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Inguinopelvic Lymphadenectomy Following Positive Inguinal Sentinel Lymph Node Biopsy in Melanoma: True Frequency of Synchronous Pelvic Metastases

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Abstract

Background—True frequency of synchronous pelvic metastases with positive inguinal sentinel lymph node (SLN) biopsy is unknown. Role of pelvic dissection in the SLN era is unclear.

Methods—From 1994 to 2004, 1 surgeon routinely performed nonselective, complete inguinopelvic lymphadenectomy after positive inguinal SLN biopsy. All cases were identified from a prospectively maintained database. Clinicopathologic features associated with pelvic disease were assessed.

Results—A total of 40 patients with positive inguinal SLN underwent, without additional selection, 42 complete inguinopelvic lymphadenectomies. Median age was 46.5 years (range 25–79 years); 79% had lower extremity primaries. Median Breslow depth was 2.3 mm (range 1.0–10.0 mm), Clark's IV/V 98%, ulceration 26%. Frequency of synchronous pelvic disease upon completion lymphadenectomy was 5 of 42 (11.9%). Patients with and without pelvic disease were similar in age, sex, Breslow depth, Clark's level, ulceration, and mitoses. All 5 cases with pelvic metastases had extremity primaries (4 distal, 1 proximal). Of the 5, 3 (60%) had 3 total involved inguinal nodes, compared with only 1 (2.7%) of the 37 cases without pelvic disease ($P = .003$). Ratio of positive to total number inguinal nodes retrieved was >0.20 in 80% of cases with pelvic disease and 8.6% of cases without ($P = .002$). Upon lymphoscintigraphy review, secondary pelvic drainage was present in 80% of cases with pelvic disease compared with 56% of cases without pelvic disease, though the trend was statistically insignificant ($P = .63$).

Conclusions—In this cohort of unselected, SLN-positive patients with complete inguinopelvic lymphadenectomy, frequency of synchronous pelvic disease was 11.9%. Patients with 3 total involved inguinal nodes or inguinal node ratio >0.20 appear more likely to harbor pelvic disease.

Prior to the widespread adoption of sentinel lymph node (SLN) biopsy, management of regional nodal basins in melanoma comprised empiric elective lymphadenectomy or observation with lymphadenectomy in the face of clinically apparent nodal disease. By distinguishing the approximately 20% of patients with occult nodal disease from the

majority who do not, SLN biopsy provides accurate staging and prognostication in a minimally invasive fashion while averting the morbidity of more extensive dissection in patients who are unlikely to benefit.^{1–3} Nonetheless, the advent of SLN biopsy has introduced new dilemmas with regard to the role of regional lymphadenectomy. Among those 20% with SLN metastases who go on to completion lymphadenectomy, only 15–24% are found to have additional non-SLN disease.^{3–6} Any survival advantage conferred by regional lymphadenectomy in this setting remains to be proven.

Management of the pelvic basin was a source of contention before the advent of SLN biopsy, and decision-making surrounding regional disease in this location presents persistent and additional challenges today.^{7–9} Consensus regarding the optimal role and extent of inguinopelvic lymphadenectomy is lacking. Most surgeons perform isolated inguinal lymphadenectomy for patients with inguinal SLN disease, but varying indications exist for further pelvic lymphadenectomy.⁹ Based on extrapolated information from imaging, elective lymphadenectomy, and recurrence data, current recommendations for pelvic lymphadenectomy may include 4 involved inguinal SLN, gross disease in inguinal SLN, metastasis to Cloquet's node, and radiographic abnormality of pelvic nodes.^{9,10} Studies showing 5-year survival rates of 24–42% after completion pelvic lymphadenectomy suggest that the procedure does benefit select patients, but identification of this target population has been difficult.^{8,9,11} Cautious interpretation of such survival data is needed as they predominantly derive from patients with more advanced disease than is commonly encountered in the SLN era.

One barrier to defining the role of pelvic lymphadenectomy following positive SLN biopsy has been the inability to directly establish the risk of synchronous pelvic metastasis in patients with inguinal SLN disease. With the current selective approach to pelvic lymphadenectomy, surgical staging of the pelvis in the setting of inguinal SLN disease is not available. Frequency of synchronous pelvic disease is instead estimated from subsequent pelvic recurrences.

