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Sentinel Node Biopsies: Weighing Clinical Value against Procedural Risk in Modern Practice

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Abstract

Sentinel lymph node biopsy (SLNB) has served as a central staging modality in the management of melanoma and select non-melanoma skin cancers, enabling histopathologic assessment of regional lymphatic spread with less morbidity than complete nodal dissection. By identifying the primary draining lymph node(s) through the use of radiotracers and vital dyes, SLNB provides valuable prognostic information that informs adjuvant therapy eligibility and risk-adjusted follow-up protocols. However, emerging evidence from trials such as MSLT-II and DECOG-SLT has called into question the therapeutic utility of SLNB in improving melanoma-specific survival, particularly in patients with microscopic nodal metastases, prompting scrutiny of its role in clinical decision-making. While generally well tolerated, the procedure carries measurable risks—including seroma formation, transient or persistent lymphedema, localized infection, and nerve injury—which may be magnified in older adults or those with multiple comorbidities. Additionally, diagnostic accuracy is influenced by factors such as tumor location, Breslow depth, lymphatic architecture, and operator proficiency, introducing variability in staging outcomes. Inconsistencies in access to high-volume surgical centers, use of adjunctive imaging techniques, and application of molecular node analysis create further disparities in the quality and interpretability of SLNB data. As systemic therapies evolve and offer improved disease control, particularly in node-positive patients, the emphasis on SLNB is shifting from therapeutic intervention to risk stratification and eligibility assessment for novel treatment pathways. Assessing the contemporary value of sentinel node biopsy requires careful consideration of procedural risks, staging precision, and clinical consequence while ensuring its use reflects a patient-specific approach rather than strictly default oncologic management.

1. Introduction

Sentinel lymph node biopsy (SLNB) has become a standard part of melanoma care, offering a way to check whether cancer has spread to nearby lymph nodes without the need for more invasive surgery. By identifying and removing the first few lymph nodes that drain from a melanoma sites, referred to as sentinel nodes, this procedure provides important staging information that helps guide treatment decisions, especially around adjuvant therapy and follow-up plans. (Blackburn, 2019) Over the years, SLNB has been seen as both a diagnostic and potentially therapeutic tool. But recent studies, including the MSLT-II and DECOG-SLT trials, have challenged the idea that removing more lymph nodes after a positive SLNB leads to better survival. (Leiter et al., 2019) Instead, these findings have helped shift the focus of SLNB toward its value in risk stratification—helping identify which patients might benefit most from newer systemic treatments like immunotherapy or targeted therapies.

Still, SLNB isn't without risks. While generally safe, it can lead to complications such as lymphedema, seromas, infections, or nerve

injuries—especially in older adults or people with other health conditions. (Isik et al., 2022) The accuracy of the procedure also depends on factors like tumor thickness, location, lymphatic anatomy, and the experience of the surgical team. On top of that, not all patients have equal access to specialized centers or the advanced imaging that can make SLNB more effective.

As current tools for treating melanoma continue to improve, reevaluating the role of SLNB is key—not only as a routine step, but also as part of a more personalized approach to care. This review of medical literature looks at how SLNB fits into modern melanoma management, weighing its benefits and risks, and considering how we can use it more thoughtfully in an era of precision medicine.

1.1. Technique and Diagnostic Utility of SLNB

Sentinel lymph node biopsy (SLNB) is a surgical procedure that is used to assess regional lymphatic spread of melanoma. It is a multidisciplinary process that involves collaborations between nuclear medicine, surgery and pathology. This procedure is typically performed by general or plastic surgeons trained in SLMB techniques. (Brănişteanu et al., 2022) The underlying principle behind SLNB, is that lymphatic drainage from a primary tumor site follows a predictable path to the first lymph nodes, termed the sentinel lymph nodes (SLNs), which are the most likely to contain metastatic disease if the melanoma has begun to spread. Prior to surgery, lymphatic drainage is assessed via lymphoscintigraphy to indicate the most likely SLNs that could contain metastatic disease. In this imaging technique, a radiotracer such as technetium-99m sulfur colloid, is injected intradermally or peritumoral near the primary melanoma. (Razenberger et al., 2024) Accurate intradermal injection is essential to ensure precise mapping. The resulting images help guide the surgical team on the most likely location of SLNs.

