Role of Dynamic Contrast Enhancement MRI and Cystourethroscopy in the Diagnosis and Local Staging of Urinary Bladder Cancer with Pathologic Correlation

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Abstract

Purpose: To evaluate the role of the dynamic contrast enhancement MRI and cystourethroscopy in the diagnosis and local staging of urinary bladder cancer with histopathological correlation.

Materials and methods: Dynamic contrast enhancement MRI and cystourethroscopy were done in this prospective study for 50 patients on the bases of suspected UB cancer after pelvic US and laboratory investigations. The definitive diagnosis was provided by histopathological examination of the resected tissue by cystourethroscopic biopsy or radical cystectomy. MRI results were compared with cystourethroscopic examination and histopathological results; the latter was regarded as the standard reference.

Results: Dynamic contrast enhanced T1WIs has revealed 29 patients with organ confined and 21 patients with non organ confined tumors. The histopathological results had revealed 31 patients with organ confined and 19 patients with non organ confined tumors. In addition dynamic contrast enhanced T1WIs has revealed 21 patients with stage T1, 8 patients with stage T2, 11 patients with stage T3, and 10 patients with stage T4. The histopathological results had revealed 21 patients with stage T1, 9 patients with stage T2, 11 patients with stage T3, and 9 patients with stage T4. Moreover, dynamic contrast enhanced T1WIs, sensitivity, specificity, PPV, NPV and accuracy were 74.83%, 93.1%, 77.51%, 91.91% and 89% respectively. Regarding the superficial ($\leq$ T1) and invasive tumors ($\geq$ T2) dynamic contrast enhanced T1WIs, sensitivity, specificity, PPV, NPV and accuracy were 85.71%, 89.66%, 85.71%, 89.66% and 88% respectively.

Conclusion: Dynamic Gadolinium enhanced MRI was considered the most accurate radiological modality in the diagnosis and local staging of urinary bladder cancer especially in invasive tumors but cystourethroscopy was considered the standard in the diagnosis of non invasive tumors. The histopathological results were regarded as the golden standard reference.

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Key Words: MRI (Magnetic resonance imaging); cystourethroscopy.

1. Introduction:

Bladder cancer is the most common tumor of the urinary system. It is the fourth most common cancer in males and the tenth most common cancer in females (1). Also (2) reported that urinary bladder cancer ranks ninth in worldwide cancer incidence. It is the seventh most common malignancy in men and seventeenth in women. In Egypt the incidence of bladder cancer in males were about four times than females (3).

Fast dynamic contrast enhanced MRI helps to differentiate bladder tumor from surrounding tissues because enhancement of the tumor occurs earlier than the normal bladder wall due to neovascularization. Fast dynamic MRI with images acquired at one image per second helps to distinguish tumor from post biopsy reaction (4).

Diagnosis of bladder carcinoma is important for appropriate management because the therapeutic method chosen and prognosis depend on the clinical and radiologic stage at presentation. MRI is the most promising imaging for diagnosis and local staging of cancer bladder. Its advantages include multiplaner imaging with better detection of tumors, better tissue characterization and superiority in evaluation invasion to the pelvic organs (5).

The aim of this study is to evaluate the role of the dynamic contrast enhancement MRI and cystourethroscopy in the diagnosis and local staging of urinary bladder cancer. MRI results were compared with cystourethroscopic examination and histopathological results; the latter was regarded as the standard reference.

2. Patients and methods:

This prospective study was conducted at MRI unit of Radiodiagnosis Department, New Damietta Hospital, Al-Azhar University for diagnosis and staging urinary bladder cancer in the period between January 2012 and February 2013. The study included 50 patients, 45 males 90% and 5 females10% with their ages ranged between 40-80

years. Patients referred from Urology Department on the bases of suspected UB cancer after pelvic US and laboratory investigations.

All the patients were subjected to the following:

1. History and clinical examination: were done by urologist.

2. Laboratory investigations: Urine analysis and cytology, complete blood picture, coagulation profile, liver and renal functions tests.

3. Radiological examinations:

A. Ultrasonography for abdomen and pelvis.

B. Chest radiography if suspected metastasis.

D. Dynamic Gadolinium enhanced MRI for pelvis.

MRI examination:

MRI machine: using Resonance Achieva 1.5 Tesla-XR Class IIa 2010, Philips.

Patient preparation and position: patients were instructed not to void for at least 2 hours before examination. The patient is lie supine, feet first on the scanner table in body coil. A midline sagittal localizer is performed for the pelvis. Using this image a series of variable different MRI pulse sequences are obtained.