At our institution, it was the practice pattern of 1 surgeon to routinely perform combined inguinopelvic lymphadenectomy in all patients found to have inguinal SLN metastasis. No further selection based on histologic variables occurred. The primary aim of our study was to determine the true risk of synchronous pelvic metastasis in melanoma patients with microscopic inguinal SLN disease using this unselected group of patients. Our secondary aim was to identify clinicopathologic predictors of synchronous pelvic disease in the setting of occult inguinal SLN metastasis, in order to clarify the target population who would most benefit from selective pelvic lymphadenectomy.

METHODS

Conduct of this study was approved by the Institutional Review Board with waiver of the requirement of written consent.

Patients and Primary Tumors

A prospectively maintained database of patients with lymphatic mapping and SLN biopsy for primary cutaneous melanoma at Emory University Hospital was queried for all cases of inguinal SLN biopsy performed between 1 January 1994 and 30 June 2004. All procedures completed by a single surgeon (DRM) were reviewed; patients with positive inguinal SLN biopsy were identified. Completion of subsequent combined inguinopelvic lymphadenectomy was verified.

Primary tumor parameters including site (distal lower extremity, proximal lower extremity, trunk), histologic subtype, Breslow depth, Clark's level, and presence of mitotic figures, ulceration, and regression were noted. Cases of desmoplastic subtype were excluded.

Lymphatic Mapping and SLN Biopsy

Indications for SLN biopsy included primary tumor thickness ≥ 1 mm or Clark's level IV without clinical nodal disease. All patients underwent cutaneous lymphoscintigraphy preoperatively using filtered technetium-99 m-sulfur colloid (100–500 μ Ci; CIS-US Inc., Bedford, MA) injected intradermally and circumferentially around the primary site. A planar gamma camera was used for dynamic lymphoscintigraphy. Images of accumulating radioactive foci were captured every 10 s for 10 min, followed by multiple 5-min static images for up to 60 min. A 2-h postinjection imaging was occasionally obtained. Skin markers overlying localized sites were placed.

For this study, all available lymphoscintigraphic images and reports were reviewed. Primary drainage to inguinal basin SLN(s) was confirmed, along with visualization of any associated lymphatic channels leading into the inguinal basins. Films were also reviewed for direct primary drainage to pelvic SLN. Secondary pelvic drainage on lymphoscintigraphy was defined as delayed visualization of nodes within the ipsilateral pelvic basin or lymphatic channels coursing from the inguinal region toward the pelvis. Institutional technique pertaining to SLN biopsy has been previously described.¹² Pelvic activity was not pursued. SLNs were bisected parallel to the long axis, and both halves entirely submitted for hematoxylin-and-eosin, S100, and HMB-45 staining. Pathology reports were reviewed.

Completion Inguinopelvic Lymphadenectomy

Upon confirmation of inguinal SLN metastasis, complete inguinopelvic lymphadenectomy was performed. Inguinal dissection was completed via a longitudinal curvilinear incision beginning medial to the anterior superior iliac spine and terminating at the apex of the femoral triangle inclusive of the SLN biopsy site. Prior SLN biopsy incisions were incorporated and removed. Dissection was carried to the pubic tubercle medially, sartorius laterally, femoral triangle apex distally, and inguinal ligament proximally. The saphenous vein and lymphatic vessels were ligated. Contents of the inguinofemoral triangle were cleared off the femoral vessels and submitted.

Pelvic dissection was performed via the same incision. The inguinal ligament was divided 1–2 cm lateral to the femoral vessels. The external oblique, internal oblique, and transversalis fascia were also divided. Preperitoneal fat and peritoneum were swept medially.

External iliac nodes were then removed and submitted. The pelvic side wall was then dissected with retraction of the external iliac vessels. The obturator fossa was entered with preservation of the ureter, obturator nerve, and hypogastric branches. Obturator node specimens were submitted. Lymphadenectomy specimens were stained using hematoxylin and eosin. Pathology reports were reviewed.

Statistical Analysis

Comparison of patients with and without pelvic disease was carried out using χ^2 , Fisher exact, and Wilcoxon rank sum tests as appropriate for categorical and continuous variables. A ratio of diseased to total procured number of inguinal nodes (SLN and non-SLN combined) was calculated. This ratio was also compared between patients with and without pelvic disease. Survival was analyzed using the Kaplan-Meier technique. Significance was defined as a 2-tailed P value $<.05$. Analysis was conducted using SPSS version 17.0 for Microsoft Windows (LEAD Technologies, Inc., Chicago, IL).

