

A Study on the Evaluation of the Diagnostic Accuracy of Computed Tomography in the Diagnosis of Urinary Bladder Mass

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Abstract:

Objectives: The goal of the study is to evaluate the diagnostic accuracy of computed tomography in the diagnosis of urinary bladder mass.

Methodology; This cross-sectional study was conducted in the department of Radiology & Imaging and department of Urology of Shear-E-Bangla Medical Collage & Hospital (SBMCH), Barisal and LAB AID limited (diagnostic), Barisal during the period from July 2017 to march 2018, enrolling 50 patients of 25 to 75 years of age range who are referred by Urology department of SBMCH, Barisal & LAB AID limited (diagnostic), Barisal, as clinically suspected cases of urinary bladder mass for CT scan of whole abdomen, during the period of July 2017 to march 2018.

Result: In this study, mean age was 57.84 ± 14.67 (mean \pm SD) years. Highest incidence of bladder mass, 42.09% was found in above 59 years age group. It was observed that 38 were male (76%) and 12 were female (24%). The most common symptom associated with bladder mass was haematuria which was observed in all study subjects (100%). Among 50 cases, 47 (94%) masses were neoplastic and rest 3 (6%) was inflammatory as diagnosed by CT scan. Among the 47 neoplastic masses, 43 were malignant and 4 were benign lesion. Commonest CT scan diagnosis was transitional cell carcinoma (TCC) (75.84%). Squamous cell carcinoma prevailed in 6.69%, Adenocarcinoma in 6.69% and Leiomyoma and chronic cystitis were 5.39% and 5.39% respectively. Considering histopathological diagnosis as gold standard test sensitivity, specificity, PPV, NPV and accuracy of CT scan in diagnosis of malignant bladder mass were 95.50%, 83.30%, 98.47%, 62.6% and 93.98% respectively.

Conclusion: In most of the cases. Computed Tomography findings of the present study correlated well with histopathological findings. It can therefore be concluded that, Computed Tomography is a useful modality in the diagnosis of different type of urinary bladder masses.

Key words: Computed Tomography (CT), Urinary bladder mass, Haematuria, Histopathological.

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I. Introduction

The urinary bladder is a hollow muscular organ in humans and some other animals that collects and stores urine from the kidneys before disposal by urination. In the human the bladder is a hollow muscular, and distensible (or elastic) organ, that sits on the pelvic floor^[1] Primary bladder neoplasms account for 2%-6% of all tumors, with bladder cancer ranked as the fourth common malignancy. Tumors may arise from the epithelial surface of the bladder. Bladder neoplasms can arise from any of the bladder wall layers. They are broadly classified as either epithelial or non (mesenchymal), with over 95% being epithelial. Urothelial tumors exhibit a spectrum of neoplasia ranging from a benign papilloma through carcinoma in situ (CIS) to invasive carcinoma. Transitional cell carcinoma (TCC) of the bladder is one of the most common malignancies affecting the genitourinary tract and is characterized by multifocality and a high incidence of recurrence. Radiologists play an important role in the staging and surveillance of this malignancy^[2].

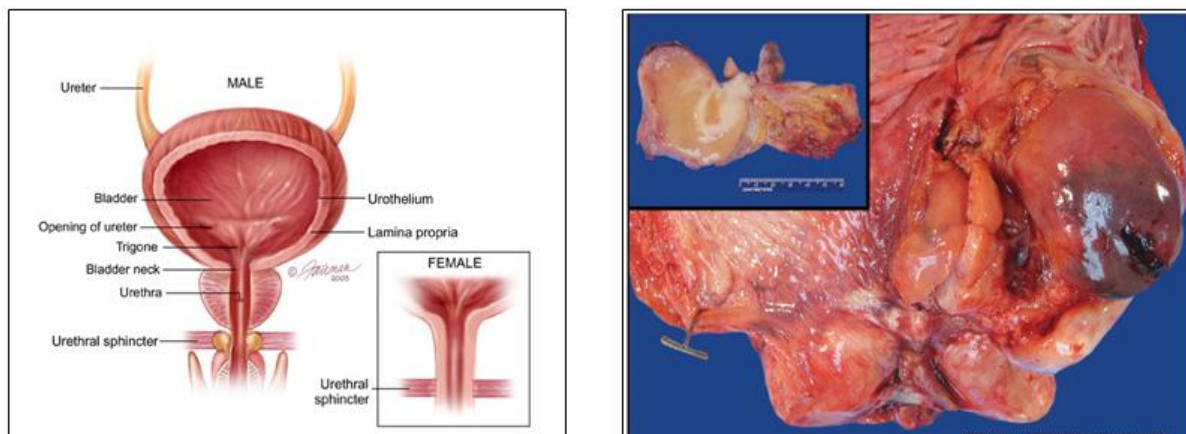


Figure: 1a & 1b: show bladder and bladder with small tumor^[4]

