Mohs Micrographic Surgery: Development, Technique, and Applications in Cutaneous Malignancies

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Abstract

Keywords

- Mohs micrographic surgery
- Mohs surgery
- cutaneous malignancies
- skin cancer

Mohs micrographic surgery (MMS) is a specialized technique for treating skin malignancies that offers the highest cure rate by allowing histological evaluation of the entire peripheral and deep margins. MMS also maximally preserves as much uninvolved, normal adjacent tissue as possible, allowing for the best cosmetic and functional outcomes. When used for appropriate indications, this technique is also more cost-effective than other treatment modalities. In this article, the authors will discuss the development of MMS, the steps involved in this procedure, and the indications for this technique. They will also review the use of MMS for basal cell carcinoma, squamous cell carcinoma, melanoma in situ, and some less common skin malignancies.

Mohs micrographic surgery (MMS), or Mohs surgery, is a technique used to treat skin malignancies that offers the highest cure rates, maximally spares normal skin, and allows for the best cosmetic and functional results.¹ This technique consists of sequential steps that are performed on the same day in an outpatient setting. In MMS, the Mohs surgeon also functions as the pathologist, thus resulting in better coordination and greater accuracy of clinicopathological correlation.² The high cure rates in MMS are achieved through accurate evaluation of 100% of the tissue margins. Thus, the Mohs surgeon's knowledge of dermatopathology and frozen section interpretation is essential to ensure the success of this technique.³

Mohs micrographic surgery, a tissue-sparing technique, also produces excellent cosmetic and functional results by allowing the surgeon to obtain adequate surgical margins to clear the cancer prior to reconstruction.^{4,5} Of note, the success of MMS relies on tumor contiguity.⁶ Noncontiguous or "skip" lesions might not be detected by MMS, thus resulting in higher recurrence rates.^{6,7} Noncontinuity of lesions may occur as a result of previous treatments that failed to completely eradicate the tumor.⁶ MMS can also be more cost effective than standard surgical excisions.⁸ A recently published review by Tolkachjov et al compared four studies investigating the cost of MMS versus other treatments for skin cancers.^{1,9–12} Findings

showed that MMS and office-based excisions have comparable costs, whereas facility-based excisions or radiotherapy cost more than MMS.¹ The indications for MMS are determined by various features of the skin cancer, the anatomical site involved, and certain patient factors (►Table 1).^{3,4,13,14}

In recent years, MMS has been increasingly used in the treatment of skin malignancies,¹⁵ which led the Centers for Medicare & Medicaid Services and insurance companies to impose greater restrictions on this procedure.^{1,15} Thus, an evidence-based criterion was developed jointly by the American Academy of Dermatology, American College of Mohs Surgery, American Society for Dermatologic Surgery Association, and the American Society for Mohs Surgery. The Mohs Appropriate Use Criteria (AUC) aims to prevent overuse of Mohs surgery, decrease healthcare cost, and achieve optimal clinical results for patients.¹⁴ A smartphone application describing AUC has also been developed to aid dermatologists and Mohs surgeons in their clinical practice.¹

History and Development

Mohs micrographic surgery was originally developed in the 1930s by a general surgeon, Dr. Frederic E. Mohs.¹⁶ While experimenting on skin cancer treatments as a research

Table 1 Indications for Mohs micrographic surgery^{3,4,13}

Tumor characteristics
Large size of lesion measuring >2 cm anywhere on the body Aggressive histological subtypes (morpheaform/fibrosing/sclerosing BCC, infiltrative BCC, micronodular BCC, sclerosing SCC, basosquamous, pagetoid, poorly differentiated SCC, spindle cell SCC, etc.) Perineural invasion Ill-defined margins Incompletely excised or recurrent lesions
Anatomical site
High-risk anatomical locations such as mask areas of the face (– Table 2) Areas in close proximity to embryonic fusion planes (periorbital, periauricular, perinasal, temporal) Need for tissue preservation to achieve functional outcomes (hands, feet, genitals) Skin cancers arising in scars, chronic wounds, or previously irradiated areas
Patient factors
Immunocompromised patients (patients on immunosuppressive drugs, organ transplant recipients, patients with hematological malignancies or human immunodeficiency virus) Genetic syndromes (basal cell nevus syndrome, xeroderma pigmentosum) Environmental exposures (arsenic)

