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Platinum Priority – Prostate Cancer

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Mapping of Pelvic Lymph Node Metastases in Prostate Cancer

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Abstract

Background: Opinions about the optimal lymph node dissection (LND) template in prostate cancer differ. Drainage and dissemination patterns are not necessarily identical.
Objective: To present a precise overview of the lymphatic drainage pattern and to correlate those findings with dissemination patterns. We also investigated the relationship between the number of positive lymph nodes (LN+) and resected lymph nodes (LNs) per region.
Design, setting, and participants: Seventy-four patients with localized prostate adenocarcinoma were prospectively enrolled. Patients did not show suspect LNs on computed tomography scan and had an LN involvement risk of $\geq$10% but $\leq$35% (Partin tables) or a cT3 tumor.
Intervention: After intraprostatic technetium-99m nanocolloid injection, patients underwent planar scintigraphy and single-photon emission computed tomography imaging. Then surgery was performed, starting with a sentinel node (SN) procedure and a superextended lymphadenectomy followed by radical prostatectomy.
Outcome measurements and statistical analysis: Distribution of scintigraphically detected SNs and removed SNs per region were registered. The number of LN+, as well as the percentage LN+ of the total number of removed LNs per region, was demonstrated in combining data of all patients. The impact of the extent of LND on N-staging and on the number of LN+ removed was calculated.
Results and limitations: A total of 470 SNs were scintigraphically detected (median: 6; interquartile range [IQR]: 3–9), of which 371 SNs were removed (median: 4; IQR: 2.25–6). In total, 91 LN+ (median: 2; IQR: 1–3) were found in 34 of 74 patients. The predominant site for LN+ was the internal iliac region. An extended LND (eLND) would have correctly staged 32 of 34 patients but would have adequately removed all LN+ in only 26 of 34 patients. When adding the presacral region, these numbers increased to 33 of 34 and 30 of 34 patients, respectively.
Conclusions: Standard eLND would have correctly staged the majority of LN+ patients, but 13% of the LN+ would have been missed. Adding the presacral LNs to the template should be considered to obtain a minimal template with maximal gain.
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1. Introduction

The presence of lymph node (LN) metastases (positive lymph nodes [LN+]) is an important prognostic factor in prostate cancer (PCa) [1]. Until now, pelvic LN dissection (LND) has proved to be the most accurate and reliable nodal staging procedure [2,3], as currently available imaging techniques report low sensitivity [4]. LND also has therapeutic intent, since several studies have indicated the possibility of long-term survival in the presence of limited LN involvement (LNI) [5]. Good evidence exists that LND can be omitted in selected low-risk PCa patients [6]. However, when performed for intermediate- and high-risk patients, LND should be extended [7,8]. Series of extended LNDs (eLNDs) have shown that the actual rate of LN+ is higher than observed with limited LND (1LND) [7,9]. It has also been demonstrated that in many cases, even this template does not cover all primary landing sites. Several studies have been performed with intraprostatic injection of technetium-99m nanocolloid to obtain precise information on lymphatic drainage, and revisions of the standard template have been suggested [10,11]. Unfortunately, studies establishing the link between drainage and dissemination patterns with explicit data are rare.

Although it has been shown that nodal count at LND is closely associated with metastatic rate [12], one should ensure that the yield of dissecting an additional region outweighs efforts and potential morbidity before further extending anatomic LND limits.

Therefore, the aim of this anatomic mapping study was to present an overview of prostatic drainage patterns and to correlate findings with dissemination patterns in patients at high risk for LNI. We also investigated the relationship between the number of affected and resected LNs (ie, LN density) per region and hypothesized that an obvious difference could indicate the presence of a certain hierarchy in the drainage chain.

2. Patients and methods

2.1. Patients

This observational study is a subanalysis of a larger prospective imaging study designed to assess sensitivity, specificity, and positive and negative predictive value of carbon 11–labeled choline positron emission tomography–computed tomography and diffusion-weighted magnetic resonance imaging (MRI) for preoperative N-staging in PCa patients at high risk for LNI [13]. Between February 2008 and February 2011,

Table 1 – Patient and disease characteristics

Characteristics	Patients with negative LNs, *n* = 40	Patients with positive LNs, *n* = 34	Total, *n* = 74
Age, yr, median (range)	65.1 (51.8–73.9)	63.9 (49.2–73.6)	64.5 (49.2–73.9)
Preoperative PSA, ng/ml, median (range)	10.1 (1.5–70.9)	10.8 (5.0–25.0)	10.4 (1.5–70.9)
Clinical T stage (2002 TNM)			
1c	0 (0)	1 (2.9)	1 (1.6)
2a	1 (2.5)	1 (2.9)	2 (2.7)
2b	2 (5.0)	1 (2.9)	3 (4.1)
2c	12 (30.0)	2 (5.9)	14 (18.9)
3a	23 (57.5)	19 (55.9)	42 (56.8)
3b	2 (5.0)	9 (26.5)	11 (14.9)
4	0 (0)	1 (2.9)	1 (1.6)
Biopsy Gleason score			
6	1 (2.5)	0 (0)	1 (1.6)
7 (3 + 4)	17 (42.5)	6 (17.6)	23 (31.1)
7 (4 + 3)	6 (15.0)	11 (32.4)	17 (23.0)
8	10 (25.0)	11 (32.4)	21 (28.4)
9 (4 + 5)	4 (10.0)	5 (14.7)	7 (9.5)
9 (5 + 4)	2 (5.0)	0 (0)	2 (2.7)
10	0 (0)	1 (2.9)	1 (1.6)
Pathologic T stage (2002 TNM)			
2b	2 (5.0)	0 (0)	2 (2.7)
2c	24 (60.0)	6 (17.6)	30 (40.5)
3a	11 (27.5)	9 (26.5)	20 (27.0)
3b	1 (2.5)	18 (52.9)	19 (25.7)
4	2 (5.0)	1 (2.9)	3 (4.1)
Pathologic Gleason score			
7 (3 + 4)	14 (35.0)	3 (8.8)	17 (23.0)
7 (4 + 3)	17 (42.5)	8 (23.5)	25 (33.8)
8	3 (7.5)	11 (32.4)	14 (18.9)
9 (4 + 5)	5 (12.5)	10 (29.4)	15 (20.3)
9 (5 + 4)	1 (2.5)	1 (2.9)	2 (2.7)
10	0 (0)	1 (2.9)	1 (1.6)
Predicted risk for LN involvement			
Partin tables, %, median (range)	11.5 (10–29)	15 (10–29)	12 (10–29)
Briganti nomogram, %, median (range)	54 (6–75)	59 (17–75)	56 (6–75)
Nodes examined per patient, no., median (range)	21.5 (7–42)	20.5 (10–49)	21 (7–49)

LN = lymph node; PSA = prostate-specific antigen.
Numbers between parentheses are percentages unless indicated otherwise.