Does Shave Biopsy Accurately Predict the Final Breslow Depth of Primary Cutaneous Melanoma?

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Shave biopsy (SB) is used for the diagnosis of suspicious skin lesions, including melanoma. Its accuracy for melanoma has not been confirmed. We examined our experience with SB to determine its ability to predict true Breslow depth (BD). We performed a retrospective review of the tumor registry for all patients diagnosed with melanoma by SB from 1995 to 2004. Site and depth of lesion, tumor stage, correlation of BD between SB and wide local excision (WLE), and changes in surgical management due to discordance were examined. Melanoma-in-situ was defined as a depth of 0 for this analysis. One hundred thirty-nine patients were diagnosed with melanoma by SB. Pathology after WLE were as follows: 54 (39%) patients had no residual disease, 67 (48%) had a BD equal to or less than the SB, and 18 (13%) had a thicker BD compared with the SB. For these 18 patients, the median BD by SB and WLE was 1.1 mm (range 0–6.5) and 3.5 mm (range 0.5–20.5), respectively ($P = 0.0017$). Upstaging of final BD from SB to WLE was significantly associated with increasing tumor depth and higher stage of melanoma ($P < 0.0001$). Only seven of the 139 patients (5%) required further surgery because of the increased depth of the WLE. SB underestimated the final BD of melanoma in 13 per cent of patients, but changed the management of few patients. SB is a valuable tool for practitioners in the diagnosis of melanoma. Nevertheless, patients diagnosed with melanoma by SB should be counseled about the rare need for additional surgery.

MELANOMA IS A POTENTIALLY lethal cancer with an incidence that has been rapidly increasing over the past 50 years. Fortunately, early and accurate diagnosis can limit the associated morbidity and mortality. Traditional surgical teaching involves the use of excisional biopsy (EB) for the diagnosis of suspicious lesions. The National Institute of Health and the American Academy of Dermatology recommend EB as the technique of choice for diagnosis of suspected melanoma.[1, 2] In a survey of almost 3000 dermatologists who perform the initial biopsy of lesions suspected to be melanoma, 68 per cent reported EB as the preferred technique, but 32 per cent reported otherwise, including 10 per cent who prefer shave biopsy (SB).[3] Although frequently condemned in the literature,[4, 5] SB has remained the procedure of choice for many clinicians.

The most important histologic factor for predicting metastasis and survival in patients with melanoma is the tumor thickness, or Breslow depth. Successful formulation of a definitive treatment plan depends greatly on the accuracy of the initial biopsy to estimate the Breslow depth.[6–8] Concerns have been raised that SB may underestimate the Breslow depth and that it may even lead to increased rates of recurrence. Although several reports have shown that initial biopsy type does not affect patient outcome,[9–11] few reports on the accuracy of shave biopsy to predict Breslow depth have been performed. Thus, we reviewed our experience with melanoma initially diagnosed by SB to assess the correlation of Breslow depth between SB and wide local excision (WLE) and to examine changes in surgical management due to any discordance.

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Methods

This study was approved by the Wake Forest University Institutional Review Board. A retrospective analysis was performed using the Wake Forest University Baptist Medical Center tumor registry. All patients initially diagnosed with cutaneous melanoma by SB from 1995 to 2004 were included. Site of lesion,

tumor depth, and tumor stage were examined. For the analysis of tumor depth, melanoma-in-situ patients were defined as a depth of 0 mm. In addition, Breslow depth of initial SB was compared with that of subsequent wide local excision. Changes in surgical management, such as need for re-excision or sentinel lymph node dissection, due to any discordance were assessed. Melanoma staging criteria were performed according to American Joint Committee on Cancer guidelines.[12]

Statistical analysis was performed to test for possible associations with Breslow depth for these patients undergoing SB and WLE. Descriptive statistics such as frequencies, means, and standard deviations were examined to characterize distributions of characteristics and check for outliers. Cochran-Armitage Trend tests were performed to test for significant association of upstaging with final Breslow depth, increasing tumor stage, and higher stage of melanoma. Other patient characteristics that were categorical such as gender and primary site of lesion were tested with χ^2 or Fisher's exact tests. Continuous patient characteristics such as age were tested using *t* tests. Significance was considered to be resulting in a 2-sided $P < 0.05$. All analyses were performed using SAS v9.1.3 (SAS Institute, Cary, NC.)