Abbreviations: BCC, basal cell carcinoma; SCC, squamous cell carcinoma.

assistant at the University of Wisconsin, he discovered that injecting 20% zinc chloride solution to tumors caused tissue necrosis but preserved its microscopic architecture.^{17,18} He later formulated and patented a 20% zinc chloride paste that can be applied topically on human skin.¹⁹ He also developed the fixed-tissue technique wherein this paste was applied on the skin cancer in vivo for 24 hours prior to taking the first excision specimen (also referred to as stage or layer). The first layer was then taken the following day, and the specimen was processed using standard paraffin sections. If further stages were necessary, zinc chloride was again applied overnight before the subsequent stage was taken. Thus, it often took several days of surgery and multiple stages to achieve clear margins for large skin cancers.^{16,20}

In addition, Dr. Mohs introduced the technique of horizontal sectioning and color-coding of specimens, which allowed 100% margin examination while maintaining proper tissue orientation.^{19,21} In comparison, traditional vertical sectioning evaluates only approximately 0.01% of the entire tissue margins.^{17,18} The use of fixed-tissue technique and horizontal sectioning allowed Dr. Mohs to successfully treat many patients with skin cancers. However, 20% zinc chloride application to the skin is painful. It also causes local tissue inflammation, which prohibits immediate reconstructive surgery once clear margins are achieved and led Dr. Mohs

to explore the use of second-intention healing for his patients. He found that second-intention healing produced cosmetically acceptable results and sometimes even better outcomes than primary closure in concave areas.^{16,18}

In 1941, Dr. Mohs presented his findings in the Archives of Surgery and named this technique chemosurgery.²² This study included 440 patients whom he treated successfully using this technique for more than 4 years.²² As a general surgeon, most of his initial findings were published in surgery journals, but he failed to capture the attention of his fellow surgeons.¹⁶ However, this technique gained the interest of dermatologists during his presentation at the American Academy of Dermatology annual meeting in 1946.^{16,19} He also wrote an article in the Archives of Dermatology in 1947²³ and presented his findings to the dermatology section of the California Medical Association in 1948.²⁴

In 1953, while filming a surgery on an eyelid lesion, Dr. Mohs used the fresh-tissue technique because of limited time to complete the procedure. This modified approach significantly shortened the duration of surgery and caused less inflammation, and therefore he started using this technique for eyelid lesions and some lesions on other parts of the body,¹⁹ which he published in the book *Skin Surgery* in 1956.²⁵ He later presented the success of this technique in 70 patients during the American College of Chemosurgery meeting in 1969 and later published in the *Bulletin of the American College of Chemosurgery* in 1970.²⁶

It was not until the 1970s that the fresh-tissue technique began to be used widely after Dr. Tromovitch and Dr. Stegman presented their findings at the American College of Surgery meeting in 1970.^{13,18} They reported a series of 102 patients in the Archives of Dermatology in 1974 and named this technique microscopically controlled excision.²⁷ The advantages of this approach include less pain, shorter surgery duration to achieve clear margins, and less inflammation, which allowed immediate same-day reconstruction after cancer clearance.²⁷ This fresh-tissue technique is now known as MMS.³

Table 2 Risk of recurrence for various body sites^{14,37}

High risk (H)	Mask areas of face: central face, eyebrows, eyelids, periorbital area, nose, lips, chin, mandible, preauricular and postauricular areas, temple, ears Genitals, areola and nipples, hands, feet
Medium risk (M)	Scalp, forehead, cheek, neck, pretibial area
Low risk (L)	Trunk, extremities

Fig. 1 Taking the Mohs stage. (a) Lesion outlined with a marking pen. (b) Debulking the lesion using a curette. (c) Lightly scoring the excision specimen with a No. 15 blade. (d) Superficial nicks at the 3, 6, 9, and 12 o'clock positions for orientation purposes. (e) Lesion excised with a bevel. (f) Lesion placed on a blotting paper marked at the 12 o'clock position. (g) Hemostasis with electrocautery. (h) Specimen removed and resultant defect showing the markings for tissue orientation.

Although Mohs surgery has developed and advanced in the past few decades, the use of fresh-tissue technique, horizontal tissue sectioning, and total margin control before reconstruction remains the cornerstone of MMS.

