

A study of diagnostic accuracy of CT scan in the diagnosis of urinary bladder tumors at tertiary health care centre

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Abstract

Background: Computed tomography (CT) has been the most commonly used imaging technique for evaluation and staging bladder tumours. Overall accuracy of CT staging and lymph node assessment varies in different study series. **Aim:** To determine the diagnostic accuracy of CT scan in the diagnosis of urinary bladder tumours at tertiary health care centre. **Material and Methods:** A total of 30 patients already diagnosed and with signs and symptoms suggestive of urinary bladder carcinoma were included in the study. Radiological imaging studies were carried out on all patients. Both plain and contrast enhanced CT scans were obtained. **Results:** CT could accurately detect 80% perivesical spread of tumour, 67% pelvic side wall and abdominal wall, lymphnode involvement in 85.3 cases, involvement of adjacent organ in 75% cases and distant metastases in 83.4% cases. **Conclusion:** Overall accuracy of staging of bladder cancer by CT found to be 73.3%, although accuracy in differentiating superficial and deep muscle involvement was poor. **Key Words:** Urinary bladder tumors, Computed Tomography scan, tumor staging, metastasis, accuracy.

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INTRODUCTION

Urinary bladder cancer is the ninth most common cancer accounting for 3.9% of all cancer cases.¹ It is primarily a disease of the elderly people. This prominence exists in part, because an increasing life expectancy permits an ever increasing proportion of the population to reach the higher risk age group and in part because of an apparent increase in the predisposing factors. More than 90% of BCa are transitional cell carcinomas, 5% are squamous cell carcinomas, and less than 2% are adenocarcinomas.² It is a heterogeneous disease, with 70%

of patients presenting with superficial tumours, which tend to recur but are generally not life threatening, and 30% presenting as muscle-invasive disease associated with a high risk of death from distant metastases.² Over the past 15 years, computed tomography (CT) has been the most commonly used imaging technique for evaluation and staging bladder tumours. CT is most useful for evaluating extravesical extension, invasion of adjacent organs and detection of lymphnode metastases. Overall accuracy of CT staging varies from 64% to 81%. The overall accuracy of lymphnode assessment varies from 83-92% with false negative rates of 25-40% due mainly to tumour in normal sized lymphnodes.^{3,4} This information helps in decision making regarding candidates for radical cystectomy. The anatomical and dosimetric data provided by CT have improved radiation port planning, facilitating positive use of computerized dosimetry. This present study was done to determine the diagnostic accuracy of CT scan in the diagnosis of urinary bladder tumours at tertiary health care centre.

MATERIAL AND METHODS

A total of 30 patients with signs and symptoms suggestive of urinary bladder carcinoma and already diagnosed by cystoscopic examination were included in the study. Known cases of urinary bladder carcinoma referred to Department of Radiology, Assam Medical College and Hospital, Dibrugarh were also included. Detailed history was taken. Signs and symptoms were recorded. General and systemic examination was done.

Imaging Ultrasonography: The patients were kept on empty stomach for at least 6 hours before the examination. The urinary bladder was examined in the distended state. Real time B-mode ultrasonography was done with a SIEMENS-SONOLINE-ADARA Real Time Scanner with a 3.5 MHz transducer.

Routine transverse and sagittal scanning was performed with the patient in the supine position. Patients were then rescanned in both right and left posterior oblique positions. Apart from the bladder and prostate, the entire abdomen was also scanned to look for any added pathology.

Computed Tomography: Somatom AR.TX (SIEMENS, Germany) CT scanner was used. Adequate opacification of small and large bowel is done by an oral contrast agent (10 ml of water soluble iodine based agent diluted in 200 ml of water) 6—12 hours before the study to ensure good colonic opacification. An additional 1 litre of water mixed with 10 ml of iodine based contrast is given over 1 hour prior to CT study for opacification of small bowel. Just before examination 100 ml of diluted contrast agent is given for opacification of rectum or in some cases air is insufflated into the rectum. Upper abdominal scans were taken with 10 mm of slice thickness at 10 mm intervals up to the iliac crest. Pelvic scan was taken in contiguous 5 mm slices. Both plain and contrast enhanced CT scans were obtained. About 100 ml of nonionic contrast medium was injected intravenously as a bolus dose to image the pelvis and another 50 ml was given for abdominal scans. Delayed scans after 10—15 minutes were also taken in the pelvis. The examination was performed in well distended bladder. However, over distension of the bladder was avoided for better delineation of peripelvic fat and anterior abdominal wall.

Intravenous Urography: IVU was performed in 20 cases with ionic or non-ionic contrast medium. Full length films including the renal, ureters and bladder area were taken. Both full bladder and post void films were taken.

Routine ChestX-Ray: It was done to rule out secondaries and to help in staging.

Cystoscopy: Cystoscopy examination was performed in all cases. Biopsy was performed in all cases and transurethral resection was performed in almost all cases.

