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Achieving Optimal En Face Tissue Sections During Staged Lentigo Maligna Excisions: A Novel Technique

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Achieving Optimal En Face Tissue Sections During Staged Lentigo Maligna Excisions: A Novel Technique

Strategies for the optimal surgical management of lentigo maligna (LM) and LM melanoma continue to evolve. In recent years, a multitude of techniques involving staged marginal excision with mapping and subsequent rush permanent sectioning have been described.[1–4] Such approaches vary slightly in both philosophy and design but were developed in an attempt to overcome the unacceptable recurrence rates for LM with conventional excision and traditional Mohs surgery. Conventional excision with standard serial (bread loaf) sectioning is insufficient because it does not provide complete margin visualization. Lentigo maligna is known to display significant subclinical spread, which can be missed with this approach. Similarly, Mohs micrographic surgery relies on frozen tissue sections, which have proven to be less than ideal for visualizing melanocytes. The use of melanocyte stains such as Mart-1 has overcome some of these challenges with the Mohs technique, but the increased cost and meticulousness required may limit its general acceptance.[5] Increased cure rates with the newer formaldehyde-fixed and paraffin-embedded–staged excisions have been obtained.[1–4] This is likely due to the combined advantages of better melanocyte

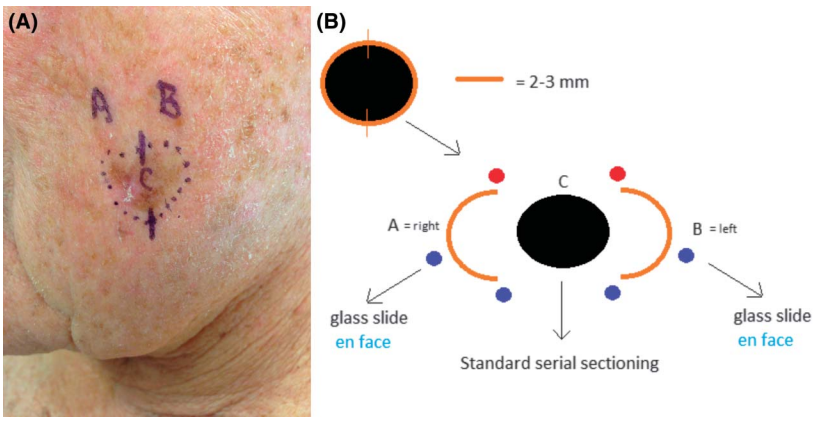

Figure 1. (A) Clinical image: A curved broken-up line maintaining 2 to 3 mm margins is drawn around the tumor. Hash marks are placed at the 12- and 6-o'clock positions in relation to the patient, which designate the edges of 2 tissue strips to be excised. (B) Schematic of the first surgical layer: the outer edges of the tissue strips (orange) correspond to the curved broken-up line shown in (A). These strips are excised, labeled left and right, color coded (blue and red) to maintain orientation, and processed between 2 glass slides (Figure 2). At the time of the first layer, the central portion of the tumor (black) is also excised and sent for standard serial sectioning to assess tumor depth.

visualization with permanent sections and en face tissue embedding for complete peripheral margin assessment.

Many of the techniques for staged marginal excision of LM use a geometric design, which facilitates angled corners and flat edges of the marginal strips of tissue.[1–3] Advocates of this technique emphasize that the clinical lesions of LM are often irregular in configuration, and therefore, the use of polygonal shapes such as squares, pentagons, or hexagons allows for greater tissue conservation. An interesting variation of the "square" technique was described by Möller and colleagues in 2009. Instead of relying on sharp angles and geometric-shaped excision lines, Möller and colleagues[4] proposed anatomically contoured excisions to better approximate cosmetic units and ultimately achieve a better repair.

In the authors' practice, they use a similar contoured technique to that described by Möller and colleagues. However, the authors have found that it is often difficult to achieve a true and complete en face peripheral margin with curved tissue strips after formalin fixation. This is largely due to the lack of pliability of thin formalin-fixed tissue as compared with traditional frozen tissue sections. This problem may also arise with the previously described geometric or square methods, as thin tissue has the potential to warp during the fixation process. To overcome this problem, the authors have developed a simple and effective fixation technique with the end result being a flat strip of tissue.

Technique

On presentation, dermatoscopic evaluation is used to delineate the clinically apparent margins of a patient's lesion. A curved broken up line is subsequently drawn around outline of the tumor, maintaining at least 2- to 3-mm margins along its perimeter. Hash marks are placed at the 12- and 6-o'clock positions of this curved structure in relation to its orientation within the patient (Figure 1A). For small lesions, 2 tissue strips are vertically excised between these positions down to the level of the deep fat, one designated "left" and the other one designated "right." The 12-o'clock edges of each tissue strip are marked red, whereas the 6-o'clock positions are marked blue. Additionally, the outer edge of each tissue strip is marked with blue, which designates this side to be embedded en face in the paraffin boat. Such mapping successfully orients the

Figure 2. One of the tissue strips is shown here wrapped in a piece of lens paper and sandwiched gently between 2 glass slides. This entire apparatus is then placed in a bottle of formalin.

Figure 3. Gross photograph of a representative tissue strip after fixation. The red and blue ink at the tips correspond to 12- and 6-o'clock hash marks in the patient, respectively, whereas the central blue ink represents the marked outer edge designated for en face embedding in paraffin.

specimen within the patient such that the dermatopathologist can direct re-excision of only those quadrants containing positive peripheral margins. The central portion of the lesion is also excised at the time of the first layer and sent for standard serial sectioning to assess for the presence of invasive disease (Figure 1B).