Following the lymphatic drainage mapping, the SLNB procedure is performed. Lymph nodes are located intraoperatively by an injected radioactive substance, blue dye or both. The identifying substance is injected near the primary melanoma site, indicated by biopsy site or excision scar. If blue dye is used, it can be seen in the skin. The radiotracer is detected with a handheld gamma probe and blue-stain lymphatics provide visual confirmation. The site with the highest radiotracer activity is marked and an incision is made in the skin. The gamma scanner can be inserted into the incision site to locate the highest scanning lymph nodes more accurately. Lymph nodes that have potentially had melanoma cells spread to them are removed. The combination of the radiotracer and dye can help enhance the accuracy of the SLN identification and increases the likelihood that any identified and removed nodes are the true sentinel nodes.

The excised SLNs are then sent to pathology for further evaluation. Hematoxylin and eosin (H&E) staining is the initial method used to identify melanoma involvement in the nodes. In cases where H&E staining is inconclusive or negative despite a high index of clinical suspicion, immunohistochemistry (IHC) may also be used to identify melanoma associated markers like S-100, HMB-45, and Melan-A. In certain cases, advanced molecular techniques like reverse transcriptase polymerase chain reaction (RT-PCR) and gene expression profiling can offer additional quantitative data on tumor burden with SLNs. The pathological findings are critical for determining the stage of disease and guiding subsequent treatment decisions including the potential need for adjuvant therapy.

Sentinel lymph node biopsy (SNLB) plays a critical role in prognostication and risk stratification for patients with melanoma. The results can inform decisions regarding the use of adjuvant treatments such as immune checkpoint inhibitors and help tailor surveillance strategies. A positive SLNB indicates a higher risk of recurrence and poorer prognosis, warranting more aggressive follow-up and systemic therapy. Conversely, a negative SLNB can spare patients from unnecessary interventions, reducing treatment related morbidity and healthcare costs SLNB is particularly valuable in staging intermediate-thickness melanomas, where the risk of nodal metastasis is most uncertain. For patients with thick melanomas, who often already require adjuvant therapy due to high metastatic risk, SLNB may offer limited additional prognostic benefit. In contrast, patients with thin melanomas generally have a low risk of nodal involvement, though SLNB can still be considered in select cases, particularly when high-risk features are present. Ultimately, SLNB is not only a diagnostic and staging tool but also contributes to personalized treatment planning and, in select cases, may have therapeutic value. Its use should be carefully considered based on tumor characteristics and patient-specific factors.

Evidence from Clinical Trials: Reevaluating Survival Benefit

SLNB was introduced to detect and remove microscopic nodal metastases at an early stage. Two major randomized Phase III trials, MSLT-II and DECOG-SLT, were conducted to assess the impact of immediate completion lymph node dissection (CLND) after a positive sentinel node dissection. In the MSLT-II trial, 1,934 patients with a positive SLN were randomized to immediate CLND or observation with nodal ultrasound surveillance (Faries et al., 2017). This study found no significant difference in melanoma-specific survival (MSS) between the two groups. This finding indicates that immediate removal or remaining regional lymph nodes is not as beneficial as originally regarded. Similarly, the DECOG-SLT trial randomized 480 patients and found no survival benefit from complete dissection in SLN-positive patients (Leiter et al., 2019). These studies suggest that routine complete lymphadenectomy should not be recommended for patients with microscopic metastases. Thus, removal of additional lymph nodes after a positive SLNB does not translate into improved MSS.

However, while neither trial showed an MSS benefit, there were differences in disease recurrence patterns related to disease-free survival (DFS). In MSLT-II, the participants who underwent immediate CLND experienced slightly improved 3-year DFS (68% compared to 63% in the observation group) (Faries et al., 2017). Essentially, this finding reflects improved regional disease control with only 8% of patients having a regional nodal recurrence compared to 15% in the observation group of the study. Despite this, the lack of differences in MSS suggests this improved DFS in those with CLND may not be clinically significant. In fact, lymphedema was seen in 24.1% of patients who underwent CLND compared to only 6.3% of those in the observation group (Faries et al., 2017). Additionally, the DECOG-SLT trial also found a similar higher incidence of nodal recurrence in patients who did not undergo dissection (Leiter et al., 2019). In both studies, there were no improvements in distant metastasis-free survival. The lack of MSS benefit despite improved regional nodal control suggests that early dissemination of melanoma cells to distant sites beyond the lymph nodes occurs before or irrespective of lymph node removal. These findings indicate that patients who developed distant metastases did so at similar rates and that the primary life-limiting factor is distant metastatic spread rather than persistence of microscopic disease in regional nodes.

