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ORIGINAL ARTICLE – MELANOMA

# Microsatellitosis in Patients with Melanoma

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## ABSTRACT

**Background.** Microsatellitosis (mS) in melanoma has been considered a marker of unfavorable tumor biology, leading to the current American Joint Committee on Cancer staging of IIIB/C/D disease, despite few investigative studies of this entity limited by the small sample sizes and incomplete nodal microstaging. We sought to better characterize outcomes and prognostic factors in a multi-institutional cohort of patients with mS and nodal microstaging.

**Methods.** The Sentinel Lymph Node Working Group cohort included 414 mS patients who underwent sentinel lymph node (SLN) biopsy. Cox regression analysis was used to evaluate the prognostic significance of established clinicopathologic characteristics. Melanoma-specific survival (MSS) of patients with mS was compared with 3002 similarly staged patients from the Surveillance, Epidemiology, and End Results (SEER) Program registry.

**Results.** The median age of the mS cohort was 64.9 years; 39.6% were female. Median thickness was 3 mm, 40.6% of cases were ulcerated, and the SLN positivity rate was 46.7%. Increasing thickness, male sex, and SLN positivity were significantly associated with poorer MSS. Stage IIIB/C/D 5-year MSS rates were 86.3% (95% confidence interval [CI] 79.4–93.3%), 54.1% (95% CI 45.4–59.7%), and 44.2% (95% CI 25.4–63.0%), respectively. MSS survival for the stage IIIB mS cohort was significantly better than a similarly staged SEER cohort (5-year MSS of 70.1%, 95% CI 66.0–74.2%), while no significant difference was observed for the stage IIIC or D cohorts.

**Conclusions.** SLN metastases are common and are a significant prognostic factor in patients with mS. Survival in stage IIIB patients with mS was considerably more favorable than their stage would otherwise suggest, which has important implications for decisions regarding adjuvant therapy for patients with mS.

Microsatellitosis (mS) in melanoma refers to nest(s) of melanoma deposits near to but discontiguous from the primary tumor, separated by an area of subcutaneous or dermal tissue. Since their initial characterization by Day et al.[1] in 1981, microsatellites in melanoma have been viewed as a surrogate for poor tumor biology, a local indicator of the metastatic potential of an aggressive tumor.

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A few early studies in patients with mS demonstrated a relatively poor survival in this group, reinforcing the perceived adverse effect of this pathologic feature, and patients with mS were classified with at least stage IIIB disease by the American Joint Committee on Cancer (AJCC) staging.[2–8] This designation persists in the 8th edition AJCC staging, where patients with mS are classified with stage IIIB, C, or D disease dependent on the T category, ulceration of the primary tumor, and nodal status.[9] By comparison, the stage IIIB staging group in the 8th edition also includes patients with T1a–T3a N2b M0 disease (N2b classification refers to two to three involved lymph nodes, with at least one clinically detected).

mS is relatively rarely identified in melanoma, with rates of approximately 5–10% in patients with intermediate-thickness melanoma, and lower rates in thin (T1) lesions, although higher rates in patients with thick melanoma have been reported.[10–18] Consequently, to date, studies investigating mS in melanoma have been limited by the relatively small sample size, making it difficult to discern the prognostic significance of mS independent of other adverse pathologic variables, such as tumor thickness, ulceration or nodal metastasis, with which it is commonly associated.[5,8] A single-institution study of 98 patients with mS has identified a relatively favorable prognosis of these patients in the absence of other high-risk features, specifically primary tumor ulceration and sentinel lymph node (SLN) positivity.[19] The survival profile of this subgroup of patients with mS was considerably better than the expected survival of patients with a similar staging designation of stage IIIB disease.

In this investigation, we study the natural history and prognostic factors in a large multi-institutional cohort of patients with melanoma and mS identified from a large multicenter collaborative dataset of the Sentinel Lymph Node Working Group (SLNWG). Moreover, we compare the survival outcomes of these patients with mS with similarly staged (irrespective of mS status) patients from the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program registry, which includes SLN biopsy data. We hypothesized that outcomes for patients with mS could differ from other patients with stage IIIB, IIIC or IIID subclassifications, and that this may have important implications in the consideration of adjuvant therapy in patients with isolated MS.