RESULTS

Patients, Primary Tumors, and SLN Biopsy

From 1994 to 2004, 981 patients with primary cutaneous melanoma underwent successful lymphoscintigraphic mapping and SLN biopsy by a single surgeon (DRM). At least 1 SLN was localized to and retrieved from the inguinal region in 272 patients. Of these, 48 patients (17.6%) were found to have microscopic metastases within inguinal SLNs. Also, 8 patients did not proceed with completion lymphadenectomy for extraneous reasons; 4 developed medical complications (pulmonary emboli, myocardial infarction), 2 were diagnosed with in-transit or distant metastases prior to scheduled completion lymphadenectomy, 1 was treated elsewhere after relocation, and 1 had multiple prior ipsilateral inguinal and femoral hernia repairs with extensive mesh preventing adequate pelvic lymphadenectomy as planned. With the exception of the latter patient, database review confirmed that no other SLN-positive patient during the study period then underwent isolated inguinal lymphadenectomy by this surgeon.

A total of 40 patients with inguinal SLN disease underwent subsequent complete inguinopelvic lymphadenectomy. Two patients underwent bilateral lymphadenectomies for a total of 42 procedures. Table 1 summarizes the overall demographic and tumor features. Median age was 46.5 years (range 25–79 years). Lower extremity primary sites were predominant (79%), and median Breslow depth was 2.3 mm (range 1.0–10.0 mm). Upon review of 37 available lymphoscintigrams, all demonstrated primary uptake of SLN within inguinal basins. Primary pelvic SLNs were never identified. There were 22 cases (59.5%) that additionally showed secondary pelvic drainage (in the form of delayed visualization of pelvic nodes or lymphatic channels coursing from inguinal to pelvic basins). On SLN biopsy, median number of retrieved nodes was 2 (range 1–4 nodes), while the median number of diseased SLN nodes was 1 (range 1–3 nodes).

Inguinopelvic Lymphadenectomy

Median interval between SLN biopsy and subsequent lymphadenectomy was 26.5 days. Inguinal lymphadenectomy specimens contained a median of 9 nodes (range 3–35 nodes), while pelvic specimens yielded a median of 6 nodes (range 2–23 nodes). Non-SLN metastasis was identified in 9 of 42 cases (21.4%). The 6 inguinal lymphadenectomy specimens (14.3%) contained residual non-SLN disease.

The prevalence of synchronous pelvic disease upon completion lymphadenectomy was 5 of 42 (11.9%). Details pertaining to lymphadenectomy and lymphoscintigraphy in these 5 patients are shown in Table 2. Secondary drainage to the pelvis was identified in 4 of 5 patients. No patients were seen to have pelvic drainage by-passing the inguinal basin.

Comparison of Patients With and Without Synchronous Pelvic Disease

Patients with and without non-SLN pelvic disease were similar in age, sex, Breslow depth, Clark's level, ulceration, and mitoses (Table 1). All 5 cases with pelvic disease were extremity lesions (4 distal, 1 proximal). Of the 5, 3 (60%) had 3 total involved inguinal nodes (SLN and non-SLN, i.e., inguinal nodes from SLN biopsy and completion lymphadenectomy), compared with only 1 of the 37 cases (2.7%) without pelvic disease ($P = .003$). Ratio of total positive inguinal nodes (SLN and non-SLN) to total retrieved inguinal nodes (SLN and non-SLN) was >0.20 in 80% of cases with pelvic disease and >0.20 in 8.6% of cases without pelvic disease ($P = .002$). Upon lymphoscintigraphy review, secondary pelvic drainage was present in 4 of 5 cases with pelvic disease (80.0%) compared with 18 of 32 cases (56.3%) without pelvic disease, though the trend was statistically insignificant ($P = .63$). No other significant differences between the 2 groups were identified.

Recurrence and Survival

With median follow-up of 52 months, median time to initial recurrence was 11 months. At detection of first recurrence, 2 patients had local disease only, 3 showed in-transit growths only, 6 had distant metastases only, 2 had concurrent inguinal and distant disease, and 1 had concurrent pelvic and distant disease. Actuarial overall 5-year survival for the series was 73%.