MRI pulse sequences: T1 and T2WIs turbo spin echo images were used. Dynamic study T1 spoiled gradient WIs was used by I.V administration of (Gd-DTPA)(0.1mm l/kg) using pump injector at rate of 2ml/s followed by a 20 ml of sterile 0.9% saline solution flush. Dynamic study was initiated 10 seconds from the start of contrast injection and images were repeatedly acquired four times each 15 seconds at the same sections. Fast dynamic MRI using one image every 2 seconds, can be useful in differentiating tumor which enhances earliest approximately seconds after the beginning of arterial enhancement from post biopsy change which enhances approximately 10 seconds after the beginning of arterial enhancement. Late Gadolinium enhanced was performed 5 minutes after the dynamic study. The used MRI pulse sequences parameters table (1).

Table (1): shows MRI pulse sequences parameters.

Parameters	MRI Pulse sequences		
	T1WIs	T2WIs	Dynamic T1WIs
Repeation time	700 msec	3000 msec	140 msec
Echo time	15 msec	125 msec	10 msec
Matrix	256x192	256x192	256 x192
Field of view	380 mm	300 mm	380 mm
Slice thickness	5mm	5 mm	5 mm
Interslice gap	1 mm	1mm	1 mm
Aqusition time(minutes: seconds)	4	4	0.15
Flip angle	-	-	60

- **MRI diagnostic criteria:**
  The MRI images were evaluated based on study by (6,7).
- **T1-stage:**
  T1WIs: the urinary bladder wall at the tumor appears regular and surrounded by clear perivesical fat.
  T2WIs: shows a mass lesion surrounded by normal outer bladder muscle wall, seen as regular low signal intensity band**.**
  Dynamic contrast enhanced T1WIs: shows enhanced tumor and adjacent mucosa surrounded by regular hypointense muscular layer**.**
- **T2.a-stage:**
  T1WIs: like T1 stage tumor.
  T2WIs: shows a mass lesion surrounded by irregular inner contour of hypointense muscular layer with regular outer contour.
  Dynamic contrast enhanced T1WIs: shows enhanced tumor and adjacent mucosa surrounded by hypointense muscular wall with irregular inner contour.
- **T2.b-stage:**
  T1WIs: like T1 stage and T2a stage tumors.
  T2WIs: shows a mass lesion surrounded by disrupted hypointense muscular layer with intact perivesical fat.
  Dynamic contrast enhanced T1WIs: shows a mass lesion surrounded by disrupted hypointense muscular layer with smooth regular outer contour and clear perivesical fat**.**
- **T3.b-stage:**
  T1WIs: the contour of urinary bladder wall at the tumor appears irregular, shaggy with streaky areas of the same signal intensity as the bladder wall muscle extending to the perivesical fat.
  T2WIs: shows a mass lesion disrupting the surrounding hypointense muscular layer, showing irregular shaggy outer border extending to the perivesical fat.
  Dynamic contrast enhanced T1WIs: shows enhanced tumor extending into perivesical fat**.**
- **T4.a stage:**
  T1WIs: shows a mass lesion contiguous with the contour of adjacent pelvic organs (this finding is not specific due to lake of signal differentiation between the tumor and invaded structures on T1WIs).
  T2WIs: shows a mass lesion disrupting the surrounding hypointense muscular layer, extending to adjacent pelvic organ.
  Dynamic contrast enhanced T1WIs: shows enhanced tumor extending to adjacent pelvic organs.
- **T4.b-stage:**
  T1WIs: shows a mass lesion contiguous with the contour of abdominal or pelvic side walls (this finding is also not specific as in T4.a stage).
  T2WIs: shows a mass lesion disrupting the surrounding hypointense muscular layer, extending

to the abdominal or pelvic side walls.

Dynamic contrast enhanced T1WIs: shows contrast enhanced tumor, extending to the abdominal or pelvic side walls.

- **Lymph nodes:** were considered abnormal if the short axis was 1cm or more.
- **Pathologic staging:** TNM staging of bladder cancer table (2).

Table (2): shows TNM guideline for the staging of urinary bladder cancer (8).

Primary tumor (T)		
CIS	Carcinoma in situ.	
Ta	Noninvasive papillary tumor.	
T1	Tumor invades the lamina propria, but not beyond.	
T2	T2a	Tumor invades deep muscle (inner half).
	T2b	Tumors invade superficial muscle (outer half).
T3	T3a	Tumors extend microscopically into perivesical fat.
	T3b	Tumors extend macroscopically into perivesical fat.
T4	T4a	Tumor invades prostate, vagina or uterus.
	T4b	Tumor invades pelvis side wall or abdominal wall.
Regional lymph nodes (N)		
NX	Regional lymph nodes status is unknown.	
N0	No regional lymph node metastasis	
N1	Metastasis in a single lymph node 2 cm or less in greatest dimension.	
N2	Metastasis in a single lymph node more than 2 cm but less than or equal 5 cm in greatest dimension, or multiple lymph node, none more than 5 cm in greatest dimension.	
N3	Metastasis in a lymph nodes more than 5 cm	
Distant metastases (M)		
MX	Distant metastases cannot be assessed	
M	No distant metastases	
M1	Distant metastases	