## PATIENTS AND METHODS

### *Study Populations*

This retrospective study was performed through the SLNWG, an international multicenter collaborative group; 10 centers contributed data for this study (see electronic supplementary Table S1). Data from participating SLNWG centers were queried to identify melanoma patients with mS (SLNWG cohort) who had undergone SLN biopsy (1994–2015). Each contributing center received respective Institutional Review Board (IRB) approval for participation in the SLNWG study group.

Outcomes for patients in the SLNWG cohort were compared with similarly staged patients from the SEER registry (SEER cohort), a US population-based cancer registry supported by the National Cancer Institute. The SEER public-use database was queried to identify all patients whose first melanoma diagnosed was invasive cutaneous melanoma, between 2004 and 2009, from 18 SEER regions.[20] SEER patients with missing TNM classification, number of positive nodes excised, and cause of death missing were excluded. The SEER cases were staged based on the AJCC staging 8th edition definitions, identifying 1056, 1572, and 374 stage IIIB, IIIC, and IIID patients, respectively.

### *Clinical Outcome*

The primary outcome evaluated was melanoma-specific survival (MSS), which was defined as the time from definitive treatment of primary melanoma to melanoma-related death, with patients alive at the time of last follow-up being censored.

### *Prognostic Factors*

The presence of mS was recorded by the Pathology Department at each institution. Commonly accepted criteria for defining mS include the presence of one or more discontiguous nests of melanoma cells separated from the primary tumor by at least 0.3 mm of normal dermis or subcutaneous tissue, with each nest at least 0.05 mm in diameter.[13,14]

For patients in the SLNWG cohort, the clinical variables included age, sex, and anatomic site, while pathologic variables included tumor thickness, ulceration, mitotic rate, lymphovascular invasion (LVI), Clark level, regression, tumor histology, and tumor-infiltrating lymphocytes (TIL). These variables were treated categorically as follows: age ($\leq$ 40, 41–65, $>$ 65 years), anatomic site (extremity, trunk, head/neck), thickness to two significant digits (0.01–1.00, 1.01–2.00, 2.01–4.00, and $>$ 4.00 mm), Clark level (II/III, IV/V), histology (superficial spreading, nodular, other), ulceration (present, absent, unknown), mitotic rate (0, $>$ 0, unknown), regression (present, absent, unknown), and TIL (present, absent, unknown). Characteristics of the SLN that were recorded were SLN status (classified as negative or positive based on the absence or presence of nodal

metastases) and total number of metastatic nodes. SLN evaluation was performed according to the standard technique for each respective contributing institution.

For patients in the SEER cohort, the clinical variables included age, sex, and anatomic site, while pathologic variables included tumor thickness, ulceration, Clark level, and tumor histology. Variables were recoded as categorical variables as described above.

### *Statistical Analysis*

Descriptive statistics are presented as frequencies for categorical variables, with differences evaluated using the Chi square test. MSS curves for the SLNWG and SEER cohorts were estimated using the Kaplan–Meier method, and survival curves stratified by a covariate or between databases were compared using the log-rank test. Hazard ratios for covariates associated with MSS were estimated using Cox regression analysis. To minimize potential overfitting, a reduced model was developed using stepwise elimination of nonsignificant factors from the full multivariate model using the Wald test. Factors with missing data were excluded from the multivariate model. A $p$ value $< 0.05$ was considered statistically significant. All statistical analyses were performed using SAS 9.4 statistical software (SAS Institute, Cary, NC, USA).[21]

## RESULTS

### *Clinical and Pathologic Features of the Study Cohort*

Clinical and pathologic features of the SLNWG mS cohort are summarized in Table 1. The median age of the 414 patients was 64.9 years and 39.6% were female. The median thickness of the primary tumor was 3 mm, and 35.5% were categorized as T4 lesions (> 4.0 mm). Ulceration was present in 40.6%. Primary tumors were most commonly located on the extremity (46.7%), although a notable minority was located in the head and neck (23.9%). Among patients with known LVI status, the LVI rate was found to be 57%.

