

Mohs Micrographic Surgery

A Patient Guide



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WHAT IS SKIN CANCER?

Cancer is the uncontrolled growth of abnormal cells at an unpredictable rate. As cancer tissue grows, normal healthy tissue surrounding the tumor is destroyed. The most common cause of skin cancer is long-term exposure to sunlight. Skin cancers therefore occur most often on sun-exposed areas of the body, particularly the head and neck. Skin cancer also occurs more commonly in people with fair complexions who sunburn easily.

Superficial X-rays, used many years ago for treatment of certain skin diseases, may contribute to the development skin cancer many years later. Trauma (scars), certain chemicals, and certain rare inherited diseases may also contribute to the development of skin cancer.

In the skin, 96% of all new cases of skin cancer are **basal cell carcinoma** (80%) and **squamous cell carcinoma** (16%). There are about 1.3 million cases each year in the United States. Basal cell carcinoma and squamous cell carcinoma are distinct from **melanoma**, a less common type of skin cancer.

What are Basal Cell and Squamous Cell Carcinoma?

Basal cell carcinomas (BCC) and squamous cell carcinomas (SCC) grow from specific cells in the outermost layer of the skin. The tumor may begin as a small bump that looks like a pimple. It gradually enlarges, and sometimes bleeds. The cancer may appear red, pearly, scaly, flesh-colored, or darker than the surrounding skin. BCC almost never spreads to distant parts of the body. SCC has a higher risk for spread (metastasis). Risk for metastasis is increased for larger, untreated tumors and in patients who are immunosuppressed.

There are several subtypes of BCCs and SCCs. For example, some grow downward, forming “roots” or projections underneath the surface of the skin. What you see on your skin may therefore be only a small portion of the whole tumor. It is important to distinguish the different cancer subtypes prior to treatment, as different therapies may be required. The diagnosis is made by a **skin biopsy** followed by examination under a microscope.

HOW SUCCESSFUL IS THE TREATMENT OF SKIN CANCER?

Initial (primary) treatment of most skin cancers has a success rate greater than 90%. Cure rate depends in part on the type of growth pattern, the size, and location of the tumor. Methods commonly used to treat skin cancer include surgical excision (surgical removal and stitching), curettage and electrodesiccation (scraping and burning with an electric needle), cryosurgery (freezing), and radiation therapy ("deep X-ray"). The method chosen depends upon several factors including the microscopic subtype of tumor, the location and size of the cancer, and previous therapy. You may have had one or more of these methods of treatment before coming for Mohs surgery.

The success rate in treating a **recurrent** (previously treated) skin cancer by the above conventional methods is often as low as 50%. The success rate for Mohs surgery in treating recurrent lesions is about 95-98%.

Mohs micrographic surgery (discussed in detail below) is a highly specialized skin cancer surgery technique which requires a trained team of medical personnel. The majority of tumors treated with Mohs surgery are complex basal and squamous cell carcinomas. In some circumstances, Mohs surgery can be used to treat less common tumors, including some superficial melanomas.

Skin cancers are complex when:

- the cancer is in an area where preservation of healthy tissue is critical to maximize function and cosmetic result (eyelids, nose, ears, lips, hands)
- the cancer is in an area of higher tumor recurrence (ears, lips, nose, eyelids, temples)
- the cancer was incompletely treated, or was previously treated and is recurrent
- the cancer is large
- the edges of the cancer cannot be clearly defined
- scar tissue exists in the area of the cancer
- the cancer grows in an area of prior radiation therapy
- the patient is immunosuppressed (organ transplant, HIV infection, chronic lymphocytic leukemia)
- the patient is prone to getting multiple skin cancers (including genetic syndromes such as basal cell nevus syndrome and xeroderma pigmentosa)

WHAT IS MOHS SURGERY?

Mohs micrographic surgery is a highly specialized, state-of-the-art technique used for the treatment of complex skin cancers. This procedure was first developed in the 1930s by Dr. Frederick Mohs, a professor of surgery at the University of Wisconsin. Mohs micrographic surgery is distinct from routine surgical excision. With the Mohs technique, surgically removed tissue is carefully mapped, color-coded, and thoroughly examined

microscopically by the surgeon on the same day of surgery. During this process, 100% of tissue margins are evaluated to ensure that the tumor is completely removed prior to repair of the skin defect. Mohs micrographic surgery therefore results in the highest cure rate for complex skin cancers while minimizing the removal of normal tissue.

Standard surgical excision allows for delayed examination of approximately 1% of tissue margins. Since only a small percentage of margins are evaluated, residual tumor may be missed. If more cancer cells are found to remain during delayed pathologic examination, a second surgical procedure will be required at a later date.