The MSLT-II and DECOG-SLT studies have changed clinical management of patients with microscopic nodal metastases. Routine CLND is no longer the standard practice. Given the absence of a survival advantage and the morbidities associated with CLND, clinicians can simply observe with intensive ultrasound surveillance of the lymph node (Fayne et al., 2019). Additionally, microscopic nodal metastasis via SLNB can trigger consideration of adjuvant systemic therapies such as immune checkpoint inhibitors and BRAF/MEK-targeted therapies. Since a positive SLN is classified as stage III disease, pursuing adjuvant therapy could offer an improved recurrence-free survival (RFS). In fact, in a study of 36 patients with positive SLN, 68.8% were treated with adjuvant therapy without CLND and the RFS was 82% which is similar to trials requiring CLND (Farrow et al., 2020). Therefore, the management of a SLN-positive melanoma patient has pivoted from an aggressive surgical approach to a combined approach of conservative monitoring and systemic therapy.

In light of these trial results, the role of SLNB in melanoma has evolved into a prognostic and staging tool. Since SLNB involves the removal of sentinel nodes, it provides regional control and the removal of the SLN clears the nodal disease in cases where the disease is confined only to those nodes. However, the primary value of SLNB lies in the information it can provide. A multivariate analysis shows that sentinel node status was the strongest predictor of disease recurrence or death from melanoma (Morton et al., 2014). The 10-year survival rate is 65% for patients with a negative SLN, but drops to about 48% for those with a positive SLN (Allard-Coutu et al., 2023). This contrast in prognosis means that knowing a patient's nodal status is crucial for accurate staging and guiding therapy. SLNB is now performed to identify high-risk patients who may benefit from additional treatments, rather than to directly extend survival by excising lymph nodes. In this way, SLNB leads to a minimally invasive removal of the primary draining node which is often the only site of regional metastasis in many patients and it provides crucial information. Now the focus is on integrating prognostic data from SLNB to guide systemic adjuvant therapies.

1.2. Risks and Procedural Complications

While sentinel lymph node biopsy (SLNB) historically has provided vital information to help guide the management of melanoma and non-melanoma skin cancers, it is associated with a wide range of post-operative complications. Although complication rates may vary, a systematic review of 9047 patients indicates an overall complication rate of 11.3% to include seroma (5.1%), infections (2.9%), lymphedema (1.3%), and hematoma (0.5%) (Moody et al., 2017). Less common complications include nerve injury (0.3%), lymphocele (1.5%), wound dehiscence (1.7%), and systemic insults such as deep vein thrombosis and allergic reactions to blue dye (Moody et al., 2017; Solari et al., 2019). The variability in the complication rates can be attributed to many factors, including surgical technique, patient demographics, study methodology, and institutional experience. Therefore, further discussion and research uncovering the effects of these factors on the efficacy of SLNB should be disclosed to patients referred for the procedure to fully understand the risk transparently. Although SLNB is a procedure that is generally reported to be well-tolerated, there have been concerns regarding the increased risk of post-operative complications in the elderly population and those with significant comorbid conditions. Individuals, particularly those over 70 years old, often present with comorbidities including diabetes, hypertension, and hyperlipidemia, all of which could have an impact on postoperative outcomes (Kadhum et al., 2024; Persa et al., 2018). However, the impacts of age and comorbidities on SLNB post-operative complications seem to differ. A study of 998 patients showed no significant difference in complication rates between younger and older patients, however, the younger patients were more likely to report sensory changes following the procedure (Kadhum et al., 2024; Solari et al., 2019). Moreover, others suggest that age alone is not a strong predictor of certain complications, such as seroma, particularly when comorbidities are well controlled (Moody et al., 2017). Some studies have shown that older patients may be more prone to higher morbidity, supporting the argument that physiologic, rather than chronological, age should help guide SLNB eligibility (Kadhum et al., 2024). The variability within these findings suggests the need for a personalized, case-by-case approach when recommending SLNB, with greater emphasis placed on the patient's overall health status rather than that of age alone.