All patients in this cohort underwent SLN biopsy and the SLN positivity rate was 47.6%. Most patients with positive SLN underwent completion lymphadenectomy (83%). Among patients with nodal metastases, the majority (55%) had more than one metastatic node identified (either at SLN biopsy or completion lymphadenectomy). In all, 131 patients (31.6%) were classified with stage IIIB disease. In addition to tumor thickness, ulceration status, and nodal status (by which the stage subgroupings were defined), stage IIIB, IIIC, and IIID patients differed on other clinical and pathologic factors, including anatomic site, level, histology, mitogenicity, presence of TILs, and LVI (Table 1).

### *Melanoma-Specific Survival (MSS) Outcomes*

With a median follow-up of 2.9 years in the SLNWG cohort ($n$ = 414) and 4.1 years among those censored at last follow-up ($n$ = 253), the 5-year MSS rates for stage IIIB, IIIC, and IIID patients were 86.3% (95% confidence interval [CI] 79.4–93.3%), 52.6% (95% CI 45.4–59.7%), and 44.2% (95% CI 25.4–63.0%), respectively. The median time to death for stage IIIB, IIIC, and IIID patients with mS was 3.0 ($n$ = 28), 1.9 ($n$ = 111), and 1.2 ($n$ = 22) years, respectively. For patients with mS in the SLNWG cohort, the MSS curves for stage IIIB, IIIC, and IIID when defined using the 6th, 7th, and 8th AJCC staging criteria, respectively, are displayed in Fig. 1. Notably, a decreasing number of patients were classified in the stage IIIB subgrouping with each successive iteration of AJCC staging (181, 156, and 131 of 414 patients, respectively). The 5-year MSS rates of the stage IIIB patients classified using the 8th edition guidelines versus the 6th edition were 86.3% and 76.9%, respectively.

### *Prognostic Factors Associated with MSS*

The association between clinical and pathologic factors where complete data were available, and MSS, was examined in the SLNWG cohort (Table 2). By univariate analysis, clinical factors associated with MSS included sex and anatomic site. Patients who were female and patients with melanomas located on their extremity had a better prognosis when compared with patients who were male and patients with melanomas located on their trunk or head and neck. Tumor factors associated with MSS included thickness, ulceration, and SLN status. In the multivariate analysis using factors where complete data were available, thickness, sex, and nodal status were factors that remained significantly associated with MSS. Survival curves highlighting the prognostic significance of these factors are displayed in Fig. 2 for subgroups defined by thickness and nodal status, for men and women. In the presence of nodal metastases, 5-year MSS was 48.8%, compared with 76.9% in patients who were SLN-negative (log rank test, $p < 0.0001$). Among male patients with a tumor thickness $\leq$ 2.0 mm and who were SLN-negative, the 5-year survival rate was 87.1% ($n$ = 51), compared with 44.8% ($n$ = 101) in male patients with a tumor thickness $\geq$ 2.0 mm and who were SLN-positive ($p < 0.001$). Similarly, among females, the corresponding survival rates for these groups were 95.8% ($n$ = 33) and 48.5% ($n$ = 59), respectively ($p < 0.001$).

**TABLE 1** Description of clinicopathological factors of the SLNWG and SEER cohorts

| Characteristic | SLNWG cohort | | | $p$ value[a] | SLNWG cohort | SEER (2004–2009) | $p$ value[a] |
|---|---|---|---|---|---|---|---|
| | Stage IIIB ($n$ = 131) | Stage IIIC ($n$ = 241) | Stage IIID ($n$ = 42) | | All ($n$ = 414) | All ($n$ = 3002) | |
| Age, years | | | | | | | |
| ≤ 40 | 7 (5.3) | 20 (8.3) | 3 (7.1) | 0.732 | 30 (7.2) | 512 (17.1) | < 0.001 |
| 41–65 | 57 (43.5) | 101 (41.9) | 21 (50.0) | | 179 (43.2) | 1580 (52.6) | |
| > 65 | 67 (51.1) | 120 (49.8) | 18 (42.9) | | 205 (49.5) | 910 (30.3) | |
| Sex | | | | | | | |
| Male | 78 (59.5) | 142 (58.9) | 30 (71.4) | 0.302 | 250 (60.4) | 1985 (66.1) | 0.021 |
| Female | 53 (40.5) | 99 (41.1) | 12 (28.6) | | 164 (39.6) | 1017 (33.9) | |
| Site | | | | | | | |
| Extremity | 50 (38.2) | 124 (51.5) | 19 (45.2) | 0.030 | 193 (46.6) | 1452 (48.4) | < 0.001 |
| Trunk | 40 (30.5) | 65 (27.0) | 17 (40.5) | | 122 (29.5) | 1064 (35.4) | |
| Head/neck | 41 (31.3) | 52 (21.6) | 6 (14.3) | | 99 (23.9) | 474 (15.8) | |
| NOS | 0 (0) | 0 (0) | 0 (0) | | 0 (0.0) | 12 (0.4) | |
| Thickness, mm | | | | | | | |
| 0.01–1.00 | 30 (22.9) | 8 (3.3) | 0 (0) | [b] | 38 (9.2) | 198 (6.6) | 0.001 |
| 1.01–2.00 | 54 (41.2) | 29 (12.0) | 0 (0) | | 83 (20.0) | 424 (14.1) | |
| 2.01–4.00 | 47 (35.9) | 99 (41.1) | 0 (0) | | 146 (35.3) | 1242 (41.4) | |
| > 4.00 | 0 (0) | 105 (43.6) | 42 (100) | | 147 (35.5) | 1138 (37.9) | |
| Ulceration | | | | | | | |
| Absent | 119 (90.8) | 127 (52.7) | 0 (0) | [b] | 246 (59.4) | 1277 (42.5) | < 0.001 |
| Present | 12 (9.2) | 114 (47.3) | 42 (100) | | 168 (40.6) | 1715 (57.1) | |
| Unknown | 0 (0) | 0 (0) | 0 (0) | | 0 (0.0) | 10 (0.3) | |
| Clark level | | | | | | | |
| II/III | 22 (16.8) | 11 (4.6) | 0 (0) | < 0.001 | 33 (8.0) | 285 (9.5) | 0.242 |
| IV/V | 102 (77.9) | 216 (89.6) | 37 (88.1) | | 355 (85.7) | 2449 (81.6) | |
| Unknown | 7 (5.3) | 14 (5.8) | 5 (11.9) | | 26 (6.3) | 268 (8.9) | |
| Histology | | | | | | | |
| Superficial spreading | 58 (44.3) | 63 (26.1) | 15 (35.7) | 0.002 | 136 (32.9) | 548 (18.3) | < 0.001 |
| Nodular | 28 (21.4) | 77 (32.0) | 16 (38.1) | | 121 (29.2) | 912 (30.4) | |
| Other | 25 (19.1) | 52 (21.6) | 3 (7.1) | | 80 (19.3) | 1542 (51.4) | |
| Unknown | 20 (15.3) | 49 (20.3) | 8 (19.1) | | 77 (18.6) | 0 (0) | |
| Mitoses | | | | | | | |
| Absent | 11 (8.4) | 4 (1.4) | 0 (0) | 0.004 | 15 (3.6) | – | – |
| Present | 97 (74.0) | 168 (69.7) | 35 (83.3) | | 300 (72.5) | – | – |
| Unknown | 23 (17.6) | 69 (28.6) | 7 (16.7) | | 99 (23.9) | – | – |
| TILs | | | | | | – | – |
| Absent | 18 (13.7) | 50 (20.8) | 15 (35.7) | 0.001 | 83 (20.0) | – | – |
| Present | 58 (44.3) | 77 (32.0) | 7 (16.7) | | 142 (34.3) | – | – |
| Unknown | 55 (42.0) | 114 (47.3) | 20 (47.6) | | 189 (45.7) | – | – |
| Regression | | | | | | | – |
| Absent | 84 (64.1) | 158 (65.6) | 30 (71.4) | 0.101 | 272 (65.7) | – | – |
| Present | 20 (15.3) | 31 (12.9) | 1 (2.4) | | 52 (12.6) | – | – |
| Unknown | 27 (20.6) | 52 (21.6) | 11 (26.2) | | 90 (21.7) | – | – |
| LVI | | | | | | – | – |
| Absent | 62 (47.3) | 96 (39.8) | 12 (28.6) | 0.001 | 170 (41.1) | – | – |
| Present | 20 (15.3) | 54 (22.4) | 19 (45.2) | | 93 (22.5) | – | – |
| Unknown | 49 (37.4) | 91 (37.8) | 11 (26.2) | | 151 (36.5) | – | – |