Mohs surgeons are dermatologists who have performed additional fellowship training to become experts in Mohs micrographic surgery. Fellowship-trained Mohs surgeons are highly skilled in all aspects of this technique, including surgical removal of the tumor, pathologic examination of the tissue, and advanced reconstruction techniques of the skin. Dr. Bhardwaj and Dr Tschetter are Mohs fellowship-trained at the University of California, San Francisco.

Advantages of Mohs Micrographic Surgery

- Highest cure rate for skin cancer
- Smallest amount of normal skin is removed maximizing the likelihood for preserving function and minimizing scar.
- Fewer risks with local anesthesia compared with general anesthesia

THE MOHS SURGERY PROCEDURE

The Mohs surgical process involves a repeated series of surgical excisions followed by microscopic examination of the tissue to assess if any tumor cells remain. Some tumors that appear small on clinical exam may have extensive invasion underneath normal appearing skin, resulting in a larger surgical defect than would be expected. It is therefore impossible to predict a final size until all surgery is complete. As Mohs surgery is used to treat complex skin cancers, approximately half of all treated tumors require 2 or more stages for complete excision.

Step 1: Anesthesia

The tumor site is locally infused with anesthesia to completely numb the tissue. General anesthesia is not required for Mohs micrographic surgery.

Step 2: Stage I - Removal of visible tumor

Once the skin has been completely numbed, the tumor is gently scraped with a curette, a semi-sharp, scoop-shaped instrument. This helps define the clinical margin between tumor cells and healthy tissue. The first thin, saucer shaped "layer" of tissue is then surgically removed by the Mohs surgeon. An electric needle may be used to stop the bleeding. This process takes approximately 10-20 minutes.

Step 3: Mapping the tumor

Once a "layer" of tissue has been removed, a "map" or drawing of the tissue and its orientation to local landmarks (e.g. nose, cheek, etc) is made to serve as a guide to the

precise location of the tumor. The tissue is labeled and color-coded to correlate with its position on the map. The tissue sections are processed and then examined by the surgeon to thoroughly evaluate for evidence of remaining cancer cells. It takes approximately 60 minutes to process, stain and examine a tissue section. During this processing period, your wound will be bandaged and you may leave the operative suite.

Step 4: Additional stages - Ensuring all cancer cells are removed

If any section of the tissue demonstrates cancer cells at the margin, the surgeon returns to that specific area of the tumor, as indicated by the map, and removes another thin layer of tissue only from the precise area where cancer cells were detected. The newly excised tissue is again mapped, color-coded, processed and examined for additional cancer cells. If microscopic analysis still shows evidence of disease, the process continues layer-by layer until the cancer is completely removed. By beginning early in the morning, Mohs surgery is generally finished in one day. Sometimes, however, a tumor may be extensive enough to necessitate continuing surgery a second day.

This selective removal of tumor allows for preservation of much of the surrounding normal tissue. Because this systematic microscopic search reveals the roots of the skin cancer, Mohs surgery offers the highest chance for complete removal of the cancer while sparing the normal tissue. Cure rates typically exceed 99% for new cancers, and 95% for recurrent cancers.

There are a number of special circumstances when the Mohs surgery technique is modified to accommodate issues that go beyond traditional “tissue sparing”. Tumors such as melanoma, Merkel cell carcinoma, malignant fibrous histiocytoma, dermatofibrosarcoma protuberans, and some others can be aggressive and life threatening. In this event, our emphasis is based on complete tumor removal with an appropriate wide local margin, followed immediately by the first Mohs layer. This sequence is performed to achieve the highest possible confidence level that the resultant skin defect site can be repaired immediately in the confident knowledge that the entire tumor has been resected.

Step 5: Reconstruction

Fellowship-trained Mohs surgeons are experts in the reconstruction of skin defects. Reconstruction is individualized to preserve normal function and maximize aesthetic outcome. The best method of repairing the wound following surgery is determined only after the cancer is completely removed, as the final defect cannot be predicted prior to surgery. Stitches may be used to close the wound side-to-side, or a skin graft or a flap may be designed. Sometimes, a wound may be allowed to heal naturally.

Healing by granulation involves letting the wound heal by itself naturally. This offers a good chance to observe the wound as it heals after removal of a difficult tumor. Experience has taught us that there are certain areas of the body where nature will heal a wound as nicely as any further surgical procedures. Healing time is approximately 3-4

weeks. There are also times when a wound will be left to heal knowing that if the resultant scar is unacceptable, some form of cosmetic surgery can be performed at a later date.

