



DARTMOUTH-HITCHCOCK
MEDICAL CENTER

Mohs Micrographic Surgery

Table of Contents

Skin Cancer	1
What is skin cancer?	1
How is skin cancer treated?	1
Is skin cancer dangerous?	2
What are the causes of skin cancer?	2
How does skin cancer begin?	2
Mohs Micrographic Surgery	3
What is Mohs Micrographic Surgery?	3
Advantages of Mohs Micrographic Surgery?	4
The Highest Chance of Cure - Mohs Micrographic Surgery ..	4
Preparing for Mohs Micrographic Surgery	5
The Preoperative Visit	5
Will I need to be Hospitalized?	6
Getting Ready for Mohs Micrographic Surgery	6
The Day of Surgery	7
The Surgical Wound	8
The Healing Process	9
Follow-up After Mohs Micrographic Surgery	10
Sun Exposure After Mohs Micrographic Surgery	10
Risks of Mohs Micrographic Surgery	11
Important Reminders	14
What you can expect and what to look out for in the care of your surgical wounds	15

Mohs Micrographic Surgery

The following information is provided as a service to our patients and their families who are considering Mohs micrographic surgery. Mohs micrographic surgery is named after the originator of the procedure, Dr. Frederic Mohs. If you have any questions or need additional information, please feel free to contact our staff.

Skin Cancer

What is skin cancer?

Skin cancer is a common tumor which occurs with increased frequency as we age and we accumulate more sun exposure. There are several common types of skin cancer: Basal Cell Carcinoma, Squamous Cell Carcinoma and Melanoma. Melanoma is a very different kind of skin cancer and will not be considered in detail in this brochure. Basal Cell Carcinoma is by far the most common of the three. Squamous Cell Carcinoma is the next most common.

How is skin cancer treated?

A variety of methods may be used to treat skin cancer. These include electrodesiccation and curettage (electrical burning combined with scraping), excisional surgery, x-ray treatments, cryosurgery (freezing) and Mohs surgery. For each tumor and patient an appropriate treatment method is selected. Factors that enter into this decision include patient preference, tumor size, tumor location and tumor growth pattern.

Occasionally, the selected method may be unsuccessful and the tumor grows back. This is because the skin cancer had irregular extensions that escaped detection and removal.

Is skin cancer dangerous?

The most common types of skin cancer are Basal Cell Carcinoma and Squamous Cell Carcinoma. Both types enlarge locally from the point of origin and usually do not spread (metastasize) to distant parts of the body. If not completely removed, both types may invade and destroy structures in their path. Compared to other forms of cancer, these types of skin cancer (Basal Cell and Squamous Cell) are generally recognized in the early stages and are more easily cured.

Malignant Melanoma may be life threatening if not treated early. It usually appears as a brownish-black spot or bump on the skin that enlarges and sometimes bleeds. Occasionally, melanoma originates in moles that have been present for many years. Melanoma does have a tendency to metastasize.

What are the causes of skin cancer?

The cause of skin cancer, like other forms of cancer, is not completely known. Prolonged exposure to sunlight, the majority of which occurs before the age of twenty, is the most important factor associated with the development of skin cancers on the face and arms. Fair-skinned people develop skin cancers more frequently than dark-skinned people do. Cancers of the skin are more common in sunny climates. In addition to fair complexions, other possible factors contributing to the development of skin cancer include family genetics, radiation, trauma and exposure to certain chemicals.

How does skin cancer begin?

Skin cancer begins in the uppermost layer of the skin, spreading along the surface and downward, forming extensions of cells similar to roots. Usually the top portion of a skin cancer is either scaly or fragile; this part often bleeds and forms a sore

or crust. However, the outside and underlying edges of a skin cancer may not have this appearance; these outer extensions often cannot be directly seen. Therefore, what is apparent to the naked eye on the surface of the skin may be “the tip of the iceberg.”

Mohs Micrographic Surgery

What is Mohs Micrographic Surgery?

Mohs Micrographic Surgery is a highly specialized procedure for the removal of skin cancer. It is especially useful in tumors that are difficult to remove because of body site or tumor growth pattern (including tumors that have recurred).

There are three steps to Mohs Micrographic Surgery:

1. The Mohs surgeon identifies the visible portion of the skin cancer; this visible portion is removed by excision (cutