of the Armed Forces of Rawalpindi are over 50 years old (17).

The study group included 82 (82.0%) men and 18 (18.0%) women. The male to female ratio was 4.6: 1. Similar male dominance was noted in patients with bladder cancer in Karachi and Rawalpindi. (12,13,17) Al-Bazzaz et al. (2009) reported that the percentage of men and women among these patients in the Iraqi population is significantly lower than 3: 1 (15).

The average ADC value in this study was 1.07 ± 0.28 × 10-3 mm2 / s. Takeuchi et al. A similar average ADC value of 1.07 ± 0.27 × 10-3 mm2 / s was recorded among bladder cancers. (2009) in the Japanese population (18). Abdel-Rahman et al. They observed a significantly lower mean ADC value of 0.95 ± 0.13 × 10-3 mm2 / s. (2015) among these patients in Egypt [11]. Gandrup et al. On average, they observed a higher value of 1.89 ± 0.53 × 10-3 mm2 / s. (2014) belongs to such patients in the Danish population (19).

MRI diagnosis included stages T1, T2, T3 and T4 in 57 (57.0%), 22 (22.0%), 15 (15.0%) and 6 (6.0%) patients, while the true diagnosis in histopathology were T1, T2. T3 and stage T4 in 58 (58.0%), 21 (21.0%), 15 (15.0%) and 6 (6.0%) patients. Gupta et al. (2015) reported similar frequencies of T1 (58.3%), T2 (21.7%), T3 (15.0%) and T4 (5.0%) in patients with bladder cancer in the Indian population (6).

There was a significant correlation between DWI and T staging in MR in histopathology (kappa = 0.665, p <0.001). Our results A et t et al. (2017) and Gupta et al. (2015) reported similar power of agreement between histopathology in assessing the stage of DWI T advancement and MR bladder cancer, for example, kappa = 0.679 and kappa = 0.669 (6.20), respectively. Rajesh et al. (2011) and Gandrup et al. (2014) noted lower adaptive potency kappa = 0.57 and kappa = 0.53 between DWI and MR assessment of bladder cancer at MRI (19.21). However, Rajesh et al. Although it only covers patients with transition cell cancer, Gandrup et al. This includes a limited sample of 28 patients who can explain conflicting results. It is also an operator and equipment tool that may be responsible for differences between observers. Yoshida et al. In 2011 (Kappa = 0.801) and Tekes et al. In 2005 (Kappa = 0.800), significantly higher compliance was noted. Both studies included a limited sample size of 76 and 71 patients, respectively (22.23).

This study is the first of its kind in the local population and strong agreement was observed between histopathology (kappa = 0.665, p <0.001) in assessing the severity of DW in MR, regardless of the patient's age and sex. The results of this study are consistent with the results of current research and therefore suggest the routine use of DWI in the preoperative stage of bladder cancer. Until precise surgery is required, it will allow the oncologist and surgeon to better plan treatment without the need for invasive preventive procedures such as biopsy.

7.CONCLUSION:

In MRI, the incidence of compliance between DWI and bladder cancer in histopathological examination was 80.0%. There was a significant correlation between DWI and T staging in MR in histopathology (kappa = 0.665, p <0.001).

8.REFERENCES:

1. Steinberg GD, Sachdeva K, Jana BR. Bladder Cancer. Southern Illinois University School of Medicine2014 [cited 2016]; Available from: http;//emedicine.medscaDe.com/article/438262-overview.
2. Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Ticulent J, Jemal A. Global cancer statistics, 2012. CA Cancer J Clin 2015;65(2):87-108.
3. Ahmad MR, Fervaiz MK, Pervaiz G. Non-occupational risk factors of urinary bladder cancer in Faisalabad and Lahore, Pakistan. J Pak Med Assoc 2012;62(3):236-9.
4. Al-Bazzaz P. Stage of urinary bladder cancer at first presentation 2009.
5. Verma S, Rajesh A, Prasad SR, Gaitonde K, Lall CG, Mouraviev V, et al. Urinary bladder cancer role of MR imaging. Radiographics 2012;32(2):371-87.
6. Gupta N, Sureka B, Kumar MM, Malik A, Bhushan TB, Mohanty N. Comparison of dynamic contrast-enhanced and diffusion weighted magnetic resonance image in staging and grading of carcinoma bladder with histopathological correlation. Ann Urol 2015;7(2):199-203.
7. Abdul-Rehman H, Fiki IM, Abd-Samad KM. The role of diffusion-weighted magnetic resonance imaging in t staging and grading of urinary bladder cancer. Egypt J Radiol Nuclear Med 2015;46(3):741-7.
8. Sherif MF. The value of diffusion weighted MR imaging in T staging and correlation with histologic grading in urinary bladder cancer. The Egypt J Radiol Nuclear Med 2015;46(1):189-94.
9. Wang H, Guo Y, Zhou X, Yang D. Urinary bladder cancer: the current and potential role of MR imaging in non-distant metastatic lesions. J Cancer Ther 2013;4:504-12.

