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Early Detection of UB Neoplasms by use Of MRI

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Abstract: Urinary bladder cancer has recently been identified as one among the most prevalent malignancies in worldwide. This current study evaluated the current findings to reveal the impact of MRI technology on the diagnostic accuracy of patients with bladder cancer. One hundred six patients with bladder cancer who underwent MRI diagnosis in different hospitals in Iraq were recruited during the period from January 2023 to January 2024. The diagnostic and clinical outcomes of the patients were recorded before and after the examination. A total of 106 patients were undergone to MRI in the detection of urinary bladder cancer. We found that almost of 35.85% indicated with hematuria rothelial Carcinoma (UC) with 42.45%, where carcinoma in situ with high grade got 93.40%. In the assessment of MRI accuracy, positive results by MRI 55.66% as a true positive in terms of the positive value of histopathology, while negative results by MRI with 3.77% a false positive in terms of the negative value of histopathology, where specificity with 93.29%, sensitivity with 89.50%, and diagnostic accuracy with 90.95%. Our results show that MRI is not highly sensitive and accurate in diagnosing bladder cancer patients.

Keywords:. Urinary bladder cancer, Magnetic resonance imaging, Accuracy and Sensitivity.

INTRODUCTION

With a prevalence of upwards of 550,000 new cases as well as an annual death rate of over 200,000 individuals, bladder cancer has lately been recognized as among the most common cancers worldwide (Zhang, N *et al.*, 2019;Teama, A *et al.*, 2014;DeGeorge, K. C *et al.*, 2017). Over the last three decades, carcinoma of transitional cells (TCC) has emerged as the most common kind (DeGeorge, K. C *et al.*, 2017).

Because of its advantage in soft tissue delineation, especially after it comes to muscle invasion and T staging, MRI is essential for the early identification in local staging for bladder cancer. Diagnostic imaging evaluations have become crucial in the modern era for both early bladder cancer detection and disease staging, which aids in the development of treatment plans which ultimately determine the prognosis of the condition (Maurer, T *et al.*, 2013;De Haas, R. J *et al.*, 2014; Gandrup, K. L *et al.*, 2014).

Cystoscopy with biopsy is still the gold standard for both diagnosing and staging bladder cancer because of its great sensitivity in detecting early lesions as well as its ease of simultaneous tumor excision at the same operation (Abdel-Rahman, H. M *et al.*, 2015). Its capacity to precisely identify the level of extravesical tumor spread along with to identify early flat lesions when enough mucosal deviations has not yet developed is, however, restricted (Zytoon, A. A *et al.*, 2017).

PATIENTS AND METHODS

Study Design

We conducted a cross-sectional study of patients with bladder cancer, which included 106 samples aged between 25 and 53 years. Patients were diagnosed by magnetic resonance imaging under the supervision of specialist doctors who determined the degree of spread of bladder cancer in patients. All tests were performed in the Diagnostic Radiology Department at different hospitals in Iraq during the period from January 2023 to January 2024.

As for the inclusion and exclusion criteria, this study identified the data of the patients who were collected, as the inclusion criteria included each of the following:

1. Patients with bladder cancer only.
2. Smokers and some non-smokers.
3. Patients who had some other diseases such as hypertension, diabetes, etc., and these are not a large percentage.
4. Patients who had previous examinations by ultrasound or other, showed the occurrence of irregular structures of soft tissues that become depressed in the bladder.
5. Patients with massive obesity.

The exclusion criteria included:

1. Patients who have undergone previous surgeries.
2. Patients who are blinded not less than 25 years and not more than 53 years.

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3. Pregnant women.
4. Patients who have undergone either radiotherapy or immunotherapy to treat diseases.
5. Heart patients.

Performance MRI Outcomes.

All patients underwent MRI in the Radiology Department of different hospitals in Iraq, which helps in detecting bladder cancer and determining the stage of spread in patients.

The SPSS version 22.0 program was employed to record and evaluate the results of the MRI and histology. The frequency and percentage of urinary bladder cancer by MRI, local staging, and histology data were shown. We estimated the MRI's diagnostic accuracy, sensitivity, specificity, positive and negative predictive values, and predictive values.