Bladder neoplasms can arise from any of the bladder layers. They are broadly classified as either epithelial or non-epithelial (mesenchymal), with over 94% being epithelial. Epithelial tumors with differentiation toward normal urothelium are urothelial. The term urothelial carcinoma is now preferred over transitional carcinoma. Urothelial tumors exhibit a spectrum of neoplasia ranging from a benign papilloma through carcinoma in situ to invasive carcinoma.^[3] Although clinical staging is accurate in evaluating superficial tumors, it is prone to both under staging and over staging of invasive lesions. Hence, imaging techniques such as CT and MRI may play an important role in accurate disease staging.^[4]

II. Objectives of the Study

General Objective:

- To evaluate the diagnostic accuracy of computed tomography in the diagnosis of urinary bladder mass.

Specific Objective:

- Analysis of Haematuria with all study subjects.
- Examine patients with histopathological diagnosis as gold standard test sensitivity.
- Check accuracy of CT scan in diagnosis of malignant bladder.

III. Methodology

Study Type:

- It was a cross sectional and descriptive type study.

Place and period of study:

- This present study was conducted in the department of Radiology & Imaging and department of Urology of Shear-E-Bangla Medical Collage & Hospital, Barisal and LAB AID limited(diagnostic), to evaluate the diagnostic accuracy of computed tomography in the diagnosis of urinary bladder mass enrolling 50 patients who were referred by Urology department of SBMCH & and LAB AID limited(diagnostic), Barisal, as clinically suspected cases of urinary bladder mass for CT scan of whole abdomen, of 25 to 75 years of age range during the period of July 2017 to march 2018.

Method of data collection:

CT scan of abdomen was performed in all patients and after surgery histopathological diagnosis was done. Histopathological reports were collected and correlated with CT findings. Finally, histopathology reports were collected from 50 patients and they were considered as study sample. After taking informed consent, data was collected in a pre-tested questionnaire by taking history, examining the patients clinically, the finding and interpretation of the CT scan and histopathological reports. Histopathological diagnosis was considered as gold standard of diagnostic criteria. The data was expressed as frequency, percentage, mean (\pm SD) and range.

IV. Result

Demographic characteristics of the study subject: Among 50 study subjects the age ranged between 25 to 75 years. Mean age was 57.84 ± 14.67 (mean \pm SD) years. Highest incidence of bladder mass, 42.09% was found in above 59 years age group. It was observed that 38 were male (76%) and 12 were female (24%).

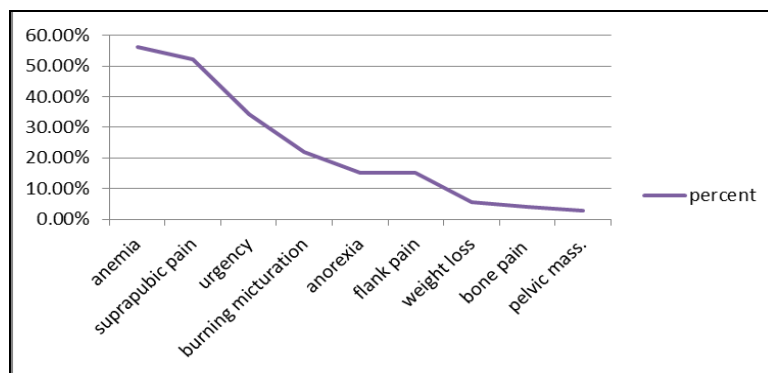


Figure 2: Clinical presentation of the study subjects with haematuria

CT scan features of the urinary bladder masses:

Among 50 cases, 47 (94%) masses were neoplastic and rest 3 (6%) was inflammatory as diagnosed by CT scan. Among the 47 neoplastic masses, 43 were malignant and 4 were benign lesion. Out of 38 cases of Transitional cell carcinoma, 79% involved base and 50% involved lateral bladder wall. 90% TCC was isodense & 79.4% with irregular margin. Tumour extension into perivesical tissue was (30%) & adjacent viscera (20%). Most cases (80%) revealed homogeneous contrast enhancement & 20% revealed distant metastasis. Among 5 cases of squamous cell carcinoma(SCC), 81% showed lateral wall involvement and 19% showed diffuse bladder wall thickening. Irregular margin noted in 100% cases & hyperdensity in 59% cases. All the cases (100%) revealed invasion to bladder wall, perivesical tissue and neighbouring viscera with strong homogeneous contrast enhancement in 100% cases. Most of the adenocarcinoma (90%) revealed homogeneous contrast enhancement. In adenocarcinoma 40% revealed distant metastasis. Leiomyoma showed regular margin with lateral bladder wall involvement in 100% cases. Homogenous enhancement seen in (100%) all cases. Chronic cystitis revealed as non-enhancing lesion with diffuse bladder wall involvement in (70%) & lateral wall in (20%) cases with irregular margin in 100% cases.

Table-I: Distribution of CT scan features of urinary bladder masses (n=50)

Type of lesion Site of involvement CT scan finding (%)	Neoplastic			Inflammatory	
	Malignant		Benign Leiomyoma	Chronic Cystitis	
	TCC	SCC			
• Involvement of base of urinary bladder	79	20	50	00	00
• Involvement of lateral wall of urinary bladder					
• Diffuse bladder wall involvement	50	80.70	20.80	100.00	20.80

Table-II: Type of lesion (Margin of lesion)

CT scan finding (%)	TCC	SCC	Adeno-carcinoma	Leiomyoma	Chronic Cystitis
	» Regular	20.6	00	60	100
• Irregular	79.4	100	40	00	100
Type of lesion (Density)	TCC	SCC	Adcno-carcinoma	Leiomyoma	Chronic Cystitis
• Isodense	90	40	10	100	100
• Hypodense	00	00	00	06	00
• Hyper density	00	60	10	00	00
• Mixed	10	00	90	00	00

Table III: Type of lesion (Extension of lesion)

CT scan finding (%)	TCC	SCC	Adeno- carcinoma	Leiomyoma	Chronic Cystitis
• Extension into bladder wall	40	100	100	00	00
• Extension into perivascular tissue	30	100	100	00	00
• Extension into adjacent viscera	20	100	25	00	00
Type of lesion (Enhancement pattern)	TCC	SCC	Adeno- carcinoma	Leiomyoma	Chronic Cystitis
Homogenous enhancement	81	90	10	100	00
Heterogeneous enhancement	19	10	90	00	00

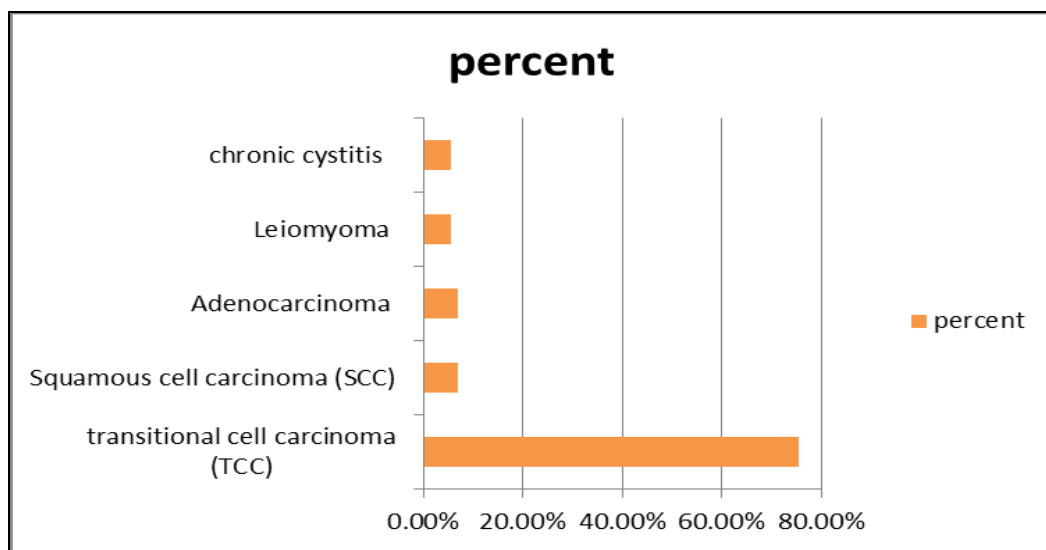


Figure 3: Characteristics of different urinary bladder

In Figure-3 Among the 47 neoplastic masses, 43 were malignant and 4 were benign lesion. Commonest CT scan diagnosis was transitional cell carcinoma (TCC) (75.84%). Squamous cell carcinoma(SCC) prevailed in 6.69%, Adenocarcinoma in 6.69% and Leiomyoma and chronic cystitis were 5.39% and 5.39% respectively.