10. Bozgeyik Z, Onur MR, Poyraz AK. The role of diffusion weighted magnetic resonance imaging in oncologic settings. Quant Imaging Med Surg 2013;3(5):269-78.
11. Watanabe H, Kanematsu M, Kondo H, Goshima S, Tsuge Y, Onozuka M, et al. Preoperativc T staging of urinary bladder cancer: does diffusion-weighted MRI have supplementary value? Am J Roentgenol 2009;192(5):1361-6.
12. Mubarak M, Kazi JI, Hashmi A, Hussain M, Naqvi SA, Rizvi SA. Urinary Bladder Tumors in Southern Pakistan: A Histopathological Perspective. Middle East J Ca 2014;5(3):167-73.
13. Naeem A, Naseem N, Anwar S, Butt S, Nagi AH. Clinico-pathological pattern, classification and staging of urinary bladder carcinomas--a five years' experience at a tertiary care hospital in central Punjab. J Ayub Med Coll Abbott 2015;27(1):131-4.
14. Ghafoori M, Shakiba M, Ghiasi A, Asvadi N, Hosseini K, Alavi M. Value of MRI in local staging of bladder cancer. Urol J 2013;10(2):866-72.
15. Al-Bazzaz PH. Stage of urinary bladder cancer at first presentation. Saudi J Kidney Dis Transpl 2009;20(4):628-31.
16. Sathya M, Chinnaswamy P. Urinary bladder cancer: a clinicopathological and histological study. J Med Sci 2014;14(4):206-9.
17. Ahmed R, Hashmi SN, Hafeez Ud Din, Muhammad I. Clinicopathological spectrum of urothelial carcinoma of the urinary bladder–a study of 541 cases at AFIP Pakistan. Pak Armed Forces Med J 2015;65(4):544-7.
18. Takeuchi M, Sasaki S, Ito M, Okada S, Takahashi S, Kawai T, et al. Urinary bladder cancer: diffusion-weighted MR imaging--accuracy for diagnosing T stage and estimating histologic grade. Radiology 2009;251(1):112-21.
19. Gandrup KL, Nordling J, Thomsen HS. MRI of the bladder in Patients suspected of bladder tumors. Open J Radiol 2014;4:207-14.
20. Afifi AH, Abdel Maksoud TS, EL-Noueam KA, Ataa MA, Abdallah DM. Multiparametric-MRI as a comprehensive study in evaluation, characterization & local staging of urinary bladder carcinomas. Egypt J Radiol Nuclear Med 2017;2017:1-15.
21. Rajesh A, Sokhi HK, Fung R, Mulcahy KA, Bankart MJ. Bladder cancer: evaluation of staging accuracy using dynamic MRI. Clin Radiol 2011;66(12):1140-5.
22. Yoshida S, Masuda H, Ishii C, Tanaka H, Fujii Y, Kawakami S, et al. Usefulness of diffusion-weighted MRI in diagnosis of upper urinary tract cancer. AJR Am J Roentgenol 2011;196(1):110-6.
23. Tekes A, Kamel I, Imam K, Szarf G, Schoenberg M, Nasir K, et al. Dynamic MRI of bladder cancer: evaluation of staging accuracy. AJR Am J Roentgenol 2005;184(1):121-7.