

## OPEN

## Mohs Melanoma Chemosurgery Simplified to a Single Brief Caustic Application: Possible Vaccine Effect

Mohs melanoma chemosurgery using 50% zinc chloride has not been widely accepted despite a 30-year consecutive series indicating 53% survival improvement ( $p = .003$ ) for advanced melanomas over conventional surgery.<sup>1</sup> In chemosurgery, melanomas are fixed and removed in layers with 24-hour zinc chloride paste applications before each excision. An extra application is made to the tumor-free plane to encompass possible satellites.

However, in a study of 64 5-year determinate cases of thin melanomas ( $<0.85$  mm), the procedure was simplified to remove melanomas with fresh-tissue excision, and then, the extra application was made with zinc chloride paste for 24 hours to the fresh-tissue excision wounds after surgery. Survival was improved 60% (hazard ratio 0.37) for zinc chloride over fresh-tissue excision alone.<sup>2</sup>

Because zinc chloride is a caustic agent, it immediately and deeply kills living tissue when applied to an open fresh-tissue excision wound. An equally effective much simpler extra application is to briefly manually apply zinc chloride to the fresh melanoma excision wound similar to astringent application on a surgical site. Occult melanoma cells, which molecular staging studies suggest may be prevalent, despite histologically clear and immunohistochemically negative margins,<sup>3</sup> may be fixed and killed, and vaccine-like anti-melanoma immunity may be stimulated.<sup>1</sup>

Zinc chloride is recognized by the FDA as a generally safe substance when used in accordance with good manufacturing practice. (Code of Federal Regulations Title 21 [Part 182]). Zinc chloride is available as zinc chloride granular USP from Spectrum Chemical Supply. A saturated solution is prepared by dissolving 4 parts of zinc chloride to 1 part of distilled water by weight. A compounding pharmacist can make a 50% paste by mixing zinc chloride saturated solution with *Sanguinaria canadensis* (available in powder form from herbal supply companies) or a 50% solution by diluting a saturated solution with distilled water. The original Mohs paste formula is Zinc chloride, satu-

rated solution 34.5 mL, *Sanguinaria canadensis* 10.0 g, and Stibnite 40.0 g. However, the stibnite, which is an inert substance, is no longer available in USP grade.

### Technique

Small amounts of 50% zinc chloride (drops of solution or pea-sized amounts of paste) are applied to the excisional wound of a melanoma after fresh-tissue surgery and held in place manually with sterile gauze with mild-to-moderate pressure for several seconds but may be somewhat longer for larger blood vessels until bleeding has stopped or decreased. Residual paste is washed off with hydrogen peroxide. Persistent bleeding vessels can be sutured with absorbable suture. A pressure dressing can be applied. The application may be facilitated by applying a pressure dressing and using mild



**Figure 1.** Melanoma wound in an 87-year-old woman, 2.5 mm thick, Clark level IV. A conservative saucerized fresh-tissue Mohs excision revealed clear margins using permanent sections. A thin layer (1-mm thick) of zinc chloride paste was briefly applied to the open excision wound under local anesthesia.



**Figure 2.** Melanoma healed wound. No recurrence in over 5 years. The patient, at her advanced age, wanted to avoid lymph node surgery. There was no palpable lymphadenopathy, and an ultrasound and whole-body positron emission tomography-computed tomography were negative.

astrigent on the wound to reduce blood flow before the 50% zinc chloride treatment. If permanent histology is used, application can be delayed until clear margin pathology results become available (Figures 1 and 2).

The width and depth of penetration depend on the amount applied. The eye is avoided, and caution is used over major arteries and nerves, such as the facial nerve, and over cosmetically sensitive locations such as the nose and ear that contain cartilage sensitive to the action of zinc chloride. Because small amounts immediately and deeply penetrate when applied to living tissue, zinc chloride should not be used unless the diagnosis of melanoma has been previously histologically confirmed.

## Conclusion

The data in the 2 referenced studies indicate significant melanoma survival improvement with zinc chloride: (1) Mohs 30-year consecutive chemosurgery series of advanced melanomas with 20% pre-existing lymph node metastases versus the contemporary Clark series at Massachusetts General Hospital of nonmetastatic primary melanomas stratified by level of invasion (53% improved survival;  $p = .003$ ) and (2) the thin melanomas with 88.9% 5-year survival with fresh-tissue excision only versus 95.7% survival with zinc chloride. A sample size of 240 per group is needed for definitive statistical determination in the thin melanomas,<sup>4</sup> but the 60% survival improvement in the zinc chloride treated patients and the large statistical sur-

vival advantage for the advanced melanomas (53% improved survival;  $p = .003$ ) despite 20% of cases with metastases compared to primary melanomas is in accordance with the proposed zinc chloride vaccine-like treatment effect.

However, cutaneous melanoma is a disease with potential for serious and significant morbidity and mortality. There is also medical-legal risk for the treating surgeon especially without proper informed consent and careful follow-up. Zinc chloride can result in scarring and should not be used unless melanoma has been previously histologically confirmed.

The patient illustrated, who wanted to avoid lymph node surgery, was informed of the potential for delay in lymph node metastases. In the final Multicenter Selective Lymph Node Trial (MSLT)<sup>5</sup> 17.4% of the observation patients with intermediate-thickness melanomas developed lymph node metastases at a median of 19.2 months after surgery; delayed node metastases also developed in the reported 20% of sentinel node biopsy patients who had false-negative biopsies. The patient was advised of the importance of careful observation over time, including monthly self-lymph node palpation, and was referred to a medical oncologist. The patient was also informed of the MSLT overall 10-year equal survival for delayed surgery of clinical nodes (nodal observation) versus sentinel node biopsy and immediate lymphadenectomy.

For the uninitiated, treatment with zinc chloride may be limited to thin melanomas with little risk of metastases and selected melanoma in situ. The technique of simplified zinc chloride application and possible vaccine effect are worthy of further study.

## References

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## Superficial CD34-Positive Fibroblastic Tumor Successfully Treated With Mohs Micrographic Surgery

Superficial CD34-positive fibroblastic tumor (SCPFT) is a rare mesenchymal tumor of borderline malignancy, recently described in the literature by Carter and colleagues<sup>1</sup> in 2014. Superficial CD34-positive fibroblastic tumor generally affects superficial soft tissues of the lower extremities, and its unique histopathological features consist of strong, diffuse CD34 immunoreactivity,

striking nuclear pleomorphism, and a low mitotic rate. Here, we present the first case of SCPFT that was successfully treated by Mohs micrographic surgery (MMS).

A 75-year-old woman with no significant medical history presented with a 2.0-cm firm erythematous asymptomatic nodule on the left posterior thigh which



**Figure 1.** (A) Gross photo of the lesion. (B) Photo of the defect. (C) Follow-up photo 12 months after the repair.