Before placing the marginal tissue strips in formalin, the following steps are undertaken. First, a piece of lens paper is folded around each tissue strip. Subsequently, the lens paper-containing tissue is sandwiched between 2 glass slides. Rubber bands are then wrapped around the glass slides so that they are pressed up gently against the tissue (Figure 2). Alternatively, tape may be used to gently secure the glass slides, which may reduce the chances of folding or rolling under the epidermis that can occur if rubber bands are placed too tightly. The entire apparatus is then placed in a labeled bottle of formalin. This process is repeated for each individual tissue strip and ensures that the tissue lays flat during the fixation period. With this technique, the authors have found that subsequent en face paraffin-embedded sections are of higher quality and allow for more complete visualization of the specimen's true outer margin (Figures 3 and 4).

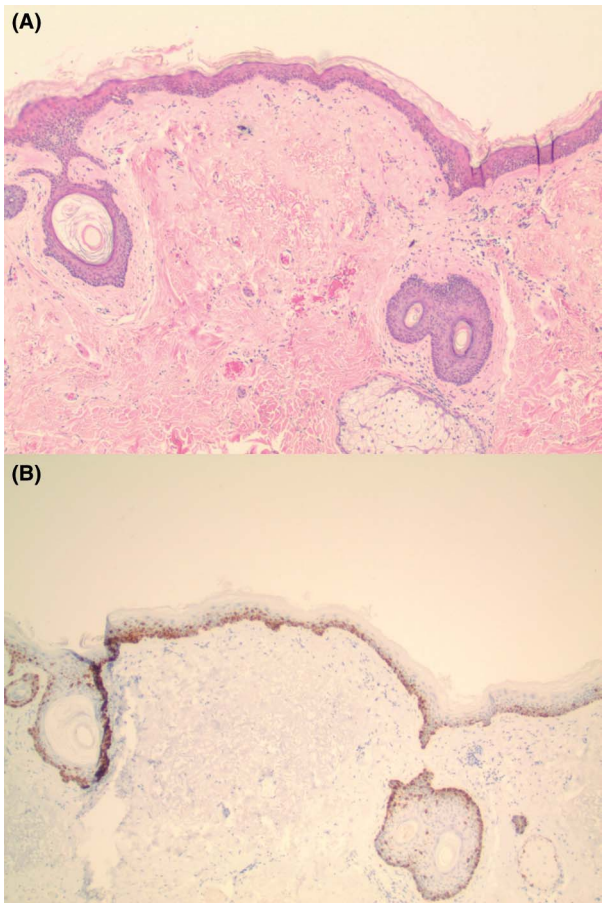

Figure 4. Resultant high-quality en face microscopic section, which represents the true outer margin of an excised tissue strip: hematoxylin and eosin (A) and Melan-A (B) stains.

Discussion

Staged marginal excision with mapping and subsequent rush permanent sectioning is considered by many to be the optimal approach for managing LM and LM melanoma. This clever surgical method relies on a complete and accurate peripheral margin assessment for a successful outcome. Thin tissue strips are prone to warp during formalin fixation, which can make it difficult to obtain a section containing the complete true outer margin in all cases. To overcome this unpredictability, the authors propose the glass slide technique outlined above, which in their experience reliably produces high-quality results.

Because this would be a novel technique for the pathologist, it is important to have a discussion with the pathology team about this method. This collaboration should yield outstanding results as displayed in Figures 3 and 4, allowing for consistent assessment of 100% of the margin. Care must be taken by the surgeon in excising a wide enough tissue strip to ensure that the en face section can be readily obtained. Additionally, if the slides are compressed too tightly, there can be separation or folding of the epidermis making correct embedding a challenge.

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Dermatologic Surgical Implications of Nickel Allergy

Metal allergies by and large are accountable for the greatest number of allergic contact dermatitis cases confirmed by patch testing, with nickel being the most common. Of note, the incidence of nickel allergy in the Western population is reported to be as high as 20% and more commonly seen in women than in men.[1] The implications of these allergies may have a significant impact on both wound healing and surgical outcome. A surgeon should be aware of these potential allergic reactions in a patient with known allergy, before the use of instruments and devices, such as surgical clips, needles, and cautery tips, as all have been reported in association with nickel contact allergy (Table 1).

Of interest, susceptibility to corrosion became a serious limitation on the field of surgical instrumentation in the late 1800s, worsened more so by the advent of steam sterilization. After the centennial, a significant improvement in rust prevention was associated with the nickel-plating of most steel instruments, which was later replaced by chromium plating in the early 1920s, and the eventual conversion to alloy steels (e.g., surgical-grade stainless steel), most of which contain nickel, but differ in their nickel-releasing capacities.[5] Currently, high-grade stainless steel is used in the majority of modern surgical material because alloys with higher sulfur content are more susceptible to corrosion and oxidization, exposing metals such as chromium and nickel, which are found in deeper layers of the metal.[4]

Notably, one of the most widely recognized surgical-associated allergic reactions has been those due to the use of surgical skin clips containing nickel.[1] Quite notably, allergic dermatitis has also been reported to occur after exposure to nickel containing acupuncture and infusion needles, such as those used in insulin infusion pumps.[3] In these aforementioned cases, the cases were directly linked to a source. Of note, in some cases, the reactions ceased only on removal of the source exposure (e.g., clip or wire), and yet the culprit source proved to have less than 10 ppm of nickel release, below the lower limit for the detection of nickel by the dimethylglyoxime test.[4] In certain instances, the reactions were first presumed to be a wound infection and later recognized as allergic.

Along these same lines, Sofen and colleagues[2] recently reported nickel dermatitis from a disposable electrocautery tip, in which the patient developed a pruritic erythematous rash 2 days postoperatively. Patch testing confirmed allergy to bacitracin, which had not been used by the patient, and nickel. The authors investigated for a surgical-associated nickel source and found that the hyfrecator tip reacted with