Mohs Micrographic Surgery Technique

A signed informed consent is first obtained from the patient after thoroughly discussing the procedure, including its risks, benefits, and alternatives. The site is then identified and marked using a surgical marker (►Fig. 1a). The marked area is shown to the patient to confirm the correct location.^{1,3,4} Reviewing photographs and body maps sent by referring physicians to help identify the correct location is important because patients are often unaware or unsure of the previously biopsied site.²⁸ For referring physicians, it is recommended to mark the lesion and include two anatomical landmarks in the photographs to aid the surgeon in identifying the correct site.¹ Biopsy site selfies may also help patients and physicians identify the correct lesion site.²⁸

In compliance with the Joint Commission Universal Protocol, a “time-out” is performed to ensure the correct site, patient, and procedure.²⁹ The site is cleaned with antiseptic solution then infiltrated with local anesthesia. One percent lidocaine with 1:100,000 epinephrine is the most frequently used anesthesia. Buffering with sodium bicarbonate in a 1:10 ratio lessens the pain by increasing the pH of the anesthetic. Slow infiltration of the anesthetic also reduces the pain of injection.^{30,31} Prior to the procedure, the site is again cleaned

with antiseptic solution such as chlorhexidine or povidone-iodine. A debulk is performed on the clinically visible tumor either with a curette or a scalpel^{1,3,4} (►Fig. 1b). Curetting helps to delineate subclinical margins and potentially lessen the number of Mohs stages.^{4,32} A sharp debulk with a scalpel is preferred for larger or deeper lesions¹⁸ and for lesions that need to be sent for permanent section pathology. For melanoma, for example, the debulk specimen is sent for permanent sections for final staging purposes to evaluate for deeper invasion.³³ Tissue may also be sent to evaluate for lymphovascular or perineural invasion. Tumor debulking also aids in flattening the first Mohs layer for tissue processing to allow adequate visualization of the entire deep and peripheral tissue margins.

After debulking the clinically visible tumor, a disc-shaped excision specimen is removed with approximately 1- to 2-mm margins around and underneath the tumor. This removal step is referred to as “taking stages.” To obtain the “stage” or “layer,” the skin is scored lightly around the specimen using a scalpel (►Fig. 1c). Superficial nicks, also referred to as “hash marks,” extending from the specimen to the surrounding skin are then placed at the edges for orientation purposes, for example, at the 3, 6, 9, and 12 o'clock positions (►Fig. 1d). Additional nicks may need to be placed for larger lesions. When removing the specimen, the blade is positioned at a beveled angle (often 45 degrees) (►Fig. 1e), which allows for the tissue edges to be flattened on a single plane for the tissue processing. Once the edges are freed, the deeper tissue may be released with a scalpel or curved iris scissors. The specimen is placed with

Fig. 2 (a) Specimen inked with different colors at the 3, 6, 9, and 12 o'clock positions. (b) Corresponding map with symbols for each color is drawn.

proper orientation on a piece of blotting paper (►Fig. 1f), and then electrocautery is performed for hemostasis (►Fig. 1g). A pressure bandage is applied, and the patient waits for the specimen to be processed.^{1,3,4,13,18}

The excised specimen is subsequently inked with different colors within each of the nicks (►Fig. 2a). A map representing the specimen is drawn, and colors of the nicks are indicated using symbols (►Fig. 2b). Consistency in inking and mapping is recommended to increase accuracy and avoid errors. After inking, the specimen is flattened so that all deep and peripheral margins are within the same plane. Sometimes, relaxing cuts within the specimen facilitate this flattening, or for larger pieces, the specimen is cut and inked into multiple pieces. The tissue is then processed using frozen section by a histotechnician. After freezing and embedding, the specimen is sectioned horizontally and mounted on glass slides. The slides are then stained with hematoxylin and eosin dye or toluidine blue. Special stains may be used to help identify certain types of skin cancers.