Although usually reported to be mild, the physical and psychological effects of SLNB should be considered. The physical impacts of SLNB include postoperative symptoms such as localized pain, swelling, and sensory changes, and wound healing complications early in the recovery period (Banting et al., 2019; Moody et al., 2017). These symptoms can influence the patient's recovery and overall physical function. In addition to the physical effects, some patients also report psychological effects of SLNB, including anxiety and stress regarding pathology uncertainty and the possibility of further nodal involvement (Banting et al., 2019). However, it is reported that 89% would choose to undergo the procedure again, and 96% reported a decrease in stress after receiving a negative test result (Banting et al., 2019). These often underexplored physical and psychological post-operative effects of SLNB should be clearly discussed and integrated into the standard of care during preoperative counseling so patients can be fully informed before deciding on how to proceed with the management of their care. Preoperative counseling should also include the discussion that, since most SLNB will result in a negative result, the procedure will lie heavily on risk stratification rather than offering a direct therapeutic benefit (Banting et al., 2019). Shared decision-making becomes pivotal as the role of SLNB continues to evolve in its utility for the management of melanoma and non-melanoma skin cancers. The costs and benefits must be weighed when looking to SLNB, including but not limited to the large trials, such as MSLT-II and DECOG-SLT, questioning the survival benefit of SLNB, variability in diagnostic accuracy, such as tumor location, Breslow depth, lymphatic architecture, and surgeon experience, and disparities in access to experienced surgical teams and advanced imaging technologies (Banting et al., 2019; McGregor et al., 2015; Schofield et al., 2015). Therefore, clinicians must prioritize transparency and evidence-based communication when counseling patients on SLNB. Given all the factors that could affect the outcome of SLNB, the decision to proceed with the procedure should be a shared decision. Clinicians should ensure the information is relayed to their patients so that they will be able to weigh both the benefits and risks, aligning them with their own values and treatment preferences in order to make a true, fully informed decision.

The accuracy of sentinel lymph node biopsy (SLNB) is pivotal for effective staging and management of melanoma and other skin

cancers. SLNB offers insight into the regional lymphatic involvement and guides clinician treatment decisions. However, the accuracy and staging precision is influenced by several variables including tumor characteristics, anatomical variability, operator expertise, and methodological limitations. Understanding these complexities is crucial to optimizing SLNB's clinical utility and ensuring accurate staging.

1.3. Factors Affecting SLNB Accuracy and Staging Precision

Tumor characteristics such as Breslow depth, ulceration, and location, significantly impact SLNB accuracy. For instance, with each unit increase in Breslow depth, the likelihood of a positive SLNB rises by 13% (Cadili & Dabbs, 2010). As tumor thickness increases, so does the risk of nodal involvement. This association highlights the necessity of precise lymphatic mapping, particularly since deeper tumors may disrupt lymphatic flow, complicating node identification (Brănişteanu et al., 2022). Similarly, ulceration, which is a hallmark of aggressive tumor biology, can alter lymphatic drainage patterns, complicating SLN detection and increasing the likelihood of false negatives (Zhang et al., 2021). These findings underscore the importance of individualized approaches to SLNB planning, ensuring that tumor-specific features are meticulously considered to enhance diagnostic precision.

Building on these tumor-related challenges, the reliability of SLNB also depends on lymphatic mapping, which can be hindered by anatomical complexity or variability. Tumor anatomical location significantly impacts SLNB precision given the variability in lymphatic drainage patterns and proximity to critical structures (Collarino et al., 2023). For example, cutaneous cancers of the head and neck pose unique challenges because of their complex and overlapping lymphatic networks. According to Han & John, approximately 20-40% of head and neck neoplasms drain to unexpected nodal basins, complicating accurate SLNB localization. While this adds to procedural complexity and increases the risk of false negatives, it has not been shown to increase SLN positivity or impact survival outcomes (Han & John, 2022). These challenges highlight the need for meticulous preoperative planning and the incorporation of advanced imaging techniques to refine SLNB localization.

Addressing these complexities necessitates careful selection of tracers and dyes to ensure reliable lymphatic mapping. Commonly used radiolabeled tracers like 99mTc-labeled colloids and visual dyes enhance SLN identification, yet their performance is influenced by factors such as particle size and operator technique. For instance, smaller particles like indocyanine green (ICG) enhance lymphatic transit and SLN uptake, but their rapid clearance can result in missed delayed drainage patterns. In contrast, larger particles such as sulfur colloids provide greater retention within the SLN, but they may incompletely visualize secondary drainage basins, potentially limiting comprehensive mapping (Patel et al., 2021). These particle-dependent trade-offs highlight the necessity of selecting tracers that align with the specific anatomical and procedural context. Advanced imaging modalities further augment the mapping process. Single-photon emission computed tomography combined with computed tomography (SPECT/CT) has shown superior sensitivity and specificity compared to planar lymphoscintigraphy (PL), enabling detection of additional SLNs in challenging cases such as head and neck cancers. Notably, SPECT/CT offers improved preoperative planning and intraoperative guidance, reducing operative duration and potential morbidity (Quartuccio et al., 2020). However, while SPECT/CT offers significant advantages, its cost and limited access may make PL a more feasible alternative in resource-limited settings.