4. Cystourethroscopy evaluation of the urinary bladder:

The diagnostic cystoscopy was done for all patients. We are mapping the bladder cavity are carefully inspected to assess the site, size, number and the growth pattern of the lesions. Tissue samples were obtained by transurethral resection from lesions and doubtful areas included the bladder muscle in the resected specimens to ensure accurate staging. The cystoscope was failed to diagnosis invasive tumors. The latter were diagnosed by MRI. These patients were underwent radical cystectomy and pelvic lymph-adenectomy with histopathological evaluation of the resected tissue.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed, using Statistical Package for Social Science (SPSS) version 19 (SPSS Inc, Chicago, USA), running on IBM compatible computer with Microsoft ® Windows 7 Operating System. Mean, frequency and percentage were used as descriptive, sensitivity, specificity, positive predictive value , negative predictive value and accuracy were used as measurements of validity for MRI tumor staging T1, T2 and Gadolinium enhanced T1WIs regarding the histopathological results.

3. Results:

The commonest age group in this study was 60-70 years (16/50 cases, 32%), followed by 40-50 years (14/50 cases, 28%), 50-60 years (13/50 cases 26%) and 70-80 years (7/50 cases, 14%).

Regarding patients complaint they were (38/50 cases, 76%) presented by painless hematuria which the most common symptom, followed by (4/50 cases, 8%) frequency, (3/50 cases, 6%) for each of strangury and dysuria and (2/50 cases, 4%) for urgency.

Table (3): shows dynamic enhanced T1WIs staging results compared to cystoscopic results.

Tumor stage	MRI staging	Cystoscopic staging
T1	21 case	26 case
T2	8 case	3 case
T3	11 case	0 case
T4	10 case	0 case
Total	50 case	29 case

MRI of the T3 and T4 stages were correlated with the histopathological results of the resected tissue after radical cystectomy.

- **MRI tumor staging:**

Organ confined (≤ T2b) and non organ confined tumors (≥ T3):

On T1WIs without contrast revealed 32 patients with organ confined and 18 patients non organ confined. On T2WIs revealed 30 patients with organ confined and 20 patients with non organ confined. On dynamic contrast enhanced T1WIs revealed 29 patients with organ confined and 21 patients with non organ confined. The histopathological results had revealed 31 patients with organ confined and 19 patients with non organ confined tumors.

On T2WIs has revealed 20 patients with stage T1, 10 patients with stage T2, 14 patients with stage T3, and 6 patients with stage T4.

The urinary bladder tumor, mucosa and submucosa are enhanced without enhanced muscle layer. Dynamic contrast enhanced T1WIs has revealed 21 patients with stage T1, 8 patients with stage T2, 11 patients with stage T3, and 10 patients with stage T4.

All tumors were pathologically confirmed to be bladder cancer. Noninvasive bladder cancer was proved in 21 patients, and invasive bladder cancer was proved in 29 patients. Transitional cell carcinoma was encountered in (30/50 patients, 60 %), squamous cell carcinoma was encountered in (18 / 50 patients, 36%), mixed transitional and squamous cell carcinoma were encountered in (1/50 patients, 2%) and adenocarcinoma was encountered in (1/50 patients, 2%). The histopathological staging has revealed 21 patients with stage T1, 9 patients with stage T2, 11 patients with stage T3, and 9 patients with stage T4.

On T2WIs the tumors were staged correctly in (34/50 patients, 68%), over stage in (9/50 patients, 18%) and under stage in (7/50 patients, 14 %) table (4).

Table (4): shows T2WIs staging results compared to histopathological results.

T2WIs staging	Histopathological staging				
	T1	T2	T3	T4	Total
T1	17	3	0	0	20
T2	5	4	1	0	10
T3	0	2	9	3	14
T4	0	0	2	4	6
Total	22	9	12	7	50

Table (5): shows T2WIs sensitivity, specificity, PPV, NPV and accuracy.

T2WIs staging		Histopathology staging			Sens.	Spec.	PPV	NPV	Accuracy
		Positive	Negative	Total					
T1	Positive	17	3	20	77.27	89.28	85	83.3	84
	Negative	5	25	30					
	Total	22	28	50					
T2	Positive	4	6	10	44.4	85.4	40	87.5	78
	Negative	5	35	40					
	Total	9	41	50					
T3	Positive	9	5	14	75	86.84	64.3	91.7	84
	Negative	3	36	36					
	Total	12	41	50					
T4	Positive	4	2	6	57.14	95.35	66.7	93.18	90
	Negative	3	41	44					
	Total	7	43	50					
Mean					63.45	89.22	64	88.92	84

On dynamic enhanced T1WIs, the tumors were staged correctly in (40 / 50 patients, 80%), over stage in (7/50 patients, 14 %) and under stage in (3/0 patients, 6 %) table (6).

