



MOHS MICROGRAPHIC SURGERY: A COMPREHENSIVE OVERVIEW

**María Alejandra
Castillo Miranda**

MD. Universidad Autónoma de Bucaramanga

**Javier Enrique
Vargas Rey**

MD. Universidad Autónoma de Bucaramanga

ABSTRACT

Mohs micrographic surgery is a distinguished method for excising skin cancers, especially basal cell and squamous cell carcinomas, with a high precision rate that preserves healthy tissue. This narrative review explores the indications, technique, and both preoperative and postoperative management of Mohs surgery, highlighting its advantages such as high cure rates and minimal scarring. The review also discusses potential complications and limitations, underscoring the importance of patient selection and surgical expertise. Mohs surgery remains a cornerstone in dermatological oncology for its effectiveness in treating complex skin cancers.

KEYWORDS : Mohs Micrographic Surgery, Skin Cancer, Basal Cell Carcinoma, Squamous Cell Carcinoma, Dermatological Oncology

INTRODUCTION

Mohs micrographic surgery (MMS) is an advanced surgical technique tailored for the removal of skin cancers, especially those located in critical areas where maximum tissue preservation is crucial. Initially developed by Dr. Frederic Mohs, the technique involves the precise excision of the cancerous tissue and immediate microscopic examination of the entire margin.

This ensures that all cancerous cells are removed while preserving as much healthy tissue as possible. Primarily utilized for treating basal and squamous cell carcinomas, Mohs surgery is renowned for its high cure rates and minimal scarring, making it the treatment of choice for tumors in aesthetically sensitive areas like the face. The procedure's ability to adapt to the complexity of different skin cancers and its effectiveness in reducing recurrence rates highlights its significant role in dermatological oncology (1,2).

METHODS

This narrative review aimed to systematically assess the efficacy and outcomes of Mohs micrographic surgery (MMS) in treating various skin cancers. We conducted a detailed search across four major databases: PubMed, Embase, Scopus, and the Cochrane Library, utilizing keywords such as "Mohs micrographic surgery," "skin cancer," "basal cell carcinoma," "squamous cell carcinoma," and "dermatological oncology."

Initially, the search yielded 156 articles. These were first screened based on titles and abstracts to determine relevance to Mohs surgery and its outcomes. The final selection comprised 15 articles that met all criteria for a comprehensive analysis of the effectiveness and safety of Mohs surgery in skin cancer treatment. These studies were included for detailed synthesis and analysis to evaluate the success rates, cosmetic outcomes, and recurrence rates associated with Mohs surgery. This methodological approach ensured a rigorous review of the available literature to provide a clear, evidence-based perspective on Mohs micrographic surgery.

Surgical Technique

Mohs micrographic surgery (MMS) is a highly specialized procedure for treating skin cancers, notably basal cell carcinoma and squamous cell carcinoma. The technique involves the precise, layer-by-layer removal and examination of skin cancer tissue, enabling the surgeon to verify that all cancer cells have been removed before concluding the procedure (3).

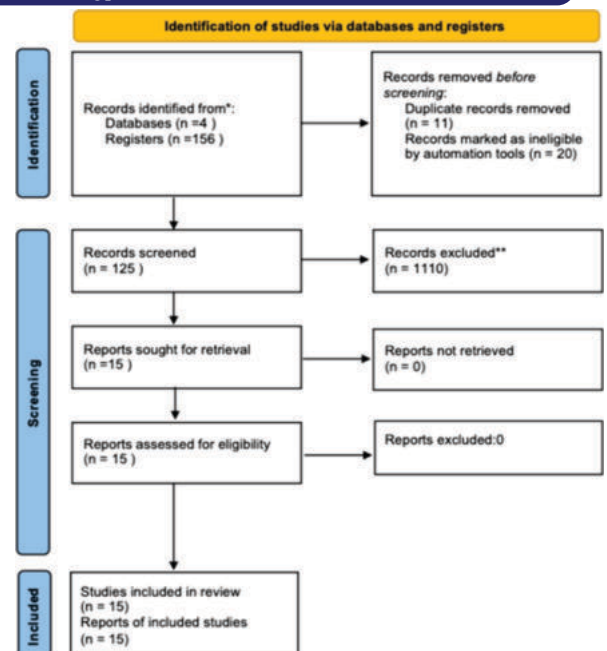


Figure 1. PRISMA

Tissue Removal:

The process begins with the surgeon removing the visible cancer along with a thin layer of surrounding tissue. This tissue is then color-coded with dyes to map the excision site and guide the microscopic examination (4).

Histological Examination:

The removed tissue is processed in an on-site lab where it's frozen, cut into microscopic slices, and stained. The surgeon examines these slices under a microscope to determine if cancer cells extend beyond the margins of the removed tissue (4).