Of the 5 SLN-positive patients with synchronous pelvic disease, one experienced in-transit recurrence 7 months after inguinopelvic lymphadenectomy while another had concurrent inguinal and distant disease, also at 7 months. The other 3 patients had no evidence of recurrence at 1, 41, and 108 months. Estimated 5-year survival was 70% for the 35 patients without synchronous pelvic disease and 50% for the 5 patients with synchronous pelvic disease.

DISCUSSION

The debate over the value of regional lymphadenectomy following positive SLN biopsy in melanoma is particularly complex when considering the inguinopelvic nodal basin. The addition of pelvic dissection to inguinal lymphadenectomy appears to benefit select patients, but preoperative identification of such patients remains elusive. Given the presumed rarity of

concurrent pelvic disease in patients with microscopic SLN involvement, and the potential increase in morbidity from the addition of pelvic lymphadenectomy, the perceived risk-benefit ratio compels most practitioners to limit completion lymphadenectomy to the inguinal region initially. Results of inguinal lymphadenectomy may then influence the decision to proceed with pelvic surgery. The selective approach to pelvic lymphadenectomy does not allow for routine pathologic staging of the pelvis. While the present intent is not to advocate complete inguinopelvic lymphadenectomy following all positive inguinal SLN biopsies, the availability of a cohort of patients so treated provides a unique opportunity to directly determine the frequency of synchronous pelvic metastasis in the setting of inguinal SLN disease. The cohort also affords the potential of identifying predictors of pelvic disease to be used in the selection of patients for more extensive dissection.

In this series, 11.9% of unselected melanoma patients with positive inguinal SLN biopsy were found to have synchronous pelvic disease upon completion inguinopelvic lymphadenectomy. Estimates of the incidence of pelvic disease from the era of elective nodal dissection varied from 5 to 18%, while among patients undergoing therapeutic pelvic dissection for palpable inguinal disease the range is higher at 12–43%.^{7,13,14} Comparison with these values is of limited utility as patients with occult SLN disease have less advanced disease and better prognosis than those with clinically positive nodes. More recent analyses of metastatic inguinopelvic melanoma are often hampered by heterogeneity of lymphadenectomy indications and extent. In their retrospective review of 344 patients with any (occult or clinical) inguinal, femoral, or pelvic metastases, Badgwell et al. found pelvic disease in 56% of the 97 patients who underwent combined inguinopelvic lymphadenectomy. The high risk of pelvic disease in this subgroup likely reflects selection bias. Of the 235 patients who underwent inguinal lymphadenectomy only, the regional recurrence rate was 15.3%.⁹

Other studies have focused specifically on completion lymphadenectomy results following biopsy-proven inguinal SLN micrometastases. In Essner et al.'s retrospective analysis restricted to 93 patients with positive inguinal SLN biopsies, pelvic recurrence rate was 15% among the 20 patients treated with inguinal lymphadenectomy alone, while pelvic pathology results were not specifically reported for the 38 patients treated with combined inguinopelvic lymphadenectomy.¹⁵ Selection for and extent of completion lymphadenectomy were not considered. An Italian retrospective review of 150 patients with inguinal SLN metastases who then underwent completion inguinopelvic dissection found 25 cases (16.7%) with iliac or obturator disease, including 13 (8.7%) where pelvic metastases were detected in the absence of additional inguinal disease.¹⁶ The authors concluded that complete inguinopelvic lymphadenectomy rather than limited inguinal lymphadenectomy is indicated for all patients with inguinal SLN disease. However, the algorithm of prior selection for completion lymphadenectomy and lymphadenectomy extent, if any, was not explicitly stated, rendering difficult the interpretation of these results and subsequent conclusion.

In order to identify the subset of patients for whom further pelvic lymphadenectomy may be indicated, we compared patients with and without synchronous pelvic disease with regard to demographic and tumor variables as well as SLN and inguinal lymphadenectomy results. We selected these clinicopathologic features based on their routine availability to treating

physicians. Patients with synchronous pelvic disease were more likely to have 3 involved total inguinal nodes. These results echo those from the aforementioned study from Badgwell and colleagues, who identified increased total numbers of metastatic groin nodes (odds ratio 2.11, 95% confidence interval 1.40–3.18) as an independent predictor of pelvic disease among 97 selected patients who underwent combined inguinopelvic lymphadenectomy for any ilioinguinal node-positive melanoma (occult or clinically detected).⁹

The ratio of diseased to removed nodes has been identified as a prognostic indicator in melanoma, but to our knowledge has not been evaluated as a potential marker of regional disease progression.¹⁷ Although we observed that the ratio of involved to removed inguinal nodes was significantly higher in patients with synchronous pelvic disease, the use of this ratio as a determinant for further pelvic dissection in patients who underwent inguinal lymphadenectomy remains to be validated.

