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Mohs micrographic surgery

By Benjamin Cooper, DO, Taha Rasul, MD, and Arianne E. Chavez, MD, FAAD, FACMS

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What is Mohs micrographic surgery and what are its advantages?

- Mohs micrographic surgery (MMS) is a precise in-office surgical technique used to treat skin cancer by removing the tumor layer by layer, examining each layer under a microscope.
- It offers the highest cure rate for most skin cancers by ensuring complete margin control while preserving as much healthy tissue as possible.

Advantage	Explanation
100% margin evaluation	- The entire peripheral and deep margin is examined via horizontal frozen sections - Contrast this with standard excision, which evaluates <1% of the margin due to "bread-loafing" technique
Higher cure rates	- Because of complete margin control, cure rates for BCC/SCC are 97%–99% for primary lesions (vs. 90-95% for conventional excision)
Tissue-sparing	- Allows for minimal margins (1–2 mm) while ensuring complete tumor clearance - Particularly beneficial on cosmetically sensitive areas (e.g., face, ears, eyelids, genitals)
Cost-effectiveness	- Mohs can be more effective long-term: → Fewer recurrences = fewer re-treatments → Often avoids need for general anesthesia or hospital setting
Single-day treatment	- Surgery and pathology are done in one session, reducing delays and uncertainty
Optimal functional & cosmetic outcome	- Smaller defects enable precise repairs with better cosmetic and functional results
Ideal for high-risk tumors	- Superior for many tumors with aggressive histology, ill-defined borders, recurrent tumors, and tumors in critical areas

What are the appropriate use criteria for MMS?

Category	Criteria considered appropriate for Mohs
Tumor type	- BCC and SCC (especially with high-risk features) - Lentigo maligna/melanoma in situ (MMIS) - Rare/aggressive tumors (see list below)
Anatomic location	- Area H: "Mask areas" of face (central face, eyelids, eyebrows, nose, lips, chin), ears, genitalia, hands, feet, nipples/areola → especially if >0.6 cm - Area M: Cheeks, forehead, scalp, neck, pretibial leg → especially if >1 cm - Area L: Trunk and extremities (excluding pretibial, hands/feet) → generally only if >2 cm or has other high-risk features
Histologic risk factors	- BCC: morpheaform, infiltrative, micronodular, metatypical/basosquamous - SCC: poorly differentiated, depth >2 mm or Clark level > IV; sclerosing, small cell, spindle cell, infiltrating, clear cell, lymphoepithelial, sarcomatoid

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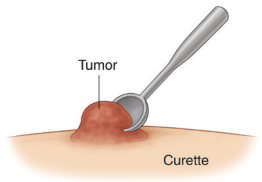
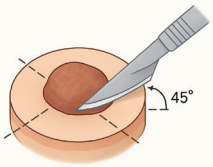
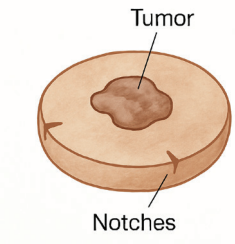
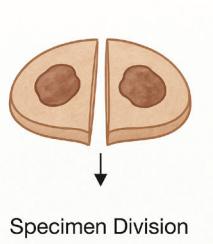
Category	Criteria considered appropriate for Mohs
Clinical risk factors	- Recurrent tumors - Perineural or perivascular invasion - Tumors in prior radiation sites or scars - Immunosuppression: Chronic lymphocytic leukemia, transplant recipients, HIV, hematologic malignancy, or immunosuppressive meds - Genetic syndromes: Gorlin syndrome, xeroderma pigmentosum (XP), etc.
Lentigo maligna/MMIS	- Lesions in Area H or M, or recurrent disease
Other tumors often considered appropriate for Mohs	- Adenoid cystic carcinoma - Adnexal carcinoma - Apocrine/eccrine carcinoma - Atypical fibroxanthoma (AFX), pleomorphic dermal sarcoma (PDS), undifferentiated pleomorphic sarcoma (UPS) - Dermatofibrosarcoma protuberans (DFSP) - Extramammary Paget disease (EMPD) - Leiomyosarcoma (LMS) - Merkel cell carcinoma (not typically treated with Mohs) - Microcystic adnexal carcinoma - Mucinous carcinoma - Sebaceous carcinoma

What are the essential steps of MMS?

Step	Description	Step	Description
1. Tumor debulking 	The clinically visible tumor or biopsy site is debulked using a curette or scalpel to remove most of the tumor tissue.	**2. Beveled excision**  **Beveled Excision** The tumor is excised at a 45° angle with orientation marks.	The tumor is excised with a scalpel held at a 45° bevel, ensuring that a small (1-2 mm) margin of normal-appearing skin is included.
3. Orientation marks 	Hash marks or notches are placed on the excised specimen and surrounding skin to aid with orientation.	**4. Specimen division (optional)** 	The excised specimen may be divided into two or more pieces or central relaxing incisions may be made to help flatten the tissue for processing.

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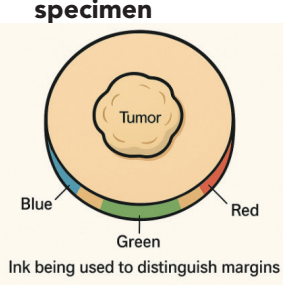
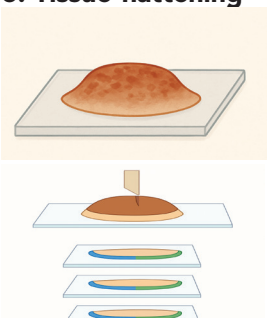
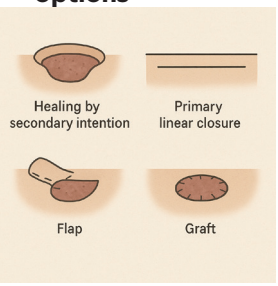
Step	Description	Step	Description
5. Inking the specimen  Ink being used to distinguish margins	The excised specimen is inked with two or more colors to clearly distinguish different margins.	**6. Tissue flattening** 	The specimen is flattened to ensure the epidermis lies in the same plane as the deep tissue, allowing for horizontal sectioning during microscopic evaluation.
7. Slide preparation 	The specimen is processed (typically stained with H&E), enabling simultaneous evaluation of both superficial and deep margins.	**8. Tumor evaluation** 	The slides are examined by the surgeon for residual tumor. If tumor remains, the site is marked on the Mohs map, and the excision process is repeated until no tumor remains.
9. Reconstructive options 	Once the tumor is cleared, the surgeon discusses reconstructive options, which may include closure via secondary intention healing, primary linear closure, flap, or graft.		

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