Evaluation of CT scan diagnosis:

Out of the 50 study subjects, 45 were histopathologically confirmed as malignant mass. Among the confirmed 45 subjects, 43 (True positive) were diagnosed as malignant mass by CT scan accurately.

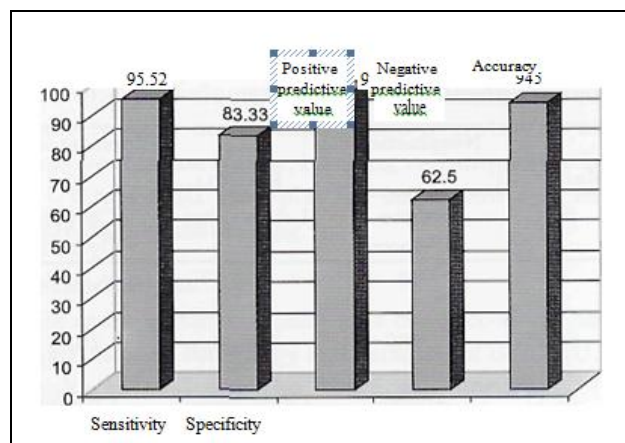
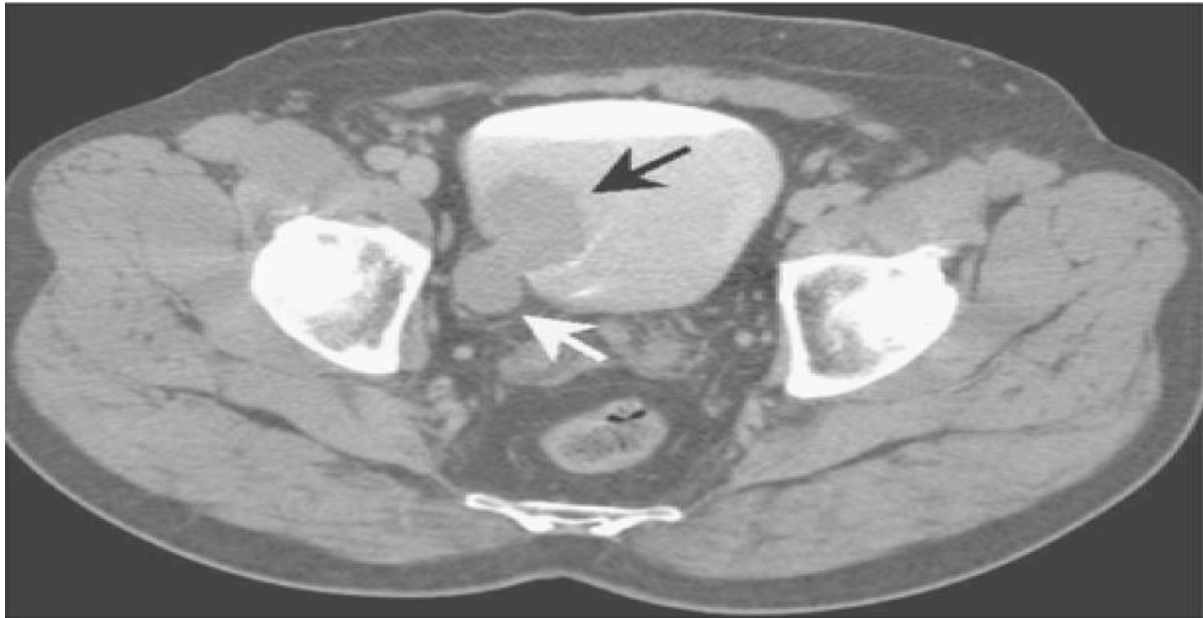


Figure 4: Bar diagram of CT scan showing Sensitivity, Specificity, Positive predictive value, Negative predictive value and accuracy of CTscan for diagnosis of malignant bladder maw considering Histopathology as a gold standard test.

Considering histopathological diagnosis as gold standard test sensitivity, specificity, PPV, NPV and accuracy of CT scan in diagnosis of malignant bladder mass were 95.50%, 83.30%, 98.47%, 62.6% and 93.98% respectively.

Figure 5: A computed tomography scan of a patient with TCC of urinary bladder.



