Geometric Staged Excision for the Treatment of Lentigo Maligna and Lentigo Maligna Melanoma

A Long-term Experience With Literature Review

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Objective: To ascertain and clarify the effectiveness and advantages of the geometric staged excision technique for the removal of lentigo maligna (LM) and lentigo maligna melanoma (LMM).

Design: This was a retrospective review of a patient database composed of 293 cases of LM and LMM.

Setting: The Laser and Dermatologic Surgery Center in St Louis, Missouri, an academic-affiliated, private dermatologic surgery center.

Patients: All patients with a diagnosis of LM and LMM treated by staged excision from 1999 to 2007.

Main Outcome Measures: The overall rate of recrudescence, margins required for clearance, stages required for clearance, and lesional characteristics were examined.

Results: The rate of recrudescence after geometric staged excision was 1.7% (4/239), with a mean of 32.3 months of follow-up. The mean margin to clearance after excision was 6.6 mm for LM and 8.2 mm for LMM. A total of 11.7% of LMM was initially diagnosed as LM on biopsy, with the invasive component discovered during the excision.

Conclusions: Geometric staged excision is an optimal method of removal of LM and LMM given its low rate of recrudescence and ability for complete examination of the peripheral and deep margins of the specimens.

Lentigo Maligna (LM) is a form of melanoma in situ (MIS) that occurs on sun-damaged skin. As with any pattern of MIS, LM may eventually involve the dermis, at which point it is a lentigo maligna melanoma (LMM) and confers the same prognosis of other patterns of melanoma for any given depth of dermal infiltration.1-3 Lentigo maligna is particularly important to the dermatologic surgeon because it is identified most commonly on areas where tissue-sparing excisions are desired for optimal cosmetic outcomes.4 Complete excision with negative histologic margins is the standard of care in the treatment of these lesions because of the risk of dermal infiltration and persistence (true local recurrence).5-7

Since the National Institutes of Health consensus statements for diagnosis and treatment of “early” melanoma in 1992, 5-mm margins have been the “standard” in the excision of MIS (including LM). Multiple studies8,10,13-16 have demonstrated that this margin may not be adequate for complete removal, with persistence and regrowth rates of LM and LMM reported as high as 9% to 20% with local excision. In addition, standard surgical excision of LM with 5-mm margins assumes that lesions diagnosed initially by biopsy as MIS are indeed only in situ, which is often not the case. In a comprehensive review, Dawn et al17 found that nearly 25% of lesions diagnosed initially as MIS had a dermal melanoma component discovered at reexcision.

Given the aforementioned rates of persistence, alternative surgical techniques to simple excision are used often in the treatment of these lesions. Conventional Mohs surgery, with its associated tissue sparing and margin evaluation, is one such treatment. This practice is, however, not without controversy because frozen-section processing often alters the morphologic characteristics of keratinocytes, producing halos that mimic melanocytes, and makes the discrimination of either cell somewhat difficult. Even with the use of rapid immunostaining, these artifacts of freezing may possibly lead to the obscuring of the true margins of the lesion.2 Published rates of recrudescence with Mohs...
micrographic surgery for LM and LMM range from 0% to 4% in studies involving only Mohs surgery to 33% in a relatively small study that compared Mohs surgery with staged excision.18-21 Staged excision of melanoma is another alternative excision method that promises not only to retain tissue sparing but also to allow for paraffin-embedded tissue processing, thus avoiding any keratinocyte freeze artifact.22-28 In addition, marginal evaluation is performed by a trained dermatopathologist, something that we consider to be extremely important for delineating lesional margins because melanocytic hyperplasia may be difficult to differentiate from melanocytic neoplasia (ie, MIS) even for a trained, experienced dermatologist. Staged excision, to date, has demonstrated low rates of persistence of 0% to 7% among all published data.21,24-36 These rates are at least comparable, if not superior, to rates of persistence with Mohs surgery. A recent, albeit small, study21 found staged excision (7% persistence) to be superior to Mohs surgery (33% persistence) when the 2 methods were compared directly.

**METHODS**

A database was compiled from a retrospective medical record review of all patients with a diagnosis of LM and LMM treated by staged excision from January 1, 1999, through December 31, 2007, at the Laser and Dermatologic Surgery Center in St Louis, Missouri. There were 293 cases that met these criteria and from which the following data points were obtained: age at diagnosis, sex, tumor location, tumor size preoperatively and postoperatively, tumor depth, ulceration, excision margin(s), number of stages, workup, and long-term follow-up information. Follow-up was obtained by record review of both patient office visits and telephone calls, with the reported length of follow-up consisting of the time from initial excision to the last recorded office visit or telephone call if the patient had moved to a different location or sought treatment from a different health care professional. Recrudescence was determined by clinical examination. Institutional review board–approval for these data and the review were submitted and granted from the Drexel University College of Medicine (protocol 19448). All data obtained and analyzed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 1983.

All melanomas were identified initially by shave, punch, or incisional biopsy with subsequent histologic analysis. On presentation to the surgery center (Figure 1), a Wood lamp was used to demarcate the clinically apparent margins of the lesions (Figure 2), and a geometric shape with at least 3 sides and encompassing a 3- to 5-mm (5-mm where possible) margin was then drawn around the lesion (Figure 3). The exact margin used was measured and recorded in the record. The area was anesthetized under local anesthesia, and the site was prepared and draped. Vertical incisions at 90° to these margins were created to the level of the middle to deep subcutaneous fat layers (Figure 4). The shape was then excised at this level. The...