Table (6): shows dynamic enhanced T1WIs staging results compared to histopathological results.

Dynamic enhanced T1WIs staging	Histopathological staging				
	T1	T2	T3	T4	Total
T1	18	3	0	0	21
T2	3	5	0	0	8
T3	0	2	9	0	11
T4	0	0	2	8	10
Total	21	10	11	8	50

Table (7): shows dynamic enhanced T1WIs sensitivity, specificity, PPV, NPV and accuracy.

Dynamic enhanced T1WIs staging		Histopathological staging			Sens.	Spec.	PPV	NPV	Accuracy
		Positive	Negative	Total					
T1	Positive	18	3	21	85.71	89.66	85.71	89.66	88
	Negative	3	26	29					
	Total	21	29	50					
T2	Positive	5	3	8	50	92.5	62.5	88.1	84
	Negative	5	37	42					
	Total	10	40	50					
T3	Positive	9	2	11	81.82	94.87	81.82	94.87	92
	Negative	2	37	39					
	Total	11	39	50					
T4	Positive	8	2	10	80	95	80	95	92
	Negative	2	38	40					
	Total	10	40	50					
Mean					74.83	93.1	77.51	91.91	89

Superficial (≤ T1) and invasive tumors (≥ T2):

On T2WIs, tumors were staged correctly in (42/ 50 patients, 84%), over stage in (5/50 patients, 10%) and (under stage in 3/50 patients 6%), yielding an overall sensitivity, specificity, PPV, NPV and accuracy were 77.27%, 89.29%, 85%, 83.33% and 84% respectively table (8).

Table (8): shows T2WIs result in differentiate superficial and invasive tumors compared to histopathological results.

T2WIs staging		Histopathological staging		
		Superficial	Invasive	Total
MRI staging	Superficial	17	3	20
	Invasive	5	25	30
	Total	22	28	50

On dynamic enhanced T1WIs, tumors were staged correctly in (44/ 50 patients, 88%) , over stage in (3/50 patients, 6%) and under stage in (3/50 patients, 6%), yielding an overall sensitivity, specificity, PPV, NPV and accuracy were 85.71%, 89.66%, 85.71%, 89.66% and 88% respectively table (9).

Table (9): shows dynamic enhanced T1WIs result in differentiate superficial and invasive tumors compared to histopathological results.

T1WIs with contrast staging		Histopathological staging		
		Superficial	Invasive	Total
MRI staging	Superficial	18	3	21
	Invasive	3	26	29
	Total	21	29	50

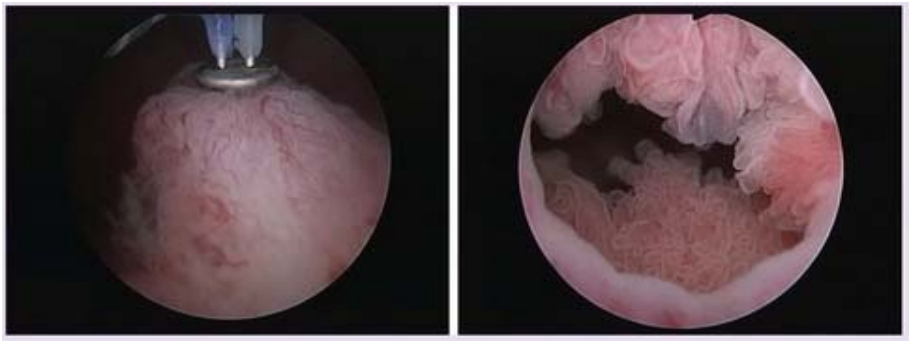
- **Enlarged pelvic lymph nodes staging:**

MRI of enlarged pelvic lymph nodes were presented in (8/50 patients, 16%) with their diameter more than 1cm in greatest dimension and the remaining (42/50 patients, 84 %) were free. All patients with enlarged lymph nodes were of (T2 to T4 stage).The histopathological results had revealed (7/8 patients, 87.5%), with malignant lymph node and (1/8 Patients, 12.5%) with false positive finding which revealed inflammatory lymph nodes. The malignant lymph nodes were diagnosed in (7/8 patients) by MRI yielding an overall sensitivity, specificity, PPV, NPV and accuracy were 97.67 %, 100%., 100%, 87.5% and 98% respectively table (10).

