

Variation in Pelvic Lymph Node Dissection among Patients Undergoing Radical Prostatectomy by Hospital Characteristics and Surgical Approach: Results from the National Cancer Database

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Abbreviations and Acronyms

LND = lymph node dissection
NCDB = National Cancer Data Base
ORP = open radical prostatectomy
PCa = prostate cancer
PLND = pelvic lymph node dissection
PSA = prostate specific antigen
RARP = robotic assisted radical prostatectomy
RP = radical prostatectomy

Purpose: Clinical practice guidelines recommend pelvic lymph node dissection at the time of surgery for intermediate or high risk prostate cancer. Therefore, we examined the relationship of pelvic lymph node dissection and detection of lymph node metastasis with hospital characteristics and surgical approach among patients with prostate cancer.

Materials and Methods: Using the National Cancer Data Base we identified surgically treated patients with pretreatment intermediate or high risk disease from 2010 to 2011. Primary outcomes were treatment with pelvic lymph node dissection and extended pelvic lymph node dissection, as well as the detection of lymph node metastasis. Multivariate logistic regression models were used to test whether hospital characteristics and surgical approach were associated with each outcome.

Results: Among the 50,671 surgically treated patients 70.8% (35,876) underwent concomitant pelvic lymph node dissection, 26.6% (9,543) underwent extended pelvic lymph node dissection and 4.5% (1,621) had lymph node metastasis. Pelvic lymph node dissection was performed more often at high volume vs low volume hospitals (81.2% vs 65.4%, adjusted OR 2.20, $p=0.01$), but less frequently with robotic assisted radical prostatectomy vs open radical prostatectomy (67.5% vs 81.8%, adjusted OR 0.30, $p < 0.001$). Higher odds ratios for lymph node metastasis were also demonstrated with high vs low volume (OR 1.35, $p=0.01$) and

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academic vs community hospitals (OR 1.35, $p < 0.001$). However, patients treated with robotic assisted radical prostatectomy had lower odds ratios for lymph node metastasis compared to those undergoing open radical prostatectomy (OR 0.56, $p < 0.001$).

Conclusions: In this cohort a third of patients are not receiving guideline recommended treatment with pelvic lymph node dissection for prostate cancer. Pelvic lymph node dissection and detection of lymph node metastasis varied by surgical approach, hospital volume and academic status.

Key Words: lymph node excision, treatment outcome, quality of health care, prostatectomy, robotics

APPROXIMATELY 240,000 men are diagnosed with prostate cancer each year, making it the most prevalent male malignancy in the United States.¹ Among patients diagnosed with intermediate and high risk PCa, there is universal agreement from clinical practice guidelines that pelvic lymph node dissection is an integral part of radical prostatectomy to facilitate reliable staging and provide potentially durable cancer control.^{2–8} For example, the National Comprehensive Cancer Network clinical guidelines recommend PLND in patients with a nomogram calculated lymph node involvement risk of 2% or greater.^{3,6} Similarly the American Urological Association guidelines recommend that PLND be performed in patients with intermediate or high risk disease.^{2,7} Furthermore, the European Association of Urology recommends that anatomically extended PLND be performed for intermediate risk PCa if the estimated risk of positive lymph nodes exceeds 5%, as well as for high risk cases.⁹

Despite the clinical advantages and low morbidity from PLND, several studies have recently shown a decrease in the use of PLND performed with RP, raising concerns about the quality of current surgical care.^{10,11} Decreased use of PLND has been attributed to the rapid adoption of robotic assisted radical prostatectomy, which now accounts for nearly 70% of all RP performed in the United States.^{12–15} Another possible explanation for the reduced use of PLND may be hospital characteristics such as high volume hospitals or tertiary academic medical centers. However, to date few studies have investigated the role of hospital related factors and surgical approach that may independently drive differential use of pelvic lymph node dissection at RP. In this context we determined whether hospital characteristics and surgical approach (ORP vs RARP) independently influenced receipt of PLND or extended PLND, as well as the detection of lymph node metastasis.

MATERIALS AND METHODS

Data Source

We used NCDB registry data to examine LND in patients with prostate cancer undergoing RP. The NCDB is a joint

program of the Commission on Cancer of the American College of Surgeons and the American Cancer Society.^{16–18} The NCDB represents a nationwide, facility based, clinical surveillance data set that currently captures approximately 70% of all newly diagnosed malignancies in the U.S. Data reported to the NCDB are retrospective and no patient or physician identifiers are collected. This study was granted an exemption from the Yale Human Investigation Committee as it was research involving existing data on unidentifiable research subjects.

Study Population

Overall 97,731 patients with histologically confirmed nonmetastatic PCa (International Classification of Diseases for Oncology [ICD-O] site code 61.9, histological code 8140) age 40 to 80 years treated with RP from 2010 to 2011 were identified for whom RARP represented the predominant surgical approach. We elected to use this time frame since a specific code for the robotic assisted approach was introduced in the NCDB as of 2010, which allowed us to reliably identify RP performed robotically.

To identify the analytic cohort, patients were selected by having PCa as their first and only cancer diagnosis, and by surgical treatment with RARP or ORP. Additional study exclusion criteria were unknown surgical approach (2,794), endoscopic or laparoscopic surgery without robotic assistance (4,341), no assessment of tumor stage (3,128) or missing tumor stage (475), unknown LND status (102), unknown number of lymph nodes examined (1,293) and undetermined LND status due to a conflicting recorded number of lymph nodes (404).

We stratified patients into low, intermediate and high risk groups according to the D'Amico criteria.¹⁹ A total of 10,787 (12.7%) patients had a missing PSA and/or Gleason score. These patients were classified according to information obtained from clinical stage (if missing PSA and Gleason), clinical stage and PSA (if missing Gleason score) or clinical stage and Gleason score (if missing PSA). With clinical practice guidelines universally recommending PLND for intermediate and high risk PCa, we limited the analytic cohort to patients diagnosed with intermediate and high risk PCa, thus excluding 34,523 patients with low risk PCa.^{2,3} This resulted in 50,671 patients in the final analytic cohort.

Covariates and End Points

For each patient the age at diagnosis, race, 2000 census tract annual median income, insurance status, geographic region, location (rural, metro and urban), influence of patient residence using classification published by the

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