Recent studies have advocated better use of lymphoscintigraphic data to guide extent of completion lymphadenectomy. Van der Ploeg et al. in 2008 proposed a strategy of tailored combined inguinopelvic or isolated inguinal lymphadenectomy for patients with and without iliac-obturator second-tier nodes on preoperative lymphoscintigraphy, respectively.¹⁸ Applied to 42 patients, this approach resulted in 24 inguinopelvic and 18 inguinal procedures. Among the 24 who underwent inguinopelvic lymphadenectomy, 2 (8%) had additional pelvic disease. Of the 18 with inguinal lymphadenectomies only, there was only 1 delayed pelvic recurrence with median follow-up of 61 months; secondary review of preoperative lymphoscintigraphy indicated missed pelvic second-tier drainage in this patient. A subsequent study from the same group obtained precise localization of inguinal/pelvic SLNs and second-tier nodes using conventional lymphoscintigraphy with single-photon emission computed tomography; of the 50 patients evaluated, second-tier nodes were visualized in all and localized to the pelvis in 46 (92%).¹⁹ The same strategy of reserving inguinopelvic lymphadenectomy for SLN positive patients with second-tier nodes located in the pelvis resulted in a similar 11% rate of additional pelvic disease with no subsequent pelvic recurrences. Based on these findings, the authors advocated combined inguinopelvic lymphadenectomy for cases of pelvic second-tier nodes. Our analysis does corroborate their findings in that 4 of the 5 patients with synchronous pelvic disease had delayed uptake of pelvic nodes or channels on lymphoscintigraphy. However, tracer visualization on lymphoscintigraphy is a function of multiple patient, technical, and disease properties (e.g., anatomic region, tracer volume, injection timing). Although preoperative lymphoscintigraphy may have potential in guidance of completion lymphadenectomy, technical standardization will be necessary prior to adoption of lymphoscintigraphic pelvic drainage alone as sufficient indication for pelvic lymphadenectomy in inguinal SLN-positive patients without other concerning findings. As such, it has not become our institutional practice to routinely use lymphoscintigraphy data to dictate pelvic dissection, especially in the absence of additional indications.

Among the other patient and disease variables selected for their routine availability to clinicians, we were unable to identify further differences between SLN-positive patients with and without pelvic disease. These results not only reflect sample size limitations, but also highlight the continued difficulty in the selection of patients who stand to benefit most

from pelvic dissection in the era of SLN biopsy. Our findings suggest that the number of diseased inguinal nodes is reflective of concomitant pelvic metastases. This observation is consistent with our current practice of using the number of involved inguinal nodes as the most important guide for additional pelvic dissection in clinically undetectable micrometastatic SLN disease.

As referenced previously, the small sample size of the current study restricts its power to identify consistent indicators of pelvic disease and, therefore, to provide a basis for practice recommendations. Another limitation is the inability to discern whether early intervention (i.e., pelvic lymphadenectomy at the time of inguinal dissection) offers any survival advantage over observation and subsequent intervention in patients with radiographic evidence of pelvic metastases. Extrapolation from MSLT-1 implies a survival benefit with early lymphadenectomy.²⁰ In the current study, however, presence of pelvic metastases was associated with decreased survival relative to pelvic node-negative patients. Follow-up from MSLT-1 will provide more definitive data.

In conclusion, among this cohort of unselected, inguinal SLN-positive patients with complete inguinopelvic lymphadenectomy, the risk of synchronous pelvic disease was 11.9%. Predictors of synchronous pelvic disease may include 3 total involved inguinal nodes, and a ratio of involved-to-removed inguinal nodes of >0.20. Detailed review of preoperative lymphoscintigraphy may also provide guidance as to the required extent of inguinopelvic lymphadenectomy.