After processing, the Mohs surgeon examines the slides under the microscope for residual skin cancer.^{1,3,4,18}

If the Mohs surgeon sees any cancer cells on the microscopic sections (►Fig. 3a), the corresponding area is usually colored with red ink on the Mohs map (►Fig. 3b) to mark out where residual tumor remains. The patient is reanesthetized with local anesthesia, the area is prepped, and the surgeon uses this Mohs map to guide the second "stage" or "layer." An approximately 1- to 2-mm margin of skin or subcutaneous tissue is again taken from the area where cancer cells were identified (►Fig. 3c). The nicks and map are used as reference to clearly delineate the area where cancer is present so that the additional excised specimen will only be taken from the area where remaining cancer cells were seen, preserving as much normal skin as possible. After taking the stage, the specimen is again inked and drawn on the map as previously described. Frozen section processing and staining are performed, and the Mohs surgeon again examines the second stage under the microscope. If skin cancer cells still remain, additional stages are taken until all the margins are clear of cancer cells. When clear margins are achieved, repair options are discussed with the patient.^{1,3,4,18}

A recent article by Lee et al used the "peanut butter cup" metaphor to illustrate the concept of MMS.³⁴ The intact peanut butter cup in its wrapper is compared with the initial specimen obtained during Mohs staging, whereas the wrapper is used to represent the peripheral and deep tissue margins that we evaluate under the microscope. The presence of chocolate or peanut butter signifies residual tumor, which necessitates taking an additional stage from the area where these are visualized. On the other hand, the absence of any chocolate or peanut butter indicates that the margins are clear of cancer.³⁴

For most cases treated with MMS, the repair or reconstruction is also performed under local anesthesia by the Mohs surgeon on the same day. Preservation of function and cosmesis are important considerations in choosing the repair method.⁴ Mohs surgeons are also trained in performing various types of repairs such as primary closures, various

Fig. 3 (a) Frozen section visualized under the microscope showing nodular basal cell carcinoma in the depth of the specimen. (b) Mapping of tumor location on the map. (c) Taking the second stage from the positive margin.

skin flaps, and skin grafts.^{1,3,4} A multidisciplinary approach involving other specialties such as plastic surgery, oculoplastics, otolaryngology, radiation oncology, and/or medical oncology may be applicable for patients with larger defects and deeper invasion.^{1,3,4}

Mohs Micrographic Surgery for Nonmelanoma Skin Cancers

Nonmelanoma skin cancer (NMSC) is the most common skin cancer in the United States, and its incidence continues to rise.^{35,36} NMSC is a term that encompasses basal cell carcinomas (BCCs), squamous cell carcinomas (SCCs), and other rare skin malignancies. Tumor factors such as anatomical site, size, and histological subtype, and patient characteristics such as immunosuppression are some important considerations in determining the appropriate treatment modality.¹⁴ Low-risk cancers treated with electrodesiccation and curettage and wide local excision (WLE) have resulted in good cure rates and satisfactory cosmetic appearance.^{37,38} However, high-risk lesions require detailed evaluation of the entire tissue margin to ensure cancer clearance.³⁸ MMS has shown to produce superior cure rates compared with other treatment modalities for high-risk lesions.^{37,38} These include skin cancers that are large (>6 mm in area H, >10 mm in area M, and >20 mm in area L; ▶ **Table 2**), recurrent, or exhibit aggressive histological features.^{14,37} The 5-year cure rates for primary BCC and SCC treated with MMS are 99% and 92 to 99%, respectively.¹ For recurrent BCC and SCC, the 5-year cure rates are 90 to 93% and 90%, respectively.¹

Basal Cell Carcinoma

Basal cell carcinomas are the most common types of skin malignancies, and incidence continues to increase annually.^{39,40} Generally, BCCs grow slowly and cause local tissue destruction, but metastasis is very rare.³⁸ For low-risk cases or patients who are not good surgical candidates, several treatment modalities such as topical chemotherapy agents, photodynamic therapy, electrodesiccation and curettage, or cryotherapy may be fair options.^{6,37,40} Radiotherapy and chemotherapy may be considered for patients with large unresectable lesions.^{37,38}

A meta-analysis conducted by Rowe et al reported a 5-year cure rate of 99% for MMS and 90 to 92% for standard treatments for primary BCC.⁴⁰ The same authors also reported that the 5-year cure rate is 94.4% with MMS and 80% with standard treatment for recurrent BCC.⁴¹ A retrospective study conducted by Smeets et al found a 3.2% recurrence rate for primary BCC and 6.7% for recurrent BCC. Risk factors for recurrence include aggressive histological subtype, more than four Mohs stages, large size, and recurrence. MMS is therefore indicated for lesions with higher risk of recurrence.³⁹

A randomized controlled trial performed by van Loo et al showed a 10-year recurrence of 4.4% for MMS and 12.2% for standard excision in primary BCC. The study also reported a 10-year recurrence rate of 3.9% for MMS and 13.5% for standard excision in recurrent BCC.⁴²