**TABLE 1** continued

| Characteristic | SLNWG cohort | | | $p$ value[a] | SLNWG cohort | SEER (2004–2009) | $p$ value[a] |
|---|---|---|---|---|---|---|---|
| | Stage IIIB ($n$ = 131) | Stage IIIC ($n$ = 241) | Stage IIID ($n$ = 42) | | All ($n$ = 414) | All ($n$ = 3002) | |
| SLN | | | | | | | |
| Negative | 131 (100) | 86 (35.7) | 0 (0) | [b] | 217 (52.4) | – | – |
| Positive | 0 (0.0) | 155 (64.3) | 42 (100) | | 197 (47.6) | – | – |
| Total positive nodes | | | | | | | |
| 0 | 131 (100) | 86 (35.7) | 0 (0) | [b] | 217 (52.4) | 193 (6.4) | < 0.001 |
| 1 | 0 (0.0) | 88 (36.5) | 0 (0) | | 88 (21.3) | 1574 (52.4) | |
| > 1 | 0 (0.0) | 67 (27.8) | 42 (100) | | 109 (26.3) | 1235 (41.1) | |

Data are expressed as $n$ (%)

*SLNWG* Sentinel Lymph Node Working Group, *SEER* Surveillance, Epidemiology, and End Results, *NOS* not otherwise specified, *TILs* tumor-infiltrating lymphocytes, *LVI* lymphovascular invasion, *SLN* sentinel lymph node

[a]Chi square test, excluding missing data

[b]These factors were used in defining the substage III classification

### *Comparison of Survival Outcomes of Microsatellitosis Patients with Similarly Staged Patients from the Surveillance, Epidemiology, and End Results Program*

To better understand the outcomes of patients with mS compared with other similarly staged patients (with or without satellite/intransit disease, and with or without SLN biopsy), the SEER database (2004–2009) was utilized. TNM data from SEER (coded based on the 6th edition AJCC staging system) were recoded to reflect the 8th edition AJCC staging system. Stratifying according to stage IIIB, IIIC, and IIID classification, MSS curves for patients in the SLNWG mS cohort and the SEER cohort were compared (Fig. 3). Stage IIIB patients with mS demonstrated significantly improved survival compared with their stage IIIB SEER counterparts ($p$ = 0.002), while there was no statistically significant difference in the survival curves between stage IIIC or IIID patients with mS and SEER patients. Clinicopathologic factors of the mS and SEER cohorts are summarized in Table 1.

## DISCUSSION

Since the initial description by Day et al.[1] in the 1980s, mS has been associated with poor survival outcomes, with a 36% 5-year disease-free survival rate noted in their early study. Consequently, it is not surprising that, in recent AJCC classifications, this relatively rare pathologic entity has conferred at least a designation of stage IIIB disease in patients with melanoma. mS is more commonly seen in thicker primary tumors, which are ulcerated, and also in the presence of nodal metastases, all of which are known independent negative prognostic factors.[5,8,11] Harris et al.[3] identified regional lymph node metastases at lymph node dissection in 53% of patients with 'microscopic satellites', compared with only 12% of patients without, in tumors with similar thickness (> 1.5 mm). To what extent mS independently confers a significant negative survival prognosis in the absence of some of these other co-existing pathologic variables remains less clear. A smaller recent institutional study by one of the contributing authors found a 90% 5-year disease-specific survival rate in patients with mS who had no nodal metastasis or primary tumor ulceration.[19] This, as well as other studies, has been limited by relatively small sample sizes.

The cohort of patients with mS and melanoma in this study is the largest to date to our knowledge. Concordant with previous studies, we found that mS was associated with other negative pathologic features. The median tumor thickness was 3 mm, 40.6% of tumors were ulcerated, and 47.6% of patients had SLN metastasis. Among patients with mS, factors found to be significantly associated with decreased MSS were increasing tumor thickness, male sex, and the presence of SLN metastasis. Among patients with mS and stage IIIB disease (ulceration absent, nodal metastasis, T1–T3a disease), the 5-year survival rate was 86.3%, a survival rate close to that seen in low-risk stage II disease. Notably, approximately 32% of the cohort of patients with mS was classified with stage IIIB disease.