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**Figure 1.** Preoperative clinical appearance of lentigo maligna.

**Figure 2.** Preoperative lentigo maligna lesonal outline after using a Wood lamp.

**Figure 3.** Preoperative geometric-shaped excisional outline.
central portion (debulk specimen) and the margin specimens were oriented and inked on site in the laboratory (Figure 5). A map of the lesion was added to the medical record. The specimen was submitted for rush permanent section processing within 24 to 48 hours. After hemostasis was obtained with cautery, a dressing consisting of antibiotic ointment and nonstick gauze was applied to the open wound. The patient was then sent home until the specimen had been examined by a dermatopathologist, after which the patient returned to the office for additional excised stages with 3- to 5-mm margins if residual melanoma was present or for defect repair if the margins were clear. Repairs were done either in house or by oculoplastic surgeons or plastic surgeons if necessary.

A dermatopathologist inspected the specimen on its arrival in the laboratory and compared the surgeon’s diagram to the specimens received. The surgeon already applied ink to the specimens so that they corresponded to the drawing received. In most cases, there were 4 specimens, which comprised the periphery, but the range was 3 to 6 specimens for the periphery depending on the size of the excision. The center field (debulk specimen) was also examined using an “on edge” technique to determine the depth of a dermal component of melanoma, if any.

Each of the separate specimens that constituted the peripheral margins was examined and measured, and a small application of ink was applied to the epidermis at the most clock-wise tip. For example, if all the specimens were laid out as per the diagram, the clockwise tip of each specimen always leads so that the epidermal surface of a 12- to 3-o’clock specimen was inked at 3 o’clock, the 3- to 6-o’clock specimen was inked at 6 o’clock, and so on for each separate peripheral margin specimen (Figure 6). Each of these specimens was then placed in a separately labeled cassette for paraffin processing. The center section was inked in the deeper aspect and divided as was practical for evaluation in the vertical (ie, on edge) traditional manner to evaluate and measure a dermal component of the melanoma if one was identified. These specimens were placed into cassettes for processing to paraffin.

The following day, the specimens, now fully paraffinized, were reexamined by the dermatopathologist. The specimens were oriented so that the true margin was en face, and the inked epidermis was scored with a sharp blade superficially at the point on the epidermis where epidermal ink was applied so that the score mark could be identified under the microscope. These specimens were then embedded en face in the paraffin boat so that the entire true margin could be sectioned by the histotechnologist. The center sections were embedded on edge so that any residual melanoma could be measured. If indicated, immunostaining with Melan-A (clone A103) was performed, a practice that evolved into staining every case, as determined by the dermatopathologist, due to its utility in differentiating subtleties in melanocyte density at the specimen margins. If histopathologic features of MIS extended to an inked margin, the margin was reported as involved.

RESULTS

A total of 293 lesions (225 LM lesions and 68 LMM lesions) were treated by staged excision between 1999 and
Of the 293 staged excisions, follow-up was performed for 239 (81.6%). Sixty patients were lost to follow-up, including 15 who died from unrelated causes. The total follow-up ranged from 2 to 96 months, with a mean of 32.3 months and a median of 30 months. Of the 239 patients with follow-up data, 235 (98.3%) had no clinical recrudescence. Four patients (1.7%) had recrudescence, all of which arose from LM on the cheek (Table 3). The mean time to recrudescence was 15 months (range, 5-27 months), with 3 of the 4 treated with reexcision and 1 with parotidectomy, radiation therapy, and neck dissection. There were no recrudescence-associated deaths.

For comparison, a literature review using the PubMed and Ovid databases and the keywords "staged excision" with "lentigo maligna" and "melanoma in situ" revealed 14 studies of staged excision of LM with 984 tumors treated. To date, to our knowledge, this is the largest single reported case series of staged excision of LM and LMM (Table 4).

As in other retrospective studies of staged excision of MIS, this large study, with 293 lesions and a mean of 32.3 months of follow-up, reaffirms the often-cited inadequacy of the "standard" 5-mm margins for MIS. In this series of cases, a mean margin of 6.6 mm was required to achieve complete clearance of lesions of LM. Most strikingly, the data highlight a significant number of neoplasms that would have already extended beyond the planned margins if treated with traditional 5-mm margins (26.2%). This fact alone underscores the importance of integrating complete marginal evaluation in the treatment of these lesions. Geometric staged excision is designed for and allows for exactly that.

An additional strength of geometric staged excision lies in the ability to also evaluate the deep margin of a lesion before final closure. As reported in both this and prior studies, a significant percentage of lesions require upgrading from initial biopsy results on final histologic evaluation after excision. In this study, 11.7% of lesions found to involve the dermis on final histologic evaluation after excision. Four patients (1.7%) had recrudescence, all of which arose from LM on the cheek (Table 3). The mean time to recrudescence was 15 months (range, 5-27 months), with 3 of the 4 treated with reexcision and 1 with parotidectomy, radiation therapy, and neck dissection. There were no recrudescence-associated deaths.

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