Mohs Micrographic Surgery for Penoscrotal Malignancy

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KEYWORDS

• Male genitalia • Penis • Scrotum • Mohs
• Carcinoma • Extramammary Paget disease

The inability to adequately assess margins of tumor excision specimens hampers the surgeon's ability to obtain cure. False-negative histologic findings can result in leaving tumor behind and highlights the importance of careful and complete microscopic visualization of excision margins. Vertical sections through the center of an excision specimen (eg, bread loafing) are adequate for diagnostic purposes but often fall short of providing sufficient visualization of the margins of the excision specimen. It has been calculated that 0.1% or less of the margins is assessed using this approach (Ronald P. Rapini, MD, 2009, personal communication).[1,2] Other methods of evaluating the surgical margins have been developed, but when applying the concept of surgical margin control to lesions of the skin and mucous membranes, perhaps the most effective is the Mohs surgery technique.[1–5] Most commonly used for removal of skin cancers of the head and neck region, Mohs surgery also can be used in the eradication of skin cancers of the external genitalia. This article highlights the documented uses of Mohs surgery for treating malignancies of the genitalia and perigenital regions.

MOHS MICROGRAPHIC SURGERY

While using zinc chloride paste as a medical student involved in research at the University of Wisconsin in the 1930s, Frederic E. Mohs developed the technique that now bears his name. Mohs applied the paste directly to the surface of skin cancers and left it in place for 24 hours. While on the patient's lesion, the paste acted as a fixative that preserved the histologic features of the cells and tissue architecture. When fixation was complete, he would dissect the fixed tissue sample off the patient and, using a microtome, slice thin sections from the undersurface of the fixed specimen. If tumor was found in these sections, then the process was repeated with application of more paste for another 24-hour fixation period. These horizontal sections cut from the undersurface of the fixed tissue and examination microscopically by the surgeon became the distinguishing features of the Mohs technique. They are the hallmark features of what is now referred to as Mohs micrographic surgery (MMS).

The original zinc chloride paste used by Mohs included 40 g of black granular antimony (stibnite), 10 g of Sanguinaria canadensis (blood root), and 34.5 mL of saturated zinc chloride solution. When compounded, it had a tarlike consistency and color (**Fig. 1**). Tissue debulking with curettage or a saturated solution of dichloroacetic acid often was performed before applying the zinc chloride paste to aid paste penetration into the skin. The paste caused an intense localized inflammatory reaction where it was applied; therefore "chemosurgery,"

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Fig. 1. Zinc chloride (Mohs) paste for chemosurgery.

as it was called, had significant morbidity associated with it. Drawbacks included severe discomfort for the patient and the fact that it often took several days to clear the tumor. In addition, patients had to wait several more days once the tumor margins were clear to allow the wound to mature before a repair of the defect could be considered.

In 1953, Mohs experimented with the use of fresh-frozen specimens to speed up the process for an educational film he was making on the removal of skin cancers of the eyelids.[3] He noted that microscopic detail was preserved with this approach, and he continued to use this thereafter for removal of tumors in the periorbital area. In 1969, he reported on a series of tumors of the eyelid removed in this manner and noted a 5-year cure rate of 100%.[3] In 1974 and later in 1976, Stegman and Tromovitch published a series of skin cancer removals from head and neck sites in which they used the fresh-frozen method to process tissue margins.[3–5] The speed at which tissue could be processed allowed the surgeon to perform multiple stages in a matter of hours instead of days, and resultant defects could be repaired immediately following tumor clearance. Consequently, today it is rare to see the chemosurgery approach used by Mohs surgeons.

MMS is most successful when tumors grow in a contiguous fashion. For most mucocutaneous malignancies treated with MMS, visible and palpable tumor is debulked using a curette or scalpel. Then a 2 to 3 mm margin of tissue is excised from around and underneath the debulk defect. The excision most commonly is performed by beveling the incisions toward the center of the debulk defect during removal (**Fig. 2**). These beveled incisions follow the contour of the debulk defect and usually approach 45°. Margin removal can be accomplished in a more completely horizontal fashion when removing from convex sites. Incisions that parallel the contour of the debulk defect usually result in a bowl- or pancake-shaped excision specimen that can facilitate manipulation of the entire surgical margin into a flat plane for laboratory processing. On occasion, a beveled incision is not possible when harvesting an MMS surgical margin. In these situations, one must provide relaxation cuts on the debulked side of the specimen to facilitate the flattening of the specimen.

Orientation of the excised margin specimen relative to where it was removed is maintained by marking the margin specimen edge at two or more spots. These marked spots correspond to marks on the patient at the edge of the defect resulting from removal of the margin specimen. Also referred to as hash marks, these marks routinely are made at the 12, 3, 6 and 9 o'clock positions on both the margin specimen and the patient's defect. The marks on the margin of the specimen are made as short shallow nicks using the scalpel. The patient is marked either with corresponding surgical nicks or an ink mark. The ink used on the margin specimen is applied in a unique fashion that is recorded on a map showing the margin specimen and its relation to the location

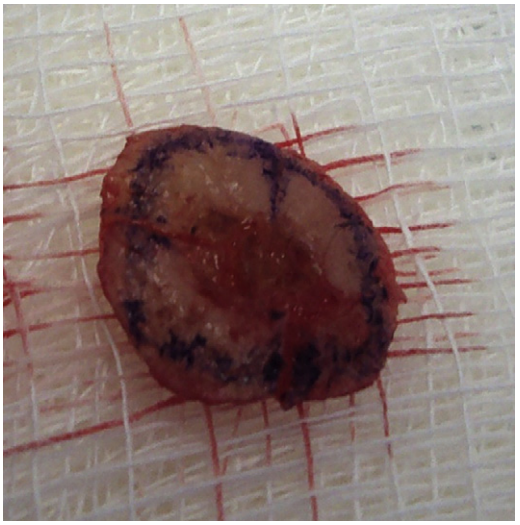

Fig. 2. Tissue excised in beveled fashion.