Future innovations may bridge current gaps in tracer performance. For example, hybrid tracers that combine radiolabels with fluorescent markers offer enhanced SLN localization, potentially overcoming limitations of diffusion and visibility (Quartuccio et al., 2020). Moreover, integrating these technologies with real-time intraoperative imaging could streamline SLNB procedures, reduce false-negative rates, and improve staging accuracy.

The diagnostic yield of SLNB is heavily contingent upon operator expertise and the procedural volume of the institution. Surgeon experience plays a pivotal role in the challenges of SLNB accuracy when using emerging techniques like ICG fluorescence imaging. Pameijer et al. found that surgeons with greater experience using this technology demonstrated better success rates, underscoring the importance of familiarity and practice. However, even experienced surgeons require adaptation to master new methods as demonstrated by the estimated learning curves of eight cases. These findings relay that proficiency reduced the risks of missing sentinel nodes due to technical

limitations such as shallow signal penetration and background fluorescence (Pameijer et al., 2024). Furthermore, patients at moderate or high-volume centers demonstrated higher rates of undergoing completion lymph node dissection (CLND) compared to those at low-volume facilities (Broman et al., 2022). This underscores the critical importance of both operator expertise and treatment at high-volume centers in ensuring the accuracy and effectiveness of SLNB, thereby optimizing staging precision and guiding appropriate melanoma management.

Despite advances in technology and methodology, false-negative rates in SLNB persist. The MSLT-I trial reported a 5.2% false-negative rate among patients with negative SLNB results, highlighting a key limitation. Such false negatives often arise from technical limitations in SLN resection, inadequate pathological analysis, or biologic factors like lymphatic obstruction by metastases (Ishizuki & Nakamura, 2023). Moreover, anatomically complex areas, such as the head and neck, have a higher false negative rate compared to other regions (GIUDICE et al., 2014; Skanjeti et al., 2021). This underscores the importance of enhanced preoperative lymphoscintigraphy and regional surveillance in patients with HNM. Diagnostic inaccuracies such as these undermine confidence in negative SLNB results, which may delay necessary interventions and compromise patient outcomes.

1.4. Equity, Access, and Variability in SLNB Implementation

Access to SLNB and its staging tools varies significantly across institutions, and these differences can lead to disparities in melanoma care. Institutional surgical volume is one of the most influential factors contributing to this variability (Lyman et al., 2017). In this context, higher-volume centers often have greater adherence to evidence-based guidelines and improved surgical outcomes. In fact, studies have shown that patients treated at high-volume centers are more likely to undergo complete lymph node dissection (Bredbeck et al., 2020). They are also more likely to receive preoperative imaging with advanced modalities such as SPECT/CT. These technologies enhance sentinel node localization, reduce false-negative rates, and improve intraoperative decision-making, particularly in anatomically challenging regions like the head and neck (Quartuccio et al., 2020). However, access to such imaging modalities is often constrained by geographic location, institutional resources, and insurance coverage.

In addition to disparities in imaging and surgical expertise, there is uneven use of molecular and genetic nodal analysis. Nodal assessments, such as reverse transcriptase polymerase chain reaction, can provide additional prognostic information beyond conventional histopathology (Scoggins et al., 2006). The high cost associated with these assessments have limited their integration into practice. As a result, patients treated at centers without access to these techniques may receive less definitive staging. Variability in SLNB implementation is also reflected in institutional differences in patient selection criteria. While most guidelines recommend SLNB for intermediate-thickness melanomas, practice patterns vary when considering thin melanomas with high-risk features. Some centers pursue SLNB aggressively in borderline cases while others may go through with opt observation (Wong et al., 2018). These disparities are further emphasized by differences in surgeon experience and training. These findings demonstrate the necessity of standardizing SLNB utilization. Criteria for patient selection, imaging protocols, and nodal analysis can help reduce the institutional variability seen in various situations. Moreover, efforts to expand access to high-quality imaging, molecular diagnostics, and surgical expertise are needed. Without addressing these gaps, patients with similar disease characteristics may receive fundamentally different levels of care, and this can affect the utility of SLNB.