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References

1. Morton DL, Cochran AJ, Thompson JF, Elashoff R, Essner R, Glass EC, et al. Sentinel node biopsy for early-stage melanoma: accuracy and morbidity in MSLT-I, an international multicenter trial. *Ann Surg*. 2005; 242:302–11. discussion 311–3. [PubMed: 16135917]
2. Carlson GW, Page AJ, Cohen C, Parker D, Yaar R, Li A, et al. Regional recurrence after negative sentinel lymph node biopsy for melanoma. *Ann Surg*. 2008; 248:378–86. [PubMed: 18791358]
3. Sabel MS, Griffith K, Sondak VK, Lowe L, Schwartz JL, Cimmino VM, et al. Predictors of nonsentinel lymph node positivity in patients with a positive sentinel node for melanoma. *J Am Coll Surg*. 2005; 201:37–47. [PubMed: 15978442]
4. McMasters KM, Wong SL, Edwards MJ, Chao C, Ross MI, Noyes RD, et al. Frequency of nonsentinel lymph node metastasis in melanoma. *Ann Surg Oncol*. 2002; 9:137–41. [PubMed: 11888869]
5. Lee JH, Essner R, Torisu-Itakura H, Wanek L, Wang H, Morton DL. Factors predictive of tumor-positive nonsentinel lymph nodes after tumor-positive sentinel lymph node dissection for melanoma. *J Clin Oncol*. 2004; 22:3677–84. [PubMed: 15365064]
6. Page AJ, Carlson GW, Delman KA, Murray D, Hestley A, Cohen C. Prediction of nonsentinel lymph node involvement in patients with a positive sentinel lymph node in malignant melanoma. *Am Surg*. 2007; 73:674–8. discussion 78–9. [PubMed: 17674939]
7. Coit DG, Brennan MF. Extent of lymph node dissection in melanoma of the trunk or lower extremity. *Arch Surg*. 1989; 124:162–6. [PubMed: 2464981]

8. Mann GB, Coit DG. Does the extent of operation influence the prognosis in patients with melanoma metastatic to inguinal nodes? *Ann Surg Oncol.* 1999; 6:263–71. [PubMed: 10340885]
9. Badgwell B, Xing Y, Gershenwald JE, Lee JE, Mansfield PF, Ross MI, et al. Pelvic lymph node dissection is beneficial in subsets of patients with node-positive melanoma. *Ann Surg Oncol.* 2007; 14:2867–75. [PubMed: 17671814]
10. Jacobs, LK., Balch, CM., Coit, DG. Inguinofemoral, iliac/obturator, and popliteal lymphadenectomy in patients with melanoma. In: Balch, CM.Houghton, AN.Sober, AJ.Soong, S.Atkins, MB., Thompson, JF., editors. *Cutaneous melanoma.* St. Louis: Quality Medical Publishing; 2009. p. 457-70.
11. Strobbe LJ, Jonk A, Hart AA, Nieweg OE, Kroon BB. Positive iliac and obturator nodes in melanoma: survival and prognostic factors. *Ann Surg Oncol.* 1999; 6:255–62. [PubMed: 10340884]
12. Murray DR, Carlson GW, Greenlee R, Alazraki N, Fry-Spray C, Hestley A, et al. Surgical management of malignant melanoma using dynamic lymphoscintigraphy and gamma probe-guided sentinel lymph node biopsy: the Emory experience. *Am Surg.* 2000; 66:763–7. [PubMed: 10966037]
13. Karakousis CP, Driscoll DL, Rose B, Walsh DL. Groin dissection in malignant melanoma. *Ann Surg Oncol.* 1994; 1:271–7. [PubMed: 7850524]
14. Hughes TM, Thomas JM. Combined inguinal and pelvic lymph node dissection for stage III melanoma. *Br J Surg.* 1999; 86:1493–8. [PubMed: 10594495]
15. Essner R, Scheri R, Kavanagh M, Torisu-Itakura H, Wanek LA, Morton DL. Surgical management of the groin lymph nodes in melanoma in the era of sentinel lymph node dissection. *Arch Surg.* 2006; 141:877–82. discussion 882–4. [PubMed: 16983031]
16. Santinami M, Carbone A, Crippa F, Maurichi A, Pellitteri C, Ruggeri R, et al. Radical dissection after positive groin sentinel biopsy in melanoma patients: rate of further positive nodes. *Melanoma Res.* 2009; 19:112–8. [PubMed: 19282788]
17. Xing Y, Badgwell BD, Ross MI, Gershenwald JE, Lee JE, Mansfield PF, et al. Lymph node ratio predicts disease-specific survival in melanoma patients. *Cancer.* 2009; 115:2505–13. [PubMed: 19309746]
18. van der Ploeg IM, Valdes Olmos RA, Kroon BB, Nieweg OE. Tumor-positive sentinel node biopsy of the groin in clinically node-negative melanoma patients: superficial or superficial and deep lymph node dissection? *Ann Surg Oncol.* 2008; 15:1485–91. [PubMed: 18324444]
19. van der Ploeg IM, Kroon BB, Valdes Olmos RA, Nieweg OE. Evaluation of lymphatic drainage patterns to the groin and implications for the extent of groin dissection in melanoma patients. *Ann Surg Oncol.* 2009; 16:2994–9. [PubMed: 19653043]
20. Morton DL, Thompson JF, Cochran AJ, Mozzillo N, Elashoff R, Essner R, et al. Sentinel-node biopsy or nodal observation in melanoma. *N Engl J Med.* 2006; 355:1307–17. [PubMed: 17005948]