Squamous Cell Carcinoma

Cutaneous SCCs are less common than BCCs, but they have a greater potential for recurrence and nodal and organ metastasis.³⁸ Cure rates have been reported to be higher for MMS compared with WLE.¹

Mohs micrographic surgery is the treatment of choice for high-risk lesions on the lips, ears, nail unit, and penis, and those arising on scars or chronic wounds.^{37,38,43–46} It is also ideal for the preservation of functionally important structures.^{44,45} The incidence of SCC is particularly increased among immunosuppressed patients, and these cancers also tend to behave more aggressively.⁴⁷ For these patients, MMS offers superior margin control and thus less chance of recurrence, as well as sparing of uninvolved skin and thus better cosmetic and functional results.^{47–49}

Mohs Micrographic Surgery for Melanoma

Mohs micrographic surgery is recommended by the American Academy of Dermatology, American College of Mohs Surgery, American Society for Dermatologic Surgery Association, and American Society for Mohs Surgery as the treatment of choice for primary and locally recurrent melanoma in situ (MIS) and lentigo maligna on the head and neck, genitalia, acral sites, and the pretibial leg.¹⁴ No specific recommendations have been made for invasive melanoma.

Due to the difficulty in identifying melanocytes in frozen sections, several stains have been used to aid in microscopic visualization of melanomas and increase accuracy of histological interpretation. Some of these stains are S-100, HMB-45, Mel-5, MART-1 (also known as Melan-A), MITF, and SOX-10.^{50,51} Among these stains, studies have reported a low recurrence of in situ and invasive melanoma with MMS using MART-1 stain.⁵² Research has also shown that MART-1 stain is highly sensitive, reliable, and easy to interpret.^{33,52} However, processing of specimen using this stain is usually time-consuming, and efforts are being made to develop protocols with shorter processing times.^{53–55} Another challenge faced by Mohs surgeons in interpreting histological sections is distinguishing melanoma from background photodamage.⁵⁶

Studies have revealed that current guidelines on excision margins for melanoma are inadequate, and wider margins are necessary to ensure complete cancer clearance.^{57,58} A study by Stigall et al found that 6-mm margins were required to clear 83% of MIS, whereas 9-mm margins were required to clear 97% of MIS.⁵⁷ Another study by Felton et al found that 15-mm margins were necessary to clear 97% of lesions.⁵⁸ A study by Zitelli et al including 535 patients who underwent MMS for melanoma resulted in similar or better 5-year survival rates and less metastatic rates compared with historical controls who underwent WLE.⁵⁹ The 5-year cure rates reported are approximately 98% for MIS and 98.7% for invasive melanoma.¹

Mohs Micrographic Surgery for Rare Skin Malignancies

Mohs micrographic surgery has also been used for a variety of other skin malignancies, such as atypical fibroxanthoma (AFX), dermatofibrosarcoma protuberans (DFSP), Merkel cell

carcinoma, microcystic adnexal carcinoma (MAC), sebaceous carcinoma, eccrine porocarcinoma, leiomyosarcoma, extramammary Paget's disease, and aggressive digital papillary adenocarcinoma.^{60–69} Most of these rare malignancies behave aggressively and may have subclinical extensions that cannot be predicted clinically. MMS is therefore indicated to achieve 100% margin control in these cases.¹ A case report on the use of MMS for the treatment of phaeohyphomycosis of the hand has also been published.⁷⁰

Atypical Fibroxanthoma

Atypical fibroxanthoma is a rare spindle cell tumor frequently seen on the head and neck of elderly patients with sun-damaged skin.⁶⁰ These tumors may recur and be locally invasive, but metastasis is rare.⁶⁰ More aggressive lesions with deeper invasion that have greater potential for recurrence or metastasis are now known as undifferentiated pleomorphic sarcoma (UPS).⁷¹ Some authors proposed that AFX and UPS belong to a disease spectrum, but recent studies show that UPS possesses cytogenetic characteristics and Ras pathway mutations not seen in AFX.⁷²