RESULTS

Table 1. Basics data of demographic features.

Variables	Number of patients [106]	Percentage, %
Age		
25 – 30	25.47	27%
31 – 40	43.40	46%
> 40	31.13	33%
Gender		
Male	83.02	88%
Female	16.98	18%
BMI, [kg/m2]		
Normal weight	24	22.64%
Overweight	37	34.91%
Obesity	45	42.45%
Smoking status		
Present	41.51	44%
Absent	58.49	62%
Medical history		
Present	25.47	27%
Absent	74.53	79%
Comorbidities		
Hypertension	15.09	16%
Diabetes	11.32	12%
Others	8.49	9%
Educations status		
Primary	20.75	22%
Secondary	27.36	29%
University – Post university	51.89	55%
Marital status		
Single	16.04	17%
Married	39.62	42%
Divorced	26.42	28%
Widow	17.92	19%

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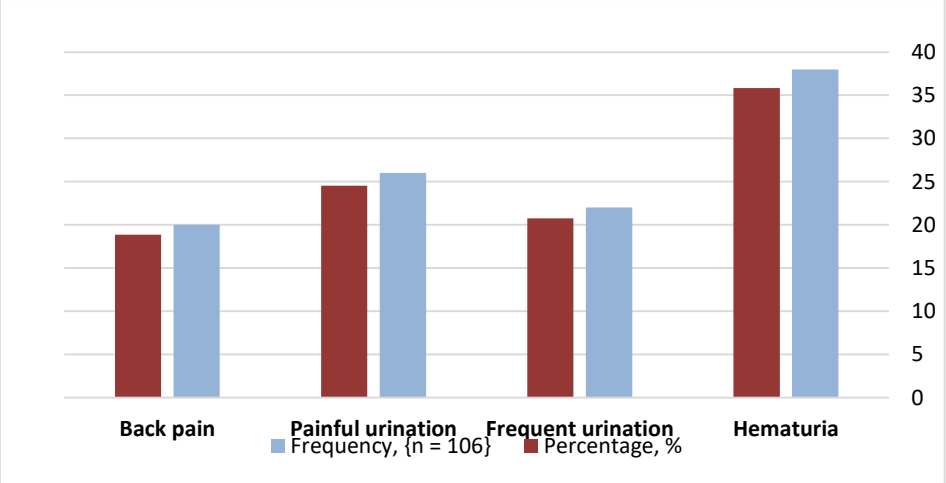

Figure 1. Distribution of common symptoms of urinary bladder cancer in patients.

Table 2. Identifying diagnostic data of urinary bladder cancer detected by MRI.

Data	Patients, {N = 106]	Percentage, %
Types		
Rothelial Carcinoma (UC)	45	42.45%
Variant Histology:	61	57.55%
Squamous Cell Carcinoma (SCC)	18	16.98%
Small Cell Carcinoma	14	13.21%
Micropapillary and Plasmacytoid Carcinomas	20	18.87%
Adenocarcinoma	9	8.49%
Muscle in transurethral resection specimen		
Yes	47	44.34%
No	59	55.66%
Carcinoma in situ		
High grade	99	93.40%
Prior bacillus Calmette-Guérin	7	6.60%
Stage from restaging transurethral resection		
<T1	52	49.06%
T1	34	32.08%
T2	20	18.87%
Muscle in restaging transurethral resection		
Yes	90	84.91%
No	16	15.09%

Table 3. Assessment of the accuracy of MRI technique in diagnoses of patients with urinary bladder cancer.

MRI/ Histopathology	Positive result by MRI	Negative results by MRI
Positive value of histopathology	59 {55.66%}, True positive	5 [4.72%], false negative
Negative value of histopathology	4 {3.77%}, false positive	38 [35.85%], true negative