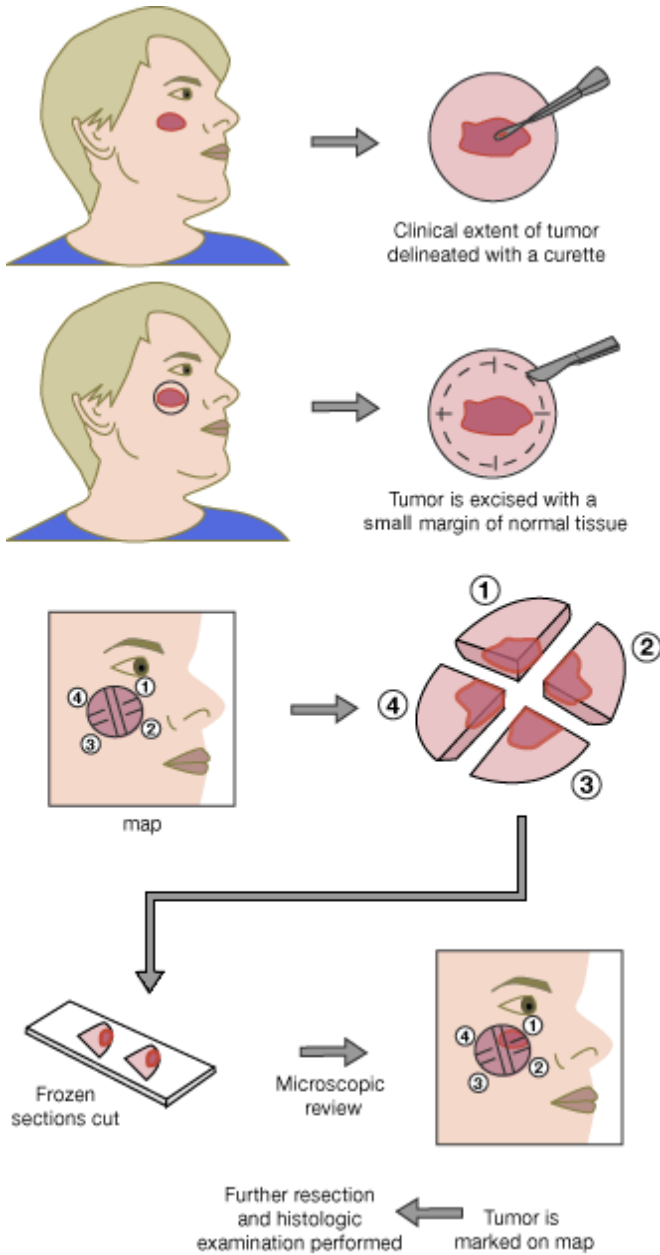
Closing the wound with stitches is often performed on a small lesion. This involves some adjustment of the wound and sewing the skin edges together. This procedure speeds healing and can offer a good cosmetic result. For example, the scar can be hidden in a wrinkle line.

Skin grafts involve covering a surgical site with skin from another area of the body. There are three types of skin grafts. The first is called a split-thickness graft. This is a thin shave of skin, usually taken from the thigh, which is used to cover a surgical wound. This can be either a permanent coverage or temporary coverage before another cosmetic procedure is done at a later date. The second graft-type is the full-thickness graft. This graft provides a thicker layer of skin to achieve desired results. In this instance, skin is usually removed from behind the ear or around the collarbone (the donor site), and stitched to cover a wound. The donor site is then sutured together to provide a good cosmetic result. A third type of graft uses skin and cartilage. This usually comes from the ear and is used to repair defects of the nose.

Skin flaps involve movement of adjacent, healthy tissue to cover a surgical site. Where practical, they are chosen because of the excellent cosmetic match of nearby skin.

In rare cases, when Mohs surgery is extremely extensive or when removal of the tumor results in functional impairment, we may recommend that you visit one of several consultant surgeons for reconstruction.

Schematic of Mohs Micrographic Surgery Technique



HOW DO I PREPARE FOR THE DAY OF SURGERY?

Mohs surgery is usually completed on an outpatient basis. The best preparation for surgery is a good night's rest followed by breakfast. Please shower and shampoo your hair within 24 hours before your procedure. This will minimize the bacterial growth on your skin and help prevent infection. Since you can expect to be here for most of the day, it is wise to bring a book or magazine to read. Also, because the day may prove to be quite tiring, it is advisable to have someone accompany you on the day of surgery to provide companionship and to drive you home.

Your referring physician may request that you have a preoperative consultation visit to evaluate the need for Mohs surgery. At this visit, the technique will be discussed in detail, you will meet the "team" performing the surgery, and a biopsy may be performed. If you are coming a great distance and/or are being referred by a physician familiar with the technique, you may be referred directly for Mohs surgery without a preoperative visit. When your appointment is scheduled, our nurse coordinator will discuss with you your pertinent medical history and give you instructions regarding any medications you are taking, including blood-thinning medications. DO NOT discontinue any of your prescribed medications unless specifically instructed.

If you have never been a patient of Dermatology Specialists, P.A., you should plan to arrive 30 minutes before your scheduled appointment in order to register. The cost of Mohs surgery is borne by most insurance carriers. Please be prepared to give insurance information to our billing office and bring with you any forms that may need processing.