A possible reason for recurrence is inadequate surgical margins; thus, MMS is ideal for these patients by allowing 100% margin control prior to reconstruction.⁶⁰ Davis et al published a retrospective review comparing 19 patients treated with MMS and 25 patients treated with wide excision. Patients treated with MMS showed no recurrence during a mean follow-up of 29.6 months, whereas those treated with wide excision had a 16% recurrence during a mean follow-up of 73.6 months.^{60,73} A study conducted by Ang et al found no recurrence in 59 cases of AFX treated with MMS after a median follow-up of 4.5 years and 8.7% recurrence in 23 cases of AFX treated with WLE.⁷⁴ Another study by Huether et al reported a 6.9% rate of recurrence for 29 cases of AFX treated with MMS.⁷⁵

Dermatofibrosarcoma Protuberans

Dermatofibrosarcoma protuberans is a rare soft-tissue sarcoma usually seen in the third to fifth decade of life and more frequent on the trunk and proximal extremities.⁶¹ It has an indolent course, but it can be locally aggressive with high risk for recurrence.⁶¹ WLE was traditionally considered the standard of care, but studies have shown high recurrence rates varying from 11 to 60%.⁷⁶ A study by Gloster et al reported recurrence rates of 1.6% for MMS, 20% for WLE, and 44% for simple excision.⁷⁷ A systematic review conducted by Foroozan et al reported moderate-quality evidence showing lower recurrence for MMS (1.11%) as compared with WLE (6.32%).⁷⁶ A series by Snow et al of 29 patients showed 100% cure rate for MMS.⁷⁸ The authors also conducted a literature review of 136 patients, including the 29 patients in their series, which showed cure rates of 93.4% after a single Mohs surgery and 98.5% after a second Mohs surgery.⁷⁸ A recent retrospective study on patients with long-term follow-up conducted at the Mayo Clinic showed lower recurrence rate and higher recurrence-free survival rates with MMS. Recurrence rate was 3% for MMS and 30.8% for WLE.⁶¹ Postoperative defect sizes were also smaller for

MMS, and majority were repaired with primary closure. On the other hand, larger defect sizes requiring flaps, grafts, or other closures were more frequent for WLE.⁶¹

Merkel Cell Carcinoma

Merkel cell carcinomas are neuroendocrine tumors that behave aggressively and have a high risk of metastasis and death.^{38,62} Several studies have shown that MMS resulted in fewer recurrence rates compared with standard excision.^{62,79–81} A study by Gollard et al reported no recurrence among eight patients treated with MMS.⁷⁹ Another study by O'Connor et al reported 31.7% local persistence and 48.8% regional metastatic rate for standard surgical excision, and 8.3% local persistence and 33.3% regional metastatic rate for MMS.⁶² Sentinel lymph node biopsy is also recommended to detect occult metastasis.^{81,82} More recent studies showed that adjuvant radiation increased survival, especially among those with large primary tumors.^{83,84}

Microcystic Adnexal Carcinoma

Microcystic adnexal carcinomas are rare tumors of eccrine origin that commonly present on the face of middle-aged females.^{63,85} These tumors are locally aggressive and have the potential for perineural invasion, yielding extensive subclinical extension.^{63,85,86} Given the degree of ill-defined clinical margins, standard excision margins are not usually recommended because these tumors vary in their extent of invasion.^{63,85,86} High recurrence rates of up to 40 to 60% have been reported with standard excision.⁶³ MMS demonstrates lower recurrence rates varying from 0 to 12%, thus making it the ideal treatment for MAC.^{63,85–90}

Sebaceous Carcinoma

Sebaceous carcinomas are rare aggressive tumors arising from sebaceous glands.^{7,64} Seventy-five percent of these occur in the periocular area; thus, majority of published data are on sebaceous carcinomas of the eyelid.^{7,64,91,92} Treatment with standard surgical excisions has been found to have high local recurrence rates of approximately 30%.⁶⁴ MMSs have also been reported to result in lower recurrence and metastatic rates compared with standard surgical excision.^{64,91} Therefore, MMS is recommended in these patients because of its superior cure rate and maximal tissue conservation, especially around the periocular area.^{7,64,91,92}

Conclusion

Mohs micrographic surgery is a cost-effective technique for treating skin malignancies and offers the highest cure rates for NMSCs, MIS, and some less common skin malignancies. This can be attributed to its ability to evaluate 100% of the tissue margins through the use of fresh frozen tissue technique, horizontal sectioning, mapping, and color-coding for precise tissue orientation. This technique also allows the conservation of normal tissue while ensuring that the entire cancer has been excised, thus producing the best cosmetic and functional results.

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Conflict of Interest

None.

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