Results

From 1995 to 2004, 139 patients were initially diagnosed with melanoma by SB at Wake Forest University Baptist Medical Center. Forty-five patients (32%) had lesions of the head/neck, 42 (30%) involved the trunk, and 52 (37%) involved the extremities. Of these, final pathology after WLE revealed 47 (34%) patients with Tis, 43 (31%) with T1, 25 (18%) with T2, 17 (12%) with T3, and 7 (5%) with T4 lesions. Forty-seven patients (34%) were stage 0, 63 (45%) were stage I, 18 (13%) were stage II, 4 (3%) were stage III, and 7 (5%) were stage IV (Table 1).

Compared with initial SB, pathology after WLE showed that 54 (39%) patients had no residual disease, 67 (48%) patients had a Breslow depth equal to or less than the SB, and 18 (13%) patients had a thicker Breslow depth compared with the SB. For these 18 patients, the median Breslow depth by SB and WLE was 1.1 mm (range 0–6.5) and 3.4 mm (range 0.5–20.5), respectively ($P = 0.0017$). Eight of these 18 lesions (44%) involved the head/neck, four (22%) involved the trunk, and six (33%) involved the extremities. Of these 18 patients, there were no patients with Tis, three (17%) with T1, one (6%) with T2, eight (44%) with T3, and six (33%) with T4 lesions. None of these patients were stage 0, four (22%) were stage I, 11 (61%) were stage II, none were stage III, and three (17%) would later progress to stage IV disease (Table 2).

TABLE 1. *Characteristics of the Patients (n = 139)*

Female	59 (42%)
Mean age ± sd (years)	63 ± 14
Primary Site	
Head/Neck	45 (32%)
Trunk	42 (30%)
Extremities	52 (37%)
T stage	
Tis	47 (34%)
T1	43 (31%)
T2	25 (18%)
T3	17 (12%)
T4	7 (5%)
Stage	
0	47 (34%)
I	63 (45%)
II	18 (13%)
III	4 (3%)
IV	7 (5%)
Pathology after WLE	
No residual disease	54 (39%)
BD ≤ SB	67 (48%)
BD > SB	18 (13%)

Of the 139 patients diagnosed with melanoma by SB, 39 (28%) had disease extending to the margin of the biopsy specimen. Of the 121 patients with either no residual disease or a Breslow depth equal to or less that the SB after WLE, only 21 (17%) had positive margins. All 18 patients with thicker Breslow depth on WLE compared with SB had positive margins on initial SB. Thus, 18 of 39 (46%) patients with positive

TABLE 2. *Characteristics of Study Population in Which BD Was Greater After WLE (n = 18)*

Female	8 (44%)
Mean age ± sd (years)	66 ± 13
Primary site	
Head/Neck	8 (44%)
Trunk	4 (22%)
Extremities	6 (33%)
T Stage	
Tis	0
T1	3 (17%)
T2	1 (6%)
T3	8 (44%)
T4	6 (33%)
Stage	
0	0
I	4 (22%)
II	11 (61%)
III	0
IV	3 (17%)
Median BD by SB (mm)*	1.1 (range: 0–6.5)
Median BD after WLE (mm)*	3.4 (range: 0.5–20.5)
Required further surgery	5 (28%)

*$P = 0.0017$ for median BD by SB *versus* median BD by WLE.

margins had thicker Breslow depth on WLE compared with SB.

Upstaging of final Breslow depth from SB to WLE was significantly associated with increasing tumor depth (> 2 mm, $P < 0.0001$) and higher stage of melanoma (stage II or higher, $P < 0.0001$). Upstaging of final Breslow depth from SB to WLE was also significantly associated with positive margins on initial SB ($P < 0.0001$). Upstaging of final Breslow depth was not associated with patient age, gender, or primary site. Seven of the 139 patients (5%) required further surgery. Two of these five patients required re-excision, two underwent sentinel lymph node dissection, and one required amputation of a toe because of the increased depth of the subsequent WLE. Additionally, two other patients upstaged by WLE declined subsequent sentinel lymph node dissection despite its indication (Table 3). Conversely, 11 patients did not require further surgery despite upstaging of the final Breslow depth after WLE. All of these patients had received adequate definitive resections despite upstaging on final pathology.