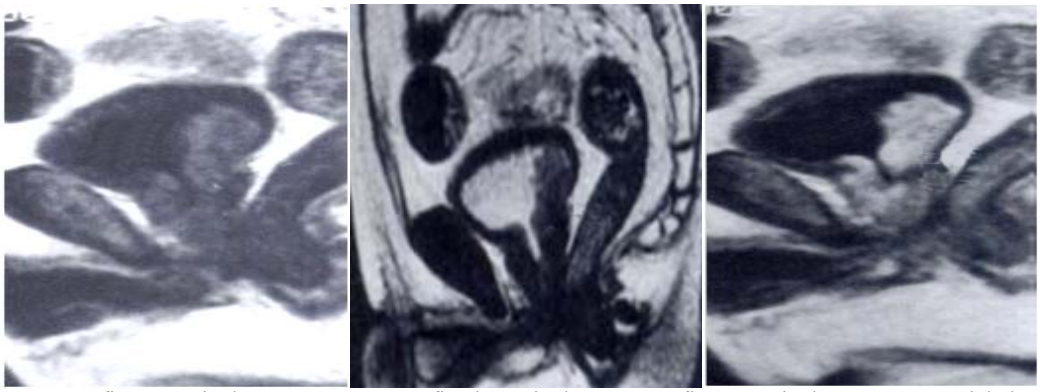
Table (10): shows MRI staging of enlarged pelvic lymph nodes results compared to histopathological results.

Enlarged pelvic lymph nodes staging		Histopathological staging		
		N0	N1-N2	Total
MRI staging	N0	42	0	42
	N1-N2	1	7	8
Total		43	7	50

Figure No.1:



Diagnostic Cystourethroscopy: UB shows left lateral wall fungating mass partially extending to posterior wall.



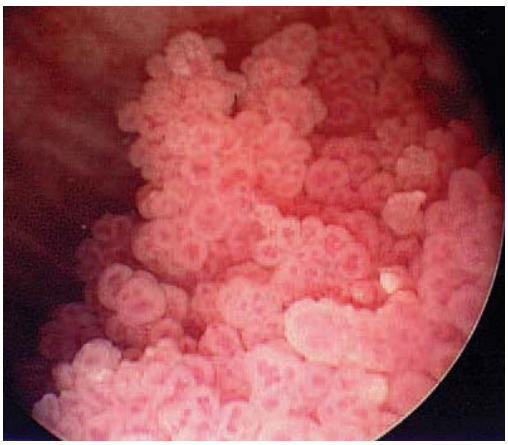
MRI: fig.1a. Sagittal T1WIs fig.1b. Sagittal T2WIs fig.1c. Sagittal T1 T2WIs arterial phase image shows early homogenous enhancement of mass

MRI: UB left lateral wall endophytic mass partially extending to the posterior wall infiltrating muscle wall, perivesical fat and corresponding part of the prostate. The lesion appears intermediate signal in T1 and T2 WIs and measuring 4x5 cm. Sagittal arterial phase image shows early homogenous enhancement of mass and infiltrated part of the prostate.

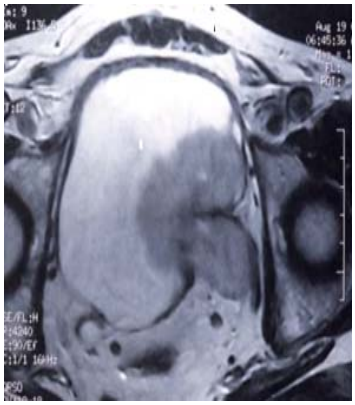
Histopathology: Grade I-II Squamous cell carcinoma, infiltrating the muscle layer, perivesical fat and prostate. Stage T4a.

MRI diagnosis: Stage T4a corresponding histopathology.

Figure No. 2:



Diagnostic Cystourethroscopy: UB shows left lateral wall a fround like mass fungating into the bladder lumen.



MRI: fig. 2a. Axial T2WIs

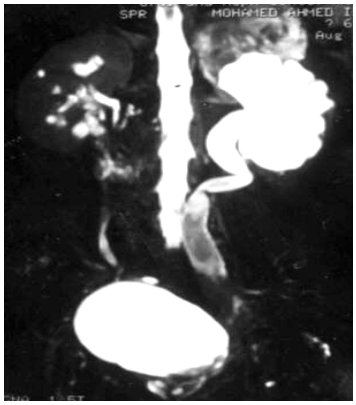


fig. 2.b. Coronal MRU

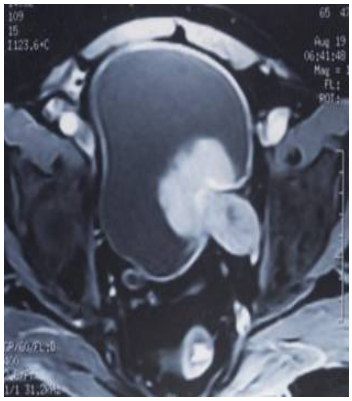


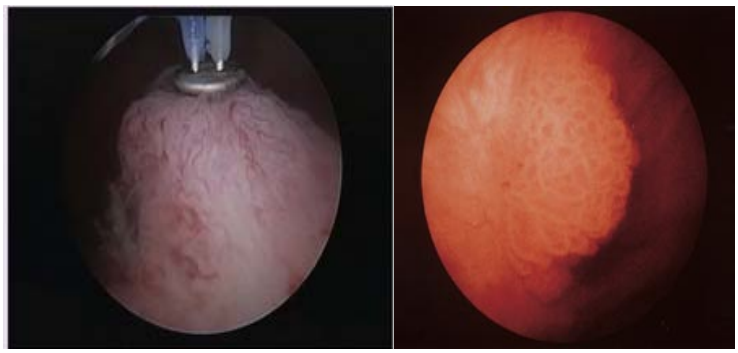
fig. 2.c. Axial T1WIs arterial phase image shows homogeneous enhancement of mass