RESULTS

Majority of the cases were in 51-60 years age group -11 cases (36.6%) followed by 61-70 years - 10 cases (33.3%). Males accounted for 28 (93.3%) cases and female accounted for 2 (6.7%) cases. Most of the patients were from lower socioeconomic status. Hematuria was the commonest symptom complained by 28 cases (93.3%) followed by increased frequency 11 cases (36.6%) and dysuria 10 cases (33.3%). Most of the tumours were sessile - 14 (46.6%) cases followed by pedunculated tumours 10 (33.3%) cases. Posterolateral wall was involved in maximum number of cases (15 cases, 50%) followed by base and trigone 6 (20%) cases each. Out of 30 cases of bladder mass in our study there were 18 (60%) cases showed attenuation value of 31-40 H.U. followed by 41-50 H.U. in 6 (20%) cases. 15 cases (50%) showed 31-40 H.U. contrast enhancement immediately after contrast injection followed by 10 cases (33.3%) which shows enhancement of 21-30 H.U. Spread to adjacent organ was maximum in the prostate 2 (6.7%) cases, rectum 1 (3.3%) case and uterus 1 (3.3%) case. The histological report showed that 28 patients (93.3%) were transitional cell carcinoma and 1 patient (3.3%) was an adenocarcinoma infiltrating from the prostate and 1 case of Squamous cell carcinoma (3.3%). Out of 28 cases of TCC, Grade-I - 10 (34.4%) cases, Grade-II - 13 (43.3%) cases and Grade-III - 5 (17.2%) cases. All the cases of metastases, 5 cases of lymphnode involvement, 3 cases of adjacent organ involvement and 2 cases of pelvic and abdominal wall involvement and Grade-III tumours. Most of cases of perivesical spread were Grade-II and tumour limited to U.B. wall were Grade-I tumour.

Table 1: Extent of involvement by the tumor with grading

Extent	No. of Cases	Percentage (%)	Tumor Grade		
			I	II	III
U.B. Wall	6	20.0	6	-	-
Perivesical Spread	15	50.0	4	7	2
Pelvic and Abdominal Wall	3	10.0	-	1	2
Adjacent Organ	4	13.3	-	1	3
Lymphnode	6	20.0	-	1	5
Metastases	5	16.6	-	-	5

Table 2: Cases Truly Detected and Accuracy of CT

	No. of cases detected by CT	No. of cases originally detected	Over staging	Under staging	Accuracy (%)
Perivesical Spread	15	12	3	-	80.0
Pelvic Side Wall and Abdominal Wall	3	2	1	-	67.0
Lymphnode Involvement	6	7	-	1	85.3
Involvement of Adjacent Organ	4	3	1	-	75.0
Distant Metastasis	5	6	-	1	83.4

The perivesical spread was detected by CT in 15 cases with overstaging in 3 cases (20%), thus, CT accuracy was 80%. Pelvic and abdominal wall involvement was detected in 3 cases. Overstaging done in 1 case, so accuracy of CT was 67%. Lymphnode involvement showing understaging by CT in 1 case with accuracy of 85.3%. CT could detect 4 cases of adjacent organ involvement with overstaging in 1 case, so accuracy of CT detecting was 75%.

DISCUSSION

Carcinoma of urinary bladder is universally accepted to be a disease of the elderly. In various studies, the most frequency of bladder cancer was observed in the age group 60-79 and 70-84 years, respectively.^{5,6} In our study of 30 cases of bladder tumour, 28 (93.3%) cases were male and 2 (6.6%) cases were female. Men are three to four times more likely to develop urothelial carcinoma of bladder than women.⁷ CT has been reported to be of value in staging of bladder tumors by indicating the extent of growth in bladder wall and adjacent tissues. In our present study, out of 30 cases of bladder tumour, 28 were transitional cell carcinoma, 1 case of squamous cell carcinoma (3.3%) and 1 case of adenocarcinoma infiltrating from prostate (3.3%). Our findings closely correlated with findings by Mostofi FK *et al*⁸ and Walsh PC *et al*.⁹ In our study, bladder involvement of tumour is sessile in 46.6% cases. Pedunculated in 33.3% cases and wall thickening in 20% cases. This correlates with the "CT and MRI of the whole body" by John R. Haaga where it said that intravesical tumour may manifest as a regular or irregular wall thickening a sessile lesion or a

pedunculated mural lesion. In our study, most common adjacent organ involved is prostate in 6.6% cases followed by rectum 3.3% cases and uterus 3.3% cases. This correlates with findings by Kelled *et al*, where he described that prostatic invasion was found to be difficult to diagnose.¹⁰ In our study, lymphnode group involved were obturator 10%, external iliac 6.6% and internal iliac 3.3%. This finding corroborates with findings of Walsh *et al*.⁹ In our study, 1 cm was the minimum size of lymphnode detected by CT which corroborates with findings by Yang WT *et al*⁵ and Husband JE *et al*.¹¹ In our study of 30 cases of bladder tumor, distant organ commonly involved were liver 10% and iliac bone 6.6%. According to Kenney *et al*, metastases from bladder TCC occurs mainly to bone followed by lung and liver, lymphnode, brain and kidneys.¹² In present study, overall accuracy of staging of bladder cancer by CT found to be 73.3% which corroborates with the findings by Seidelmann FE *et al*,¹³ Koss JC *et al*¹⁴ and Jaffrey RB *et al*¹⁵ who in their respective studies found overall accuracy of non-spiral CT for staging bladder cancer to be between 64-81%.

Table 3: Accuracy of CT scan in detecting Ca UB and correlation with different studies

Site	Series	Present study
Superficial and deep muscle involvement	Kim B <i>et al</i> ¹⁶ CT is poor on differentiating involvement of bladder wall	16.6%
Perivesical Spread	Siedleman <i>et al</i> ¹³ : 81% Sager <i>et al</i> ¹⁷ : 80% Voges <i>et al</i> ¹⁸ : 81%	80.0%
Pelvic side wall and abdominal wall	Kim B <i>et al</i> ¹⁶ : 85% Barentsz JO ¹⁹ : 85%	67%
Lymphnode involvement	Barentsz JO ¹⁹ : 97% Voges <i>et al</i> ¹⁸	85.3%
Distant metastases	CT is most accurate in detecting distant metastases	83.4%

In our study, of the 30 cases of bladder tumour, CT could accurately detect 80% perivesical spread of tumour, 67% pelvic side wall and abdominal wall, lymphnode involvement in 85.3 cases, involvement of adjacent organ in 75% cases and distant metastases in 83.4% cases, although accuracy in differentiating superficial and deep muscle involvement was poor.

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