WHAT HAPPENS THE DAY OF SURGERY?

Your appointment has purposely been scheduled early in the day. Upon your arrival you should check in at the Reception Desk. When the surgical suite becomes available, you will be escorted by our surgical nurse to that area of the clinic. If you have not had a consultation visit, any questions you may have will be carefully answered by members of our highly trained team of medical personnel.

In addition to your Mohs surgeon, your surgical "team" consists of two nurses and a technician. Your nurse is an important part of the team who will help answer your questions, respond to your anxieties, assist in surgery, and instruct you in dressings and wound care after the surgery is performed. A technician, who you may not even meet, performs the essential task of preparing the tissue slides, which are examined under a microscope by the physician during the procedure.

When all your questions have been addressed and your records reviewed, the surgery will begin. The removal of each layer of tissue takes approximately one to two hours. Only 10-20 minutes of that time is spent in the actual surgical procedure, with the remaining time being required for slide preparation and interpretation. As Mohs surgery

is used to treat complex skin cancers, approximately half of all treated tumors require 2 or more stages for complete excision. Therefore, by beginning early in the morning, Mohs surgery is generally finished in one day. Once we are sure that we have totally removed your skin cancer, we will discuss with you our recommendations for dealing with your surgical wound. Please be aware that the surgical procedure, including any necessary reconstruction, may last the entire day.

WHAT CAN I EXPECT AFTER THE SURGERY IS COMPLETE?

Pain

Most people are concerned about pain. You will experience remarkably little discomfort after your surgery. Most of the pain experienced by patients can be relieved by taking Tylenol. Due to its potential to cause bleeding, we request that you do not take aspirin or ibuprofen for pain control. In some cases, you may be prescribed a stronger pain medication.

Bleeding

A small number of patients will experience some bleeding post-operatively. This bleeding can usually be controlled by the use of pressure. You should take a gauze pad and apply constant pressure over the bleeding point for 15 minutes; DO NOT lift up or relieve the pressure at all during that period of time. If bleeding persists after continued pressure for 15 minutes, repeat the pressure for another 15 minutes. If this fails, call Dr. Bhardwaj or Dr Tschetter. If necessary, they can be reached twenty-four hours a day by calling the answering service. This phone number will be given to you when you leave. It is advisable not to drink alcohol the first post-operative night as this may stimulate bleeding.

Complications

There are some minor complications that may occur after Mohs surgery. A small red area surrounding your wound is normal and does not necessarily indicate infection. Please notify us if you have increase in your temperature, chills, increasing redness, swelling or drainage, or escalating pain. Itching and redness around the wound, especially in areas where adhesive tape has been applied, are not uncommon. When this occurs, ask your pharmacist for a non-allergenic tape and inform us on your return visit. Swelling and bruising are very common following Mohs surgery, particularly when it is performed around the eyes. This usually subsides within four to five days after surgery and may be decreased by the use of an ice pack in the first 48 hours. At times, the area surrounding your operative site will be numb to the touch. This area of anesthesia (numbness) may persist for several months or longer. In some instances, it may be permanent. If this occurs, please discuss it with your physician at your follow-up visit.

Although every effort will be made to offer the best possible cosmetic result, you will be left with a scar. The scar can be minimized by the proper care of your wound. We will discuss wound care in detail with you and give you Wound Care Information Sheets that will explicitly outline how to take care of the specific type of wound you have.

WILL I DEVELOP MORE SKIN CANCERS?

After having one skin cancer, statistics say that you have a higher chance of developing a second. The damage that your skin has already received from the sun cannot be reversed. However, there are precautions that can be taken to prevent further skin cancers. They involve good common sense. You should apply sunscreen least 10 minutes before exposure to sunlight. The sunscreens are now labeled as to strength with higher Sun Protective Factor (SPF) being more protective. We would recommend that you use a "broad spectrum" SPF 30 or higher sunscreen. Despite manufacturers' claims, we recommend that you reapply sunscreen frequently. A wide-brimmed hat, long-sleeved shirt and other protective clothing are also appropriate. Avoidance of excessive sunshine is recommended.

You should have your skin checked very closely by a physician at six-month intervals. This is not only to check the surgical site as it is healing, but also to check for the development of additional skin cancers. Our policy is that Dr. Bhardwaj and Dr Tschetter will follow the majority of our patients until the wound has healed. Following completion of post-operative care, you will return to you referring physician for regular skin exams. We recommend six-month follow-up visits for two years, then yearly thereafter if no additional cancers are detected. Of course, any areas of your skin that change, fail to heal, or just concern you should be brought to the attention of your referring physician immediately. Your referring physician will be able to adequately treat most skin cancers when they are detected early.