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Figure6: Axial CT Scan showing squamous cell carcinoma involving base & left lateral bladder wall

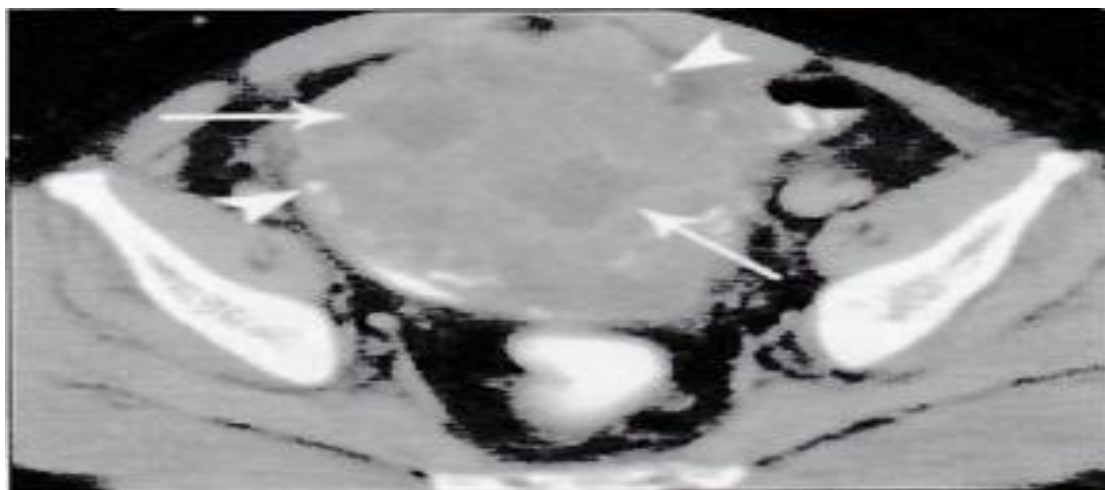


Figure 7: Axial CT image of urinary bladder showing Adenocarcinoma having solid & cystic component with peripheral calcification

V. Discussion

The most common symptom associated with bladder mass was haematuria which was observed in all study subjects. 41 subjects (56.17%) had anemia, 38 subjects (52.01%) had suprapubic pain, 34.25% had urgency. 21.91% had burning micturition. 17.81% had increased frequency, 15.06% had anorexia, 10.95% had flank pain, 5.47% had weight loss. 4.10% had bone pain and 2.74% subjects presented with pelvic mass. Previous study result showed that almost 85% of patients with bladder cancer present with hematuria, which was either gross or microscopic and was usually painless and intermittent.^[5] Out of the 50 study subjects, 45 were histopathologically confirmed as malignant mass. Among the confirmed 45 subjects, 43 (True positive) were diagnosed as malignant mass by CT scan accurately. Considering histopathological diagnosis as gold standard test, sensitivity, specificity, PPV, NPV and accuracy of CT scan in diagnosis of mass were 95.50%, 83.30%, 98.47%, 62.6% and 93.98% respectively. Knox et al evaluated and compared the diagnostic accuracy of Computed Tomography and ultrasonography (US) for diagnosing bladder cancer. They found CT was highly specific for bladder cancer (96.51%). This result is comparable with our present study.^[6] Another report conducted a similar study where it was observed that CT scan with intravenous contrast and 60-second delayed images was highly sensitive (92%) and specific (98%) method for detecting bladder cancer and associated perivesical invasion.^[8] According to the present study finding, CT scan is a modality of choice in evaluation of bladder mass lesion. Since final diagnosis of bladder mass requires cystoscopy-histopathology, CT scan is not certainly the most adequate examination. However, despite its own pitfalls it can provide suspected areas to be further assessed by following cystoscopy, while, the visualization of a bladder tumor in early imaging where cystoscopy is not available can save money and time. In bladder mass lesion, male suffer four times more than female¹". In our study, male female ratio was 3:1 which is comparable with other report.^[9] Others reported that Ninety-five percent of bladder neoplasm (TCC) arises from the transitional epithelium. Some described that prevalence of TCC, Squamous Cell Carcinoma and Adenocarcinoma were 95.1%, 4.1% and 1.2% respectively. Similar comparable incidence was observed in our study and it was transitional cell carcinoma (TCC) in 75.37%, Squamous cell carcinoma in 06.83% and Adenocarcinoma in 06.85% study subjects.^[10]

VI. Conclusion

In most of the cases, Computed Tomography findings of the present study correlated well with histopathological findings. It can therefore be concluded that, Computed Tomography is a useful modality in the diagnosis of type of urinary bladder masses.

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