Discussion

Accuracy of the initial biopsy of cutaneous lesions suspected to be melanoma is crucial for determination of prognosis and a successful treatment plan. Choice of diagnostic radiology tests, determination of surgical margins, need for sentinel lymph node biopsy, and need for possible adjuvant therapy all depend on the tumor thickness determined by the initial biopsy.[6–8] Once the clinician suspects a lesion to be melanoma, multiple options for diagnosis exist, including: SB, punch biopsy, incisional biopsy, and EB. EB has been shown to be very accurate in the determination of BD, but many clinicians without surgical training often rely on other techniques, especially when they suspect the depth of the lesion to be shallow.[13] The use of SB for the diagnosis of melanoma has been criticized because it is thought to often underestimate the final Breslow depth. In 2003, Ng et al.[13] concluded that SB is accurate in predicting the final Breslow depth of melanoma lesions ≤ 1 mm in depth, but few other reports are available. We set out to specifically examine our experience with SB to accurately predict the final Breslow depth in primary cutaneous melanoma.

After WLE, 13 per cent of patients in our study diagnosed with cutaneous melanoma had a final Breslow depth greater than that predicted by the initial SB, all of which had positive margins on initial SB. In this group, the mean tumor thickness found after WLE (3.4 mm) compared with that of the initial SB (1.1 mm) was significantly higher ($P = 0.0017$). Nevertheless, only five patients (3.6%) required another intervention. Two others who were upstaged by WLE declined further procedures, namely sentinel lymph node biopsies. Three of these patients later progressed to stage IV disease. All seven of these patients had a final Breslow depth of > 1 mm whereas the initial Breslow depth as determined by SB was < 1 mm. All of the additional procedures were necessary due to the changes in management that occur when the Breslow depth reaches 1 mm (*i.e.*, indication for sentinel lymph note biopsy [SLNB], wider margin on subsequent WLE). Despite a 13 per cent rate of understaging melanoma by SB, it only changed the management of a small percentage of patients. This data is similar to that of Ng et al.[13] who showed a 92.5 per cent accuracy rate for determination of final Breslow depth by initial shave biopsy. Likewise, the deepest melanomas were associated with a lower accuracy of initial SB. In our study, upstaging of final Breslow depth after WLE occurred significantly more often in lesions with a depth of > 2 mm, in those associated with stage II disease or greater, and in patients with positive margins on initial SB (all, $P = 0.0001$). Initial shave biopsy was accurate

TABLE 3. *Seven Patients Upstaged by WLE with BD by SB and WLE, SB Margins, Initial Procedure after SB, and Procedures Incurred Due to Upstaging*

	Initial BD by SB (mm)	Margins After SB (+ or –)	BD After WLE (mm)	Initial Procedure After SB	Subsequent Procedure(s)
1	0.78	+	3.2	WLE + STSG to R second toe	Amputation of R second toe
2	0.8	+	4	WLE of R cheek	Declined SLNB
3	0.8	+	2.4	WLE of nose	SLNB
4	0.76	+	3.65	WLE + SLNB of L brow	Further WLE
5	Mis	+	3.25	WLE of L face	SLNB
6	Mis	+	1	WLE of L cheek	Declined SLNB
7	3	+	4	WLE of back with SLND and bilateral axillary lymph node dissection	Further WLE

Mis, melinoma in situ; WLE wide local expression; L, left; R, right; STSG, split thickness skin graft; SLNB, sentinel lymph node biopsy.

in 98 per cent of cases in which the final Breslow depth was less than 2 mm. Furthermore, it was 100 per cent accurate when the final tumor depth was < 1 mm. Primary site, gender, and age were not associated with upstaging of the final Breslow depth after WLE. SLND and wider excisions should be considered in patients with an initial Breslow depth that nears 1 mm with positive margins.