TABLE 1

Overall clinicopathologic features of 42 cases of unselected inguinopelvic lymphadenectomy following positive inguinal SLN biopsy

Variables	Overall (n = 42)	No synchronous pelvic disease (n = 37)	Synchronous pelvic disease (n = 5)	P value
Age (years)	46.5 (25–79)	47 (25–79)	46 (33–65)	.61
Sex				
Female	21 (50.0%)	18 (48.6%)	3 (60.0%)	1.00
Male	21 (50.0%)	19 (51.4%)	2 (40.0%)	
Primary site				
Lower extremity	33 (7.6%)	28 (76.0%)	5 (100.0%)	.57
Trunk	9 (21.4%)	9 (24.0%)	0 (0%)	
Histology				
Superficial spreading	27 (64.3%)	24 (64.9%)	3 (60.0%)	.69
Nodular	6 (14.3%)	5 (13.5%)	1 (20.0%)	
Acral lentiginous	5 (11.9%)	5 (13.5%)	0 (0%)	
Unclassified	4 (9.5%)	3 (8.1%)	1 (20.0%)	
Breslow depth (mm)	2.25 (1.0–10.0)	2.30 (1.1–8.0)	2.20 (1.0–10.0)	.74
Clark's level IV/V	41 (97.6%)	36 (97.3%)	5 (100.0%)	.80
Ulceration	11 (26.2%)	9 (24.3%)	2 (40.0%)	.59
Regression	5 (11.9%)	5 (13.5%)	0 (0%)	.09
Mitoses (per 10 HPF)	0 (0–14)	1 (0–14)	0 (0–4)	.44
Secondary pelvic drainage on lymphoscintigraphy ^a	22 (59.5%)	18 (56.3%)	4 (80.0%)	.63
Non-SLN inguinal disease	6 (14.3%)	4 (10.8%)	2 (40.0%)	.14
Number inguinal positive nodes (SLN + non-SLN)				
Median	1 (1–4)	1 (1–3)	3 (1–4)	.05
< 3 nodes	38 (90.5%)	36 (97.3%)	2 (40.0%)	.003
3 nodes	4 (9.5%)	1 (2.7%)	3 (60.0%)	
Proportion of tumor-positive inguinal nodes ^b				
Median	0.100 (0.027–0.500)	0.100 (0.027–0.500)	0.333 (0.091–0.444)	.012
0.20	35 (83%)	34 (91%)	1 (20%)	.002
> 0.20	7 (17%)	3 (9%)	4 (80%)	

Comparison of patients with and without synchronous pelvic disease also shown

^aProportion calculated by dividing the total number of positive SLN and non-SLN in inguinal region by the total number of procured SLN and non-SLN inguinal nodes

^bLymphoscintigrams unavailable in five cases

Lymphoscintigraphic and lymphadenectomy data of five patients with pelvic disease synchronous with inguinal SLN metastasis

TABLE 2

Age and sex	Primary site	No. lymphatic channels	Secondary pelvic drainage on lymphoscintigraphy	No. positive inguinal SLN	No. positive inguinal non-SLN	No. positive pelvic nodes
65 M	L 3rd toe	1 to inguinal	Present	1	3	1
46 F	R lower leg, anteromedial	None	Present	1	2	1
33 F	R lower leg, posterolateral	1 to inguinal	Present	1	0	1
64 M	L lower leg, posterolateral	1 to inguinal	Present	2	0	2
43 F	R distal thigh, lateral	1 to inguinal	Absent	3	0	1

M male, F female, L left, R right