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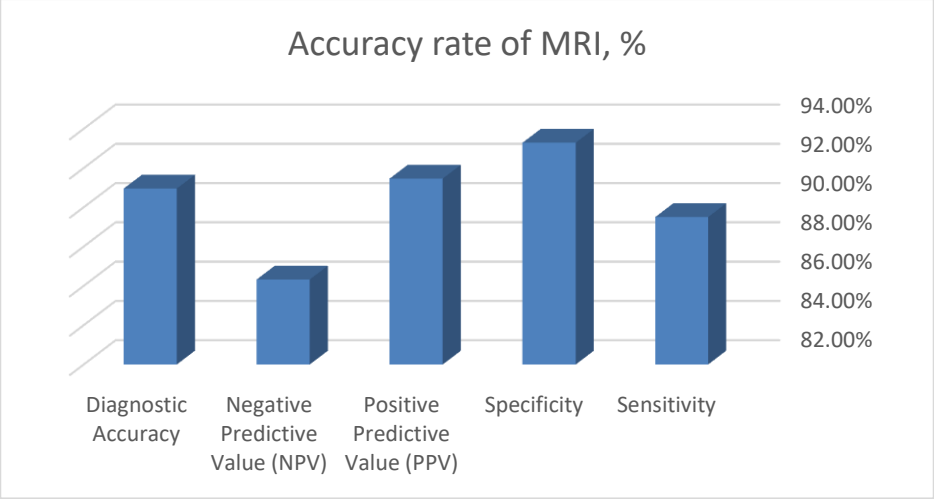

Figure 2. Determining the extends of MRI accuracy.

Table 3. Assessment of general health quality – life at patients by a questionnaire SF – 36.

Items	SF – 36
Physical function	61.34 ± 7.12
Psychological function	72.16 ± 4.95
Social and emotional functions	66.58 ± 5.32
Treatment function	71.84 ± 3.82

DISCUSSION

For the radiological assessment of genitourinary tumors, several imaging modalities, such as contrast-enhanced CT, fluoroscopy, and ultrasonography, are used. Because every type of imaging has unique diagnostic limitations and accuracy, different approaches have been investigated over time to increase the accuracy of bladder cancer staging, particularly in the first T stage of T1 or T2 (Tekes, A *et al.*, 2005).

Nowadays, MRI is a fundamental imaging technique for bladder cancer local staging. This is mostly because to its superior soft tissue contrast resolution, which makes it a better tool than CT for identifying regional visceral invasion, perivesical tissues, and detrusor muscle (Wang, H. J *et al.*, 2015). It has been demonstrated that the use of more recent MRI sequences, particularly diffusion-weighted imaging (DWI), enhances local staging, diagnostic precision, and the identification for malignant regional lymph nodes (El-Assmy, A *et al.*, 2009; Takeuchi, M *et al.*, 2009)

At first, T staging of tumors was done only by histology. With the development of sophisticated imaging techniques, CT/MRI may now accurately identify the tumor's T stage with diagnostic precision on par with histology (Abou-El-Ghar, M. E *et al.*, 2009; Brierley, J *et al.*, 2017; Narumi, Y *et al.*, 1993).

At the T2b stage, the T2 hypo-intense band has been altered without invasion of the surrounding perivesical fat, whereas the T2 hypo-intense band with the uneven inner margin at the intersection of the bladder tumor as well as normal tissue imply the T2a stage. The tumor signal is classified as being in the T3 stage when it penetrates the fat and the T4 stage when it penetrates the surrounding organs nor the pelvic wall (Daneshmand, S *et al.*, 2012; Rajesh, A *et al.*, 2011).

According to a Germany study (Gupta, N *et al.*, 2015), the best MRI method for bladder cancer local staging, however, is the combination for dynamic contrast-enhanced images with DWI as well as T2-weighted imaging. Pointing out that for local staging, MRI is more sensitive and specific than CT.

According to recent studies (Nguyen, H. T *et al.*, 2014; Klein, L., and Pollack, H. M, 1992; Beyersdorff, D *et al.*, 2008), DWI is a better way to distinguish among residual/recurrent illness and treatment response while combined to regular pelvic MRI.

CONCLUSION

In addition to improving patient care through early screening, prompt and appropriate treatment, and avoiding needless diagnostic biopsies, this study found that MRI provides a highly sensitive along with, accurate, non-invasive modality for diagnosing bladder cancer. As a result, patients'

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morbidity and mortality have dropped. Hence, we praise the regular use of MRI as a primary modality for the assessment of pre-operative bladder lesions in order to determine the best course of action for treatment and post-operative care.

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