When compared with other SEER patients with stage IIIB disease, patients with mS classified with stage IIIB disease demonstrated a considerably more favorable 5-year MSS. This raises the question as to whether these patients are most suitably assigned to this higher-risk staging classification versus, for instance, a stage II classification

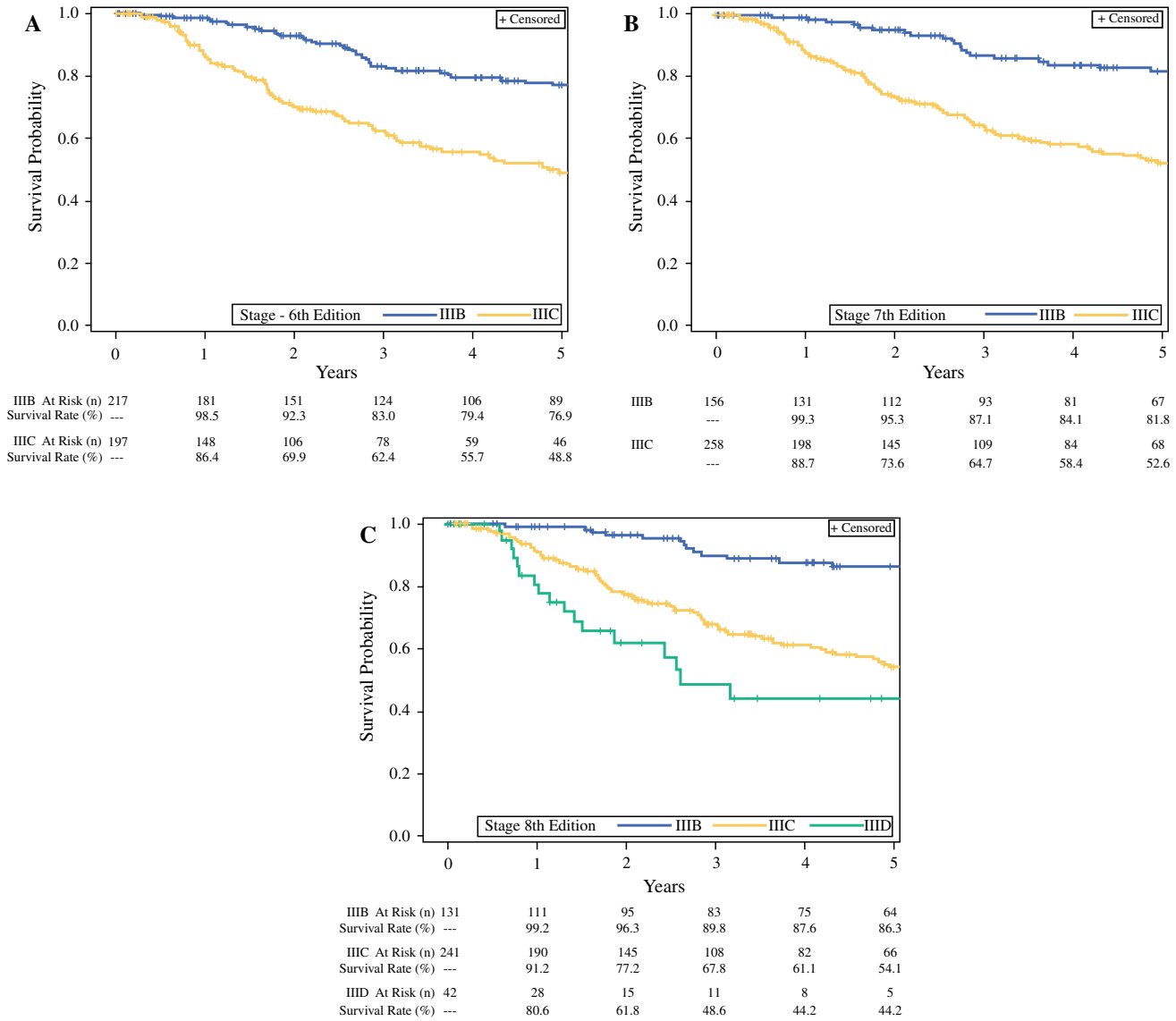


**FIG. 1** Kaplan–Meier survival curves for the MS cohort ($n$ = 414) when staged by the **a** AJCC 6th edition, **b** AJCC 7th edition, and **c** AJCC 8th edition. *AJCC* American Joint Committee on Cancer, *MS* microsatellitosis