Iterative Process:

If cancerous cells are found at the margins, the surgeon removes another layer of tissue from the specific area where the cancer was detected, sparing the rest of the wound from unnecessary excision. This step is repeated until no cancer cells are detected at the margins (5).

Reconstruction:

Once the margins are clear, the surgeon reconstructs the

wound. The method of reconstruction depends on the size and location of the wound, ranging from simple suturing to advanced flap or graft techniques (6).

This technique ensures complete cancer removal with minimal loss of healthy tissue, which is particularly valuable in cosmetically sensitive areas.

Indications

Mohs micrographic surgery (MMS) is a highly specialized technique reserved for specific skin cancer types where tissue preservation is critical, such as in cosmetically sensitive areas or where the highest cure rate is desired. The primary indication for Mohs surgery is non-melanoma skin cancers such as basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), especially when they are located on the face, ears, nose, or other areas where minimal tissue removal is crucial[7].

High-Risk Locations:

Cancers appearing on the eyelids, nose, ears, and lips pose a higher risk due to their functional and cosmetic importance. Mohs surgery is often indicated here to ensure complete tumor removal with minimal impact on appearance and function[8].

Recurrent Cancers:

Mohs is also recommended for recurrent cancers, which may have unclear boundaries and are at a higher risk of subsequent recurrences if not thoroughly excised. These cancers often have scar tissue that makes them challenging to treat with less precise modalities[9].

Large or Aggressively Growing Tumors:

Large tumors or those with rapid growth rates, particularly aggressive SCC, may benefit from Mohs surgery as it allows for the assessment of the entire surgical margin, ensuring all cancerous cells are removed[9].

Poorly Defined Borders:

Tumors with indistinct edges are difficult to treat effectively with standard excision methods. Mohs surgery, with its meticulous examination of all excised tissue, ensures that the margins are completely free of cancer cells[9].

High-Risk Histologic Subtypes:

Certain histological subtypes of skin cancers that are known to be aggressive or have a tendency to recur are also prime candidates for Mohs surgery. This includes morpheic, infiltrative, and micronodular BCC and SCC[9].

By utilizing Mohs surgery in these scenarios, clinicians can not only achieve a higher cure rate but also significantly reduce the likelihood of recurrence, thereby minimizing the need for additional treatments and surgeries. This approach underscores the importance of tailored treatment strategies in dermatologic oncology, prioritizing both oncologic and functional outcomes.

Advantages, Disadvantages, and Complications of Mohs Surgery

Advantages

Mohs surgery offers the highest cure rate among treatments for non-melanoma skin cancers, particularly basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). Its precision in tissue removal and examination ensures complete cancer eradication while preserving as much healthy tissue as possible, which is crucial for aesthetic and functional outcomes in sensitive areas such as the face and neck[10].

Disadvantages and Limitations

Despite its effectiveness, Mohs surgery can be time-

consuming, requiring several hours or a full day to complete, depending on the tumor size and complexity. This can be a significant drawback for patients and healthcare systems where time and resources are limited. Additionally, Mohs surgery requires specialized training and facilities, which may not be readily available in all healthcare settings[11].

Complications

While generally safe, Mohs surgery can lead to complications, such as infection, bleeding, and rare cases of nerve damage, particularly when performed in anatomically complex areas. The risk of cosmetic issues also exists, especially if the cancer is extensive and requires significant reconstruction[12].

Preoperative Evaluation and Management in Mohs Surgery

Preoperative evaluation and management for Mohs surgery are crucial to ensuring the best possible outcomes and preparing both the patient and surgical team for the procedure. This phase involves a detailed assessment of the patient's medical history, current health status, and the specific characteristics of the skin cancer being treated.

Preoperative Evaluation

The initial step in the preoperative evaluation involves a thorough review of the patient's medical history, including any previous incidences of skin cancer, underlying health conditions, and current medications, particularly those that could affect wound healing such as anticoagulants. A precise physical examination of the skin lesion is performed to assess the size, depth, and location of the tumor. This helps in planning the surgical approach and anticipating potential complications[13].

Dermoscopic imaging or biopsy may be utilized to confirm the diagnosis and determine the subtype of skin cancer, which can influence the surgical strategy. For lesions in cosmetically sensitive areas, such as the face or hands, additional imaging studies might be conducted to map the involvement of deeper structures and to plan for possible reconstructive procedures post-Mohs surgery[14].

Management Strategy

Patients are advised on the importance of skin care and sun protection prior to surgery to optimize skin condition and reduce the risk of postoperative complications. Instructions are also provided regarding medication management, especially for those on blood thinners, to manage the risk of bleeding during and after surgery.

Nutritional status is another critical aspect of the preoperative management. Adequate nutrition supports wound healing and immune function. Patients may be referred to a nutritionist if there are concerns about their nutritional intake or if they have conditions like diabetes that need careful management around the time of surgery[15].

