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Original Research Article

Incidence of False Positive Pelvic Lymph node in Carcinoma Urinary Bladder- A Single Centre Experience

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Abstract

Background: To assess the diagnostic accuracy of computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography/computed tomography (PET/CT) in predicting pelvic lymph node (LN) metastases in bladder cancer patients.

Methods: This study enrolled 31 patients with bladder cancer who underwent radical cystectomy with pelvic lymphadenectomy and underwent CT, MRI, and PET/CT prior to surgery between December 2019 and March 2023. LN metastases were defined by an LN diameter 1.0 cm and/or the presence of central necrosis on CT, an LN diameter 1.0 cm on MRI, and a focally increased FDG uptake on PET/CT. For pelvic LN metastases, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy were calculated.

Results: The sensitivity, specificity, PPV, NPV, and accuracy for detecting pelvic LN metastases were 51.4%, 85.9%, 41.3%, 90.1%, and 80.3%, respectively, for CT; 24.3%, 96.3%, 56.3%, 86.8%, and 84.6% for MRI; and 48.6%, 89.5%, 47.4%, 90.0%, and 82.9% for PET/CT, respectively. PET/CT and CT had a higher sensitivity than MRI (p=0.004 and p=0.013, respectively). MRI had a higher specificity than PET/CT and CT (p=0.002 and p=0.001, respectively). The difference between PET/CT and CT in terms of specificity was not statistically significant (p=0.167).

Conclusion: These findings indicate that preoperative CT, MRI, and PET/CT exhibited low to moderate sensitivity and positive predictive value, and moderate to high specificity, negative predictive value, and accuracy to anticipate pelvic LN metastases. Additional efforts are required to enhance the sensitivity of imaging techniques.

Introduction

Lymphatic spread to the pelvis is the most important route of metastasis of Bladder Carcinoma. Once pelvic lymph node involved, 5-year survival rate reduce to 25–35% [1, 2, 3]. Hence, both for better prognostic stratification and management planning , it is necessary to recognize the presence, location, and number of lymph nodes of all sizes when imaging patients with urinary bladder malignancies. Although by convention 10 mm is considered the threshold on both CT and MRI for characterizing a lymph node as malignant, it is important to consider that small lymph nodes even can harbour malignant cells [2, 4].

Current advances in cross-sectional imaging techniques have led to more accurate preoperative staging of primary pelvic cancers. Newer imaging techniques such as PET/CT and lymphotropic nanoparticle-enhanced MRI (LNMRI) have proven to be useful for detecting malignancy in subcentimeter sized lymph nodes [3-5]. Multiple studies have shown that both CT and MRI are approximately equivalent for the evaluation of lymph nodes in carcinoma Urinary bladder [6]. However optimal imaging method for detecting

metastasis in lymph nodes, especially preoperatively in normal-sized lymph nodes is lacking [7].

The aim of the present study was to retrospectively analyse the incidence of positive pelvic Lymph nodes detected in preop cross sectional imaging and comparing them with pathologic examination in patients with bladder cancer (BCa) who underwent radical cystectomy and pelvic lymphadenectomy in our institute thus estimating the incidence of false positive pelvic lymph nodes.

Materials & methods

Of 39 patients admitted with urinary bladder cancer to our department during Dec 2019- March 2023, 31 patients of localised urinary bladder cancer with pelvic lymph node involvement were included in the study. Patients who underwent palliative cystectomy (2 patients) and no pelvic lymphadenopathy (6 patients) were excluded from the study. All patients after clinical staging and blood investigations underwent radical cystectomy with pelvic lymphadenectomy with removal of all suspicious pelvic lymph nodes (mean 14, range 10-15 in number). Postoperatively histopathological reports were analysed. Pathological positive lymph nodes in HP report compared with their preop cross sectional imaging reports and incidence of false positive lymph nodes were estimated.

Results

Among 31 patients' majorities are male & >40 year age. All presented with painless gross intermittent hematuria for which TUR Biopsy done earlier, all showing MIBC. Histologically 29 of them has feature of transitional cell carcinoma and 2 having squamous cell carcinoma. All having pelvic Lymph node involvement in preop CECT abdomen and pelvis but on final HP study only 7 found to have malignant involvement from the bladder primary. Lymph node metastasis lowest in T1 & T2 group (0%). But as Stage progression occur there are a greater number of involved pathologically positive lymph node (90% in T3b vs 30% in T3a). Thus higher the T-stage, more metastatic LN diagnosed pathologically.