Two types of shave biopsy have been described in the literature, superficial and deep. Admittedly, we did not differentiate between "superficial" and "deep" shave biopsy, as the retrospective nature of this study made this determination difficult. Superficial shave biopsy, typically performed with a scalpel, yields a flat, thin specimen limited to epidermis and upper dermis no more than 1 mm in depth. Conversely, deep shave biopsy is performed with a curved blade and penetrates to mid dermis yielding a thicker disk of tissue 1 to 4 mm in depth. The study by Ng et al. in 2003 revealed superficial shave biopsy to be 96 per cent accurate in Breslow depth determination when Breslow depth was < 1 mm. Likewise, deep shave biopsy was 95 per cent accurate in Breslow depth determination when Breslow depth was < 2 mm. Accuracy of shave biopsy, both superficial and deep, was lower with thicker melanomas.[13] Thus, it seems as though deep shave biopsy in the hands of experienced clinicians, in general, is safe and accurate, when the tumor depth is thought to be less than 2 mm. Ideally, superficial shave biopsy should be performed only when a skilled clinician feels a lesion is "thin." Unfortunately, predicting the thickness of a melanoma is difficult. Thicker melanomas associated with advanced disease may present with ulceration and bleeding that is obvious to all clinicians. But predicting the Breslow depth of less invasive tumors is more challenging. Signs and symptoms of cutaneous melanoma were examined by Negin et al.,[14] as predictors of Breslow depth in 2003. They showed that pain, underlying lump, bleeding, itching, ulceration, and recent change in size or color are significantly associated with increasing Breslow depth. Moreover, as the number of signs and symptoms present increase, so does the Breslow depth. In the absence of these signs and symptoms, patients were more likely to have a Breslow depth $\leq$ 1 mm.[14]

In practice, many factors play into a clinician's decision as to what type of initial biopsy to perform when melanoma is suspected. Efficient management of time, technical skill and resources, patient preference, and clinical guidelines are all important considerations. EB requires more technical skill and is a more time consuming procedure. It requires more anesthetic and leads to a more difficult closure of a larger, more noticeable wound. Nevertheless, it may provide more adequate tissue for diagnostic purposes[15] and reduce the need for a second definitive procedure if the lesion is not a melanoma.[16, 17] On the other hand, SB is faster, requires less technical skill, and often does not require closure. It also offers the benefit of leaving less of a scar in the case of benign disease in conspicuous areas.

In the past 30 years, mortality from melanoma has decreased significantly, especially in younger patient populations.[18] Undoubtedly, this observation is related to early detection and treatment, as the incidence of melanoma continues to rise. With this in mind, more practitioners, including physicians and physician extenders, will be evaluating pigmented lesions in the future and will be faced with the decision as to how to proceed with diagnosis. If guided strictly by current guidelines, practitioners without the skill or resources to perform EB might be inclined to proceed without biopsy in favor of observation, or worse may chose to cauterize the lesion without a diagnosis. Either of these scenarios could be deadly for a patient with what is potentially a curable melanoma. In our experience with SB for the diagnosis of melanoma, the management of less than 5 per cent of patients was changed due to underestimation of BD. More importantly, the correct diagnosis was made and the patients were appropriately referred for treatment. If the current trends of decreasing mortality from melanoma are to continue, SB should be regarded as an important tool, especially for those without the training or resources to provide EB.

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Commentary

Does Shave Biopsy Accurately Predict the Final Breslow Depth of Primary Cutaneous Melanoma?

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There has been slow, steady but significant increase in survival rates from malignant melanoma across the last 50 years. Virtually all of that has been due to an earlier diagnosis and essentially down-staging of the kind of melanomas most surgeons see. In my opinion, that has been all due to early diagnosis on the part of dermatologists and family practitioners. Therefore, I am especially reluctant to criticize whatever method they would like to use for biopsy.

This article says the obvious (*i.e.*, that a shaved biopsy may underestimate depth and width of the lesion), which is widely known and widely understood. The practicing surgeons would always want to do, within reason, an excisional biopsy unless the lesion's diameter is very large. For others, I think the shave biopsy is quite acceptable. Anything that would discourage less skilled practitioners from performing a biopsy would, in my opinion, be a step in the wrong direction.

The authors have done a nice job of discussing the events that happened to the individual patients. Table 3 shows adjustments that had to be done with their ultimate care based on a revised and more accurate deeper biopsy and/or excision.

It would be fine if we lived in a perfect world, but we do not. I would continue to encourage family practitioners and dermatologists to use whatever method with which they are comfortable for biopsy, excluding any kind of cautery under every circumstance.

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