based on their primary tumor characteristics absent consideration of their microsatellite status. Interestingly, while the N classification has been modified in the 8th edition AJCC staging for the presence of mS (N1c disease), appropriately designating this pathologic entity as a perhaps less-important determinant of N stage, the lowest AJCC stage grouping for patients with mS remains stage IIIB. When staging the study cohort patients using the 6th, 7th, and 8th edition AJCC staging criteria, the 5-year survival rate of patients with mS classified as stage IIIB increases from 76.9 to 86.3%. This has important implications with respect to follow-up and adjuvant management decisions for these patients. Patients with stage IIIB disease by virtue of mS only have a relatively favorable profile comparable in risk to low-risk stage II patients. Moreover, mS in the absence of lymph node metastases may represent a distinct biological entity in tumor progression. Perhaps mS with nodal metastases represents a further stage of metastatic progression with less-favorable prognosis.

The current study has several limitations worth noting, perhaps most importantly its retrospective study design with its inherent biases. Pathologic review was not centralized among the multiple participating centers, which could lead to heterogeneity in the characterization of primary tumor variables. However, this particular deficiency may in fact serve as a strength with respect to generalizability of the results across institutions. Finally, data from

**TABLE 2** Cox regression models for melanoma-specific survival ($n$ = 414)

| | Univariate | | Multivariate | | Reduced multivariate | |
|---|---|---|---|---|---|---|
| | HR | $p$ value | HR | $p$ value | HR | $p$ value |
| Age, years | | | | | | |
| ≤ 40 | 1.00 | | | | | |
| 41–65 | 1.02 | 0.951 | 1.14 | 0.658 | | |
| > 65 | 1.15 | 0.669 | 1.41 | 0.308 | | |
| Thickness | | | | | | |
| 0.01–1.00 | 0.51 | 0.221 | 0.62 | 0.382 | 0.60 | 0.358 |
| 1.01–2.00 | 1.00 | | 1.00 | | | |
| 2.01–4.00 | 2.12 | 0.007 | 1.93 | 0.022 | 1.97 | 0.015 |
| > 4.00 | 2.40 | 0.002 | 1.78 | 0.058 | 1.93 | 0.021 |
| Ulceration | | | | | | |
| Absent | 1.00 | 1.000 | | | | |
| Present | 1.91 | 0.000 | 1.40 | 0.078 | | |
| Sex | | | | | | |
| Male | 1.59 | 0.015 | 1.55 | 0.034 | 1.64 | 0.010 |
| Female | 1.00 | | | | | |
| Site | | | | | | |
| Extremity | 0.66 | 0.045 | 0.64 | 0.041 | | |
| Trunk | 1.00 | | | | | |
| Head/neck | 0.82 | 0.406 | 0.93 | 0.741 | | |
| SLN | | | | | | |
| Negative | 1.00 | | | | | |
| Positive | 2.81 | < 0.001 | 2.53 | < 0.001 | 2.42 | < 0.001 |