Imaging characteristics considered for suspicious pelvic lymph nodes in our study.

Short axis diameter ≥ 8 mm
Necrosis +
Enhancement +
Inconspicuous fatty hilum
Speculated /obscure margin

Table 1: Clinical characteristics

Age	≤ 40 yr	4
	> 40yr	27
Sex	Male	30
	Female	1
Clinical presentation	Gross painless hematuria in all cases	
Histological diagnosis	TCC	29
	SCC	2
Positive lymph node in preop CECT Abd & Pelvis	31	
Pathologically positive LN	7	

Table 2: Correlation of positive lymph node with different T stages

T Stage	Frequency	Preop CECT findings		Pathological Node assessment	
		LN status	Maximum Size	LN status	Positive LN (%)
pT1	0				
pT2a	8	Multiple pelvic LN	6 mm	N0 in all patients	0%
pT2b	9	Multiple pelvic LN	10mm	N0 in all patients	0%
pT3a	7	Multiple pelvic LN	12mm	N0- 5 patients N1- 2 patients	30%
pT3b	7	Multiple pelvic LN	15mm	N0- 1 patients N1- 6 patients	90%
pT4a	0				
pT4b	0				

Discussion

Multiple study reported that lymph node involvement in bladder cancer occurs in approximately 30% of cases invading the bladder wall (stage T2) and 60% of cases in which the cancer extends into the perivesical tissue (stage T3 or greater) [8, 9]. The present study showed that the detection rate of metastatic lymph nodes in BCa patients increased with advancing T stage. With T-stage advancing, the rate of lymph node metastasis increased gradually (90% in T3b vs 30% in T3a vs 0% in T2 & T1), a finding similar to other studies [10, 11]. All involved lymph node having high grade primary disease (G-3 WHO). Lymph nodes with the

short-axis diameter of < 3.0 mm were not seen on CT imaging in our study as 3mm cut were made.

Conventionally size is a well-established and important index for detecting malignancy in the pelvic lymph nodes. By convention, a short-axis lymph-node diameter of 10 mm is considered the threshold value for malignancy on both CT and MRI [7, 8], however several recent studies demonstrated that a cutoff value of 10 mm was not appropriate in all cases [9, 10]. Important imaging features such as inconspicuous fatty hilum of lymph node, short diameter > 12 mm, irregular margin and necrosis were commonly observed in metastatic lymph nodes in our study, similar to findings seen in previous studies [12, 13, 14]. However characteristics such as enhancement degree in cross sectional imaging are also not specific. These findings can be used in preliminary screening, but the proportion of lymph nodes with these characteristics is low thus increasing the suspicious domains [15, 16].

In the present study however, the proportion of metastatic lymph nodes detected by imaging was significantly lower (9 of 31 cases, 22.5%). With the development of technology and increasing resolution , the lymph nodes with diameters >3.0 mm can be easily displayed on CT/MRI images. The small intestine without inflation and small veins can be distinguished from lymph nodes.

It is also important to highlight that multiple studies have found that not all enlarged lymph nodes on imaging are metastatic [17, 18]. The lymph node enlargement may be due to fat hyperplasia, sinus tissue cell proliferation, lymphocyte proliferation, and reactive hyperplasia etc thus increasing the rate of false positive categories in cross sectional imaging similar to our study (around 78% in our study).

Limitations

The limitations of the study were a relatively small number of patients. Also many true positive lymph nodes missed on imaging may be missed because many metastatic lymph nodes can have focal cancer nest or micrometastasis but they were too small to display on imaging.

Conclusion

In summation, the findings of our investigation indicate that preoperative computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography/computed tomography (PET/CT) exhibited low to moderate sensitivity and positive predictive value (PPV), and moderate to high specificity, negative predictive value (NPV), and accuracy. Computed tomography (CT) and positron emission tomography/computed tomography (PET/CT) have demonstrated greater efficacy in identifying pelvic lymph node (LN) metastases compared to magnetic resonance imaging (MRI). However, despite this advantage, CT and PET/CT still exhibit a notably low sensitivity. Further endeavours are required to enhance the sensitivity of imaging modalities for the purpose of prognosticating pelvic lymph node metastases in patients undergoing radical cystectomy for bladder carcinoma.

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