MRI: UB shows left lateral wall fungating mass measuring 4x3 cm appears intermediate signal in T2 with involvement inner half of the UB muscle and encroachment upon left lower ureteric orifice with consequent left hydroureteronephrosis (as seen in MR Urography). Axial arterial phase image shows bright homogenous enhancement of mass.

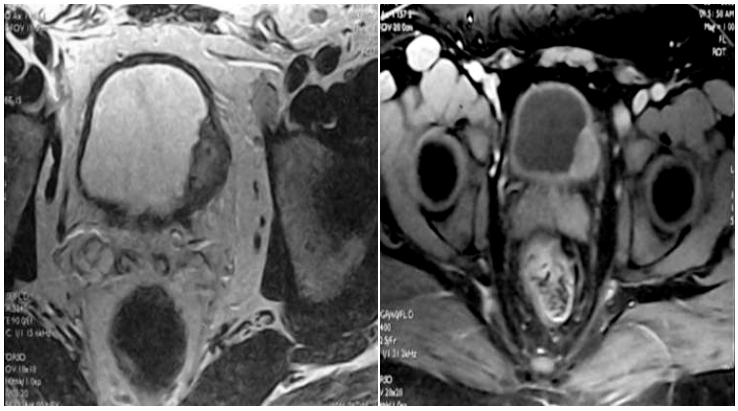
Histopathology: Grade II transitional cell carcinoma infiltrating the lamina propria and muscle layer. StageT2a.

MRI diagnosis: Stage T2a corresponding histopathology.

Figure No. 3:



Diagnostic Cystourethroscopy: UB shows left lateral wall fungating mass.



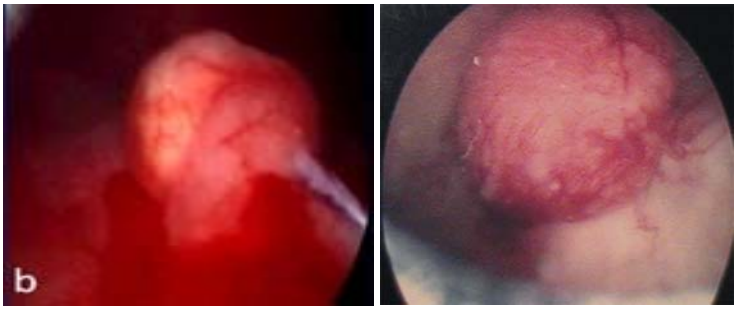
MRI: fig.3 a. Axial T2 WIs

fig. 3.b. Axial T1 WIs venous phase image shows homogenous enhancement of mass

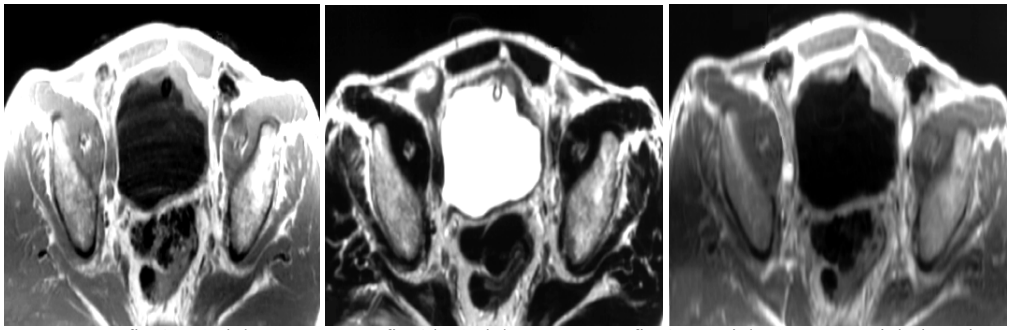
MRI: UB left lateral wall endophytic mass measuring about 1.5x 2 cm appears intermediate signal in T2WIs and infiltrating UB muscle and perivesical fat. Enlarged left external iliac lymph node is also noted measuring 1.5 cm. Axial venous phase image shows homogenous enhancement of mass and lymph node.

Histopathology: Grade II-III transitional cell carcinoma infiltrating muscle layer and perivesical fat with malignant lymph node.StageT3bN3.
MRI diagnosis: StageT3bN3 corresponding histopathology.