The accuracy of sentinel lymph node biopsy is influenced by a complex interplay of tumor-specific, anatomical, and operator dependent factors. Tumor characteristics such as depth, ulceration, and location shape lymphatic behavior and procedural complexity. Anatomical variability and prior interventions further complicate mapping efforts, necessitating advanced imaging and dual-tracer approaches. Surgeon expertise and institutional volume directly impact false-negative rates, highlighting the benefits of specialized, high-volume centers. While current false-negative rates underscore procedural limitations, emerging molecular diagnostics offer a path toward improved staging sensitivity. Continued efforts to standardize techniques and tailor approaches to individual patient profiles remain essential for maximizing SLNB's clinical value in melanoma management.

1.5. Contemporary Role of SLNB in the Era of Evolving Systemic Therapies

The clinical role of sentinel lymph node biopsy (SLNB) has evolved significantly as systemic

therapies for melanoma continue to advance. Originally conceptualized as a less invasive alternative to elective lymph node dissection, SLNB was once considered a potential therapeutic intervention. However, pivotal trials such as MSLT-II and DeCOG-SLT demonstrated that immediate completion of lymph node dissection following a positive SLNB did not improve melanoma-specific survival, reframing SLNB's value primarily as a staging and prognostic tool (Leiter et al., 2016; Faries et al., 2017). This shift has prompted clinicians to rethink SLNB as not a treatment in itself, but as a crucial step that helps guide decisions about what comes next. In modern practice, SLNB findings guide eligibility for adjuvant immunotherapies, such as anti-PD-1 checkpoint inhibitors and BRAF/MEK targeted agents, which have demonstrated significant efficacy in node-positive melanoma (Hamid et al., 2019; Robert et al., 2019). Consequently, finding micrometastatic disease in sentinel lymph nodes doesn't just help predict the patient's outlook—it also plays a key role in determining access to treatments that could significantly change the course of the disease. Hence, in this context, SLNB is essential to precision oncology, serving as a bridge between detailed pathological staging and broader treatment strategies. With ongoing advances in therapy and outcomes increasingly tied to timely initiation of the right systemic treatments, SLNB's importance in guiding treatment decisions is only growing.

Nonetheless, the decision to pursue SLNB must account for individual patient factors, balancing the benefits of precise staging with the risks and limitations of the procedure. While SLNB generally offers a favorable safety profile, complications such as seroma, localized infection, and sensory nerve damage can pose greater risks in older adults or those with comorbidities (Roaten et al., 2005; Bobircă et al., 2023; Lorek et al., 2019). Furthermore, variability in lymphatic drainage patterns, particularly in head and neck or trunk melanomas, can reduce the accuracy of node identification and increase the chance of false-negative results (Pasha et al., 2023). Personalized approaches that integrate tumor characteristics, such as Breslow depth, ulceration, and mitotic rate, with patient values and clinical context are essential to avoid unnecessary procedures. For instance, recent analyses suggest that patients with thin melanomas (<0.8 mm without high-risk features) derive limited benefit from SLNB and may be better managed with observation alone (Wong et al., 2018). Involving patients in shared decision-making, where the risks of the procedure, the potential diagnostic benefits, and the impact on future treatment are all carefully discussed, supports a more personalized approach to care. Instead of treating SLNB as a one-size-fits-all standard, it should be used thoughtfully, especially in situations where staging will genuinely influence treatment decisions and aligns with what matters most to the patient.

2. Conclusion

As systemic therapies such as immune checkpoint inhibitors and targeted agents become more effective and widely available, the value of SLNB lies not in improving survival directly, but in identifying patients who may benefit most from these treatments. At the same time, the risks and limitations of the procedure—ranging from surgical complications to diagnostic variability--require careful consideration, especially in older adults and those with comorbidities. Moving forward, SLNB should not be viewed as a one-size-fits-all intervention, but rather as part of a patient-centered, precision-based approach to melanoma management. Incorporating tumor characteristics, patient health status, and personal preferences into the decision-making process is essential. With ongoing advancements in imaging, molecular diagnostics, and treatment strategies, the role of SLNB will likely continue to evolve—demanding thoughtful integration into multidisciplinary care frameworks to maximize benefit while minimizing harm.

Sentinel lymph node biopsy remains a valuable tool in the management of melanoma, primarily for staging and guiding decisions about adjuvant therapy, and continues to offer critical prognostic information that supports personalized treatment planning. As systemic therapies evolve and our understanding of melanoma biology deepens, the role of SLNB should be approached with nuance, balancing clinical utility, patient values, and procedural risk to ensure it is used thoughtfully and effectively in modern melanoma care.

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