Patient Education and Consent

Educating patients about what to expect during and after Mohs surgery is essential. This includes discussions about the potential for multiple stages during the surgery, the approximate duration of the procedure, and the realistic expectations of postoperative care and scarring. Informed consent is obtained after discussing all potential risks, benefits, and alternatives to Mohs surgery[15].

This comprehensive preoperative approach ensures patients are optimally prepared for Mohs surgery, contributing to higher satisfaction rates and excellent clinical outcomes.

CONCLUSION

Mohs surgery is a highly effective technique for treating skin cancers, particularly in areas requiring precision and tissue

conservation. Its methodical approach allows for complete cancer removal while minimizing damage to surrounding healthy tissue, offering excellent cure rates and cosmetic outcomes. Preoperative assessment, careful surgical execution, and postoperative care are critical to its success. Challenges include its resource-intensive nature and the need for specialized training.

REFERENCES

1. Rowe DE, Carroll RJ, Day CL Jr. Mohs surgery is the most effective treatment for high-risk basal-cell carcinoma. *J Dermatol Surg Oncol.* 1989;15(4):424-431.
2. Tromovitch TA, Stegman SJ. Microscopically controlled excision of skin tumors: chemosurgery (Mohs): fresh tissue technique. *Arch Dermatol.* 1974;110(2):231-232.
3. Brodland DG, Zitelli JA. Surgical margins for excision of primary cutaneous squamous cell carcinoma. *J Am Acad Dermatol.* 1992;27(2 Pt 1):241-248. doi:10.1016/0190-9622(92)70184-9.
4. Malhotra R, Huilgol SC, Huynh NT, Selva D. The Australian Mohs database, part I: Perineural invasion in cutaneous squamous cell carcinoma. *Dermatol Surg.* 2004;30(6):988-993. doi:10.1111/j.1524-4725.2004.30226.x.
5. Smeets NW, Krekels GA, Ostertag JU, et al. Surgical excision vs Mohs' micrographic surgery for basal-cell carcinoma of the face: randomised controlled trial. *Lancet.* 2004;364(9447):1766-1772. doi:10.1016/S0140-6736(04)17397-5.
6. Rowe DE, Carroll RJ, Day CL Jr. Long-term recurrence rates in previously untreated (primary) basal cell carcinoma: implications for patient follow-up. *J Dermatol Surg Oncol.* 1989;15(3):315-328. doi:10.1111/j.1524-4725.1989.tb03185.x.
7. Miller SJ. Mohs surgery for the treatment of basal cell and squamous cell carcinomas. *Surg Clin North Am.* 2009;89(5):1205-1216. doi:10.1016/j.suc.2009.06.015.
8. Leibovitch I, Huilgol SC, Selva D, Richards S, Paver R. Basal cell carcinoma treated with Mohs surgery in Australia I. Experience over 10 years. *J Am Acad Dermatol.* 2005;53(3):445-451. doi:10.1016/j.jaad.2005.04.089.
9. Rowe DE, Carroll RJ, Day CL Jr. Mohs surgery is the most effective method for high-risk basal-cell carcinoma. *J Dermatol Surg Oncol.* 1989;15(3):315-328. doi:10.1111/j.1524-4725.1989.tb03185.x.
10. Connolly SM, Baker DR, Coldiron BM, et al. AAD/ACMS/ASDSA/ASMS 2012 appropriate use criteria for Mohs micrographic surgery: a report of the American Academy of Dermatology, American College of Mohs Surgery, American Society for Dermatologic Surgery Association, and the American Society for Mohs Surgery. *J Am Acad Dermatol.* 2012;67(4):531-550. doi:10.1016/j.jaad.2012.06.009.
11. Lawrence N. The limitations of Mohs surgery for the treatment of skin cancer. *J Clin Aesthet Dermatol.* 2013;6(10):18-23.
12. Alam M, Ratner D. Cutaneous squamous-cell carcinoma. *N Engl J Med.* 2001;344(13):975-983. doi:10.1056/NEJM200103293441306
13. Zitelli JA, Moy RL, Abell E. The reliability of frozen sections in the evaluation of surgical margins for melanoma. *J Am Acad Dermatol.* 1997;36(5 Pt 1):742-744. doi:10.1016/S0190-9622(97)80312-3.
14. Benedetto AV, Griffin TD, Benedetto EA, Humeniuk HM. Dermoscopy and surgical management of skin cancers. *J Clin Aesthet Dermatol.* 2010;3(11):44-53.
15. Newman MD, Stotland M, Ellis JI. The safety of Mohs surgery: a prospective multicenter cohort study. *J Plast Reconstr Aesthet Surg.* 2011;64(12):1569-1578. doi:10.1016/j.bjps.2011.05.007.