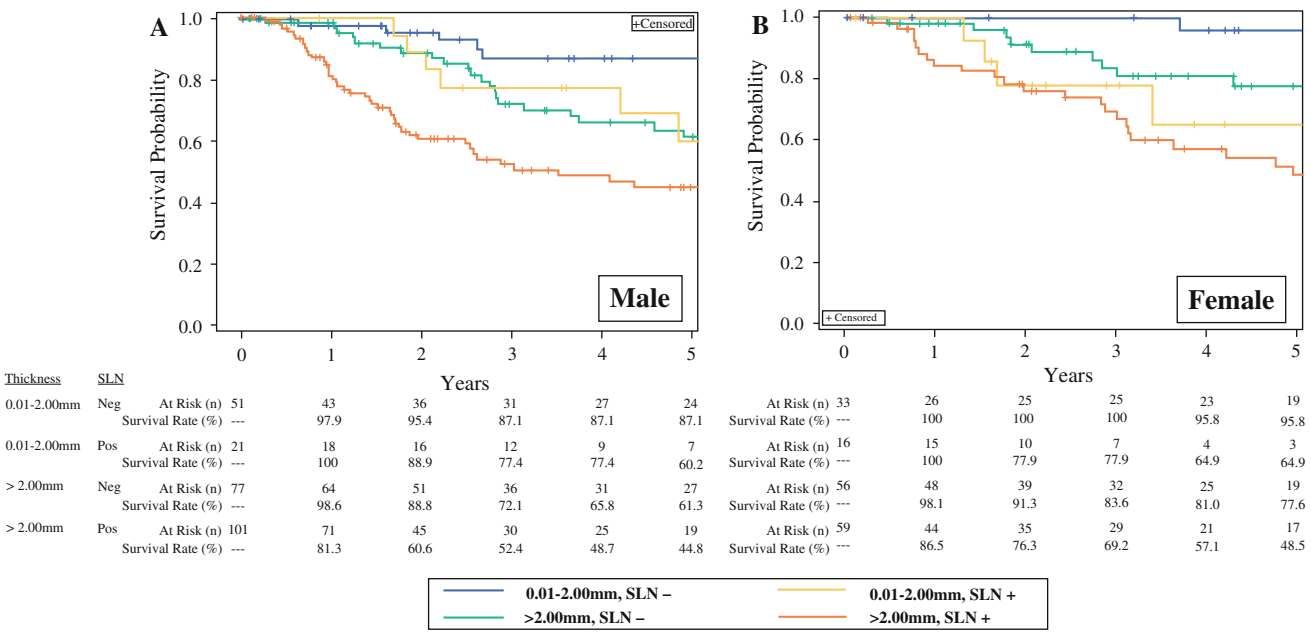


**FIG. 2** Kaplan–Meier survival curves with prognostic factors for the MS cohort ($n$ = 414) stratified by sex: **a** male, **b** female. *MS* microsatellitosis, *SLN* sentinel lymph node

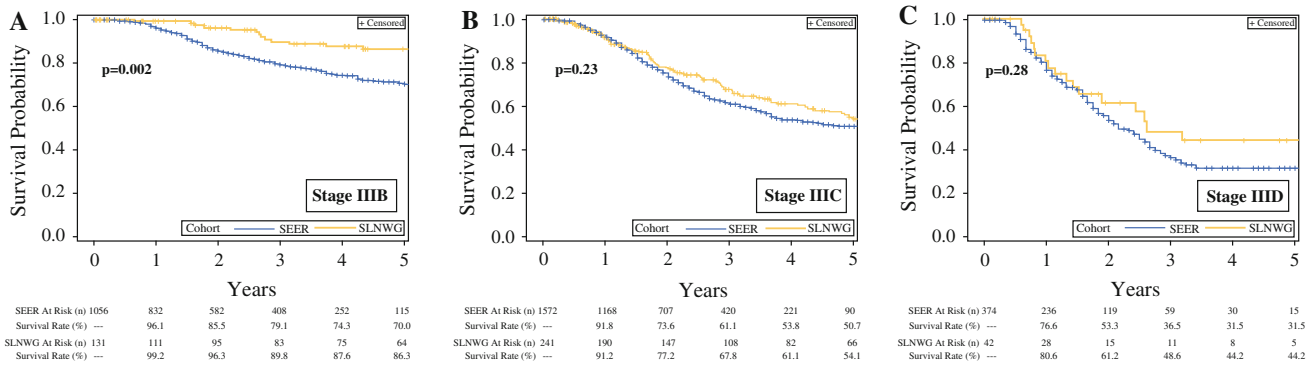


**FIG. 3** Kaplan–Meier survival curves for the MS cohort, comparing the MS cohort ($n$ = 414) and SEER cohort ($n$ = 3002) stratified by stage **a** IIIB, **b** IIIC, and **c** IIID disease using the AJCC 8th edition definitions. *MS* microsatellitosis, *SEER* Surveillance, Epidemiology, and End Results, *AJCC* American Joint Committee on Cancer

the SEER database do not offer the granularity to distinguish between micro and macrosatellitosis or intransit disease, providing only nodal stage classification. However, this limitation would not influence the conclusions derived since use of the SEER data was primarily to compare mS patients with similarly staged patients (irrespective of mS status).

## CONCLUSIONS

The presence of SLN metastasis is common in patients with mS, therefore it is reasonable to pursue SLN staging for regional control of disease and prognostication. mS in the absence of other high-risk features (thicker primary and nodal metastasis) does not appear to portend a significantly worse prognosis in melanoma, and, in future, consideration could be given to changing the staging classification for this entity when present in isolation.

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