Figure No. 4:



Diagnostic Cystourethroscopy: UB shows anterior wall single solid sessile lesion.

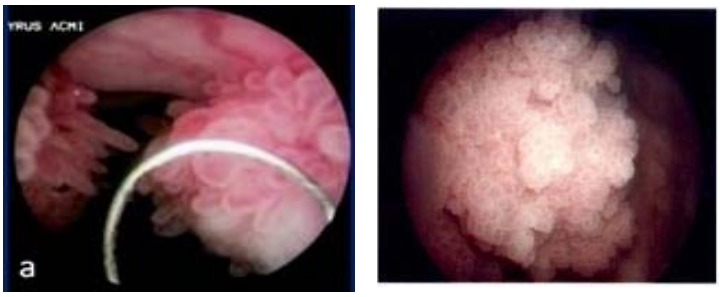


MRI: fig.4.a. Axial T1 WIs fig.4.b. Axial T2 WIs fig.4.c. Axial T1 WIs arterial phase image shows non homogenous enhancement of mass

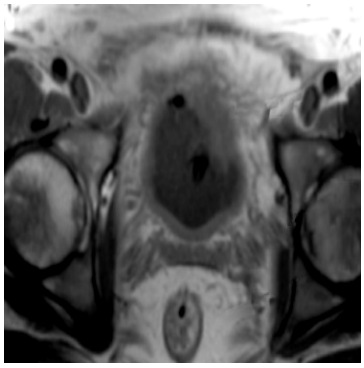
MRI: UB anterior wall focal mural thickening is seen measuring about 5x1cm appears isointense to muscle in T1 and intermediate signal in T2 WIs with intact muscle as well as perivesical fat. Axial arterial phase image shows non homogenous enhancement of mass.

Histopathology: Grade II-III papillary transitional cell carcinoma infiltrating lamina propria with free muscle layer.StageT1.
MRI diagnosis: StageT1 corresponding histopathology.

Figure No. 5:



Diagnostic Cystourethroscopy: UB shows left lateral wall and dome fungating papillary mass.



MRI: fig.5.a. Axial T1WIs

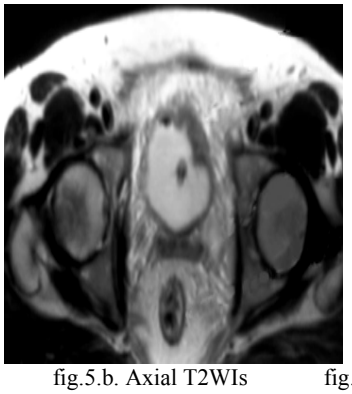


fig.5.b. Axial T2WIs

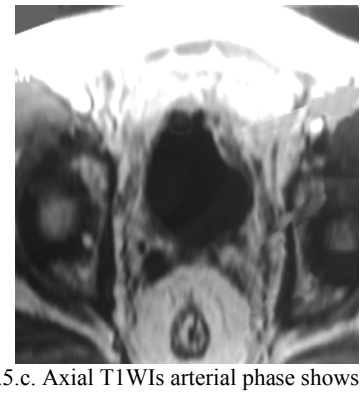


fig.5.c. Axial T1WIs arterial phase shows heterogeneous enhancement of mass

MRI: UB left lateral wall endophytic mass extending to the bladder dome measuring 5x2 cm appears isointense to muscle in T1and intermediate signal in T2 WIs with shaggy outer contour of UB denoting involvement muscle and perivesical fat. Axial arterial phase image shows heterogeneous enhancement of mass.

Histopathology: Grade II-III transitional cell carcinoma infiltrating the lamina propria and muscle layer but intact perivesical fat. StageT2b.

MRI diagnosis: Stage T3b matched by stage T2b on histopathology denoting over stage by MRI.

4. Discussion:

The commonest age group for incidence bladder cancer in the current study was sixth to seventh decade of life (16/50 cases, 32%). (9) reported similar results.

In my study males were predominance features as that in study by (10).

Almost patients complaint in our study were painless hematuria (38/50 patients, 76 %), followed by (irritative voiding symptoms of urinary bladder includes frequency, strangury, dysuria and urgency). These results were in accordance with (11) who founded that painless hematuria; occur in about 85% of patients. The irritative voiding symptoms were the second most common presentations.

Bladder cancer is the most common malignancy among Egyptian males and previously has been attributed to schistosoma infection, a major risk factor for squamous cell carcinoma (SCC). Recently, transitional cell carcinoma (TCC) incidence has been increased while SCC has declined (12).

(13) reported that significant changes in the histological pattern of cancer bladder in Egypt in the last few decades due to successful treatment of endemic schistosomiasis.(14) founded that in western countries the TCC is related to smoking risk factor. In our study the (TCC) were encountered in (30/50 cases, 60%), (SCC) were encountered in (18/50 cases, 36%), mixed TCC and SCC were encountered in (1/50 cases, 2%) and Adenocarcinoma were encountered in (1/50 cases, 2%). These results were in agreement with previously mentioned studies.

Ultrasound is a commonly used technique to screen the diagnosis of UB cancer due to its availability, low costs, non-invasive, and there is no need for contrast agents. The diagnosis relies on the detection of bladder wall thickening or the presence of focal masses protruding into the bladder lumen (15). Accurate tumor staging is not possible when using ultrasound because of the limited resolution of the different layers of the bladder wall (16). Also other limitations of US include lower rates of detection compared with CT and cystoscopy (particularly with small lesions < 5mm and position of lesion worse in anterior wall (17).

Regarding role of CT in the diagnosis and staging UB cancer (18,19) were mentioned that the CT sensitivity in detecting bladder cancer of 79%-89.7% and a specificity of 91%-94%. (20) reported that the sensitivity of 3D reconstruction in detecting bladder carcinoma in all stages were 76.9%. (21) founded that the sensitivity and specificity of MDCT urography for detecting bladder cancer is generally in the range of 79-93% and 91-99% respectively. Also (22) mentioned that CT virtual cystoscopy is a new 3D reconstruction technique that was shown to be the most sensitive and specific diagnostic modality (sensitivity 93.9%, specificity 98.1%) compared to the other modalities. (23) showed that the accuracy of contrast enhanced CT in the local staging of bladder cancer is only 40%-60%. Also (4) founded that the accuracy of CT in determining extravesical tumor extension varies from 55% to 92%. (24) stated that one limitation to CT is that the radiation dose would be increased in dynamic contrast enhanced MDCT.

(25) mentioned that the diagnostic accuracy of MRI was ranges from 72% to 96%. (26) reported

that, for local tumor staging, the accuracy of MRI varies from 62-85% (on average about 20% higher than CT). Also (6) stated that MRI is more accurate than CT for local staging and Gadolinium enhanced MRI improves accuracy of extravesical extension to 73-100%. (1) founded that MRI is considered superior to CT in demonstrating the extent of bladder wall invasion (i.e., in differentiating between stage T2a and stage T2b disease).

Our findings demonstrated the diagnostic accuracy of T2WIs was 84% but (27) showed that the diagnostic accuracy of T2WIs was 67%.We found the diagnostic accuracy for dynamic Gadolinium enhanced T1WIs was 89%. But (6, 27) were mentioned that the diagnostic accuracy for dynamic Gadolinium enhanced T1WIs were 62% and 79% respectively. (27) demonstrated that the overall accuracy was improved from 67% to 79% after use of dynamic Gadolinium enhanced MRI. We had overall accuracy was improved from 84 % to 89% after use of dynamic Gadolinium enhanced MRI.

We reported the staging accuracy of T2WIs in assessment superficial versus invasive disease was 84%, which increased to 88 % after dynamic Gadolinium enhanced T1WIs. These results were close to the results reported by (6), demonstrated that the overall staging accuracy was 85% for T2 and Gadolinium enhanced T1WIs in differentiating superficial versus invasive disease.

In my study over staging results were the most common error occurred in evaluating tumor staging by MRI. Similar results were also obtained by (6).

Our study has revealed that the MRI can staging all tumors on other hand cystoscopy has staged only T1 and T2 tumors. These results were coincided with that of (24) mentioned the cystoscopy is imperfect, tumors can be missed, and normal structures can be mistaken for bladder tumors.

The incidence of pelvic lymph nodes metastases, CT accuracy ranges from 73-92% with a tendency to under stage nodal involvement. Nodal involvement is currently judged on size criteria and both CT and MRI are unable to detect metastatic spread in normal sized lymph nodes, or lymph nodes enlarged by a benign process (28).

(29) also mentioned that the accuracy of CT in detecting lymph nodes metastases in patient with cancer UB has ranged from 70-90% with false negative rate of 20-45%. We reported the sensitivity, specificity and accuracy of MRI in detecting enlarged pelvic lymph nodes were 97.67%, 100% and 98% respectively but (6), reported that the sensitivity, specificity and accuracy were 78%, 98% and 96%, respectively. Also (30) mentioned that sensitivity; specificity and accuracy were 76%, 99% and 92% respectively.

In the current study the superficial bladder tumors (CIS, Ta and T1) were comprised 31 cases 62%, but in study by (31) was represented about 70%. Also in our study the invasive bladder tumors were presented in 19 cases 38%, on other hand in study by (32) was represented about 24%.

In conclusion, fast dynamic Gadolinium enhanced MRI was used for assessment of local invasion but they are unable to detect microscopic invasion and CIS. The aim of MRI is therefore to detect T3b disease or higher. On other hand the cystourethroscopy was the standard in the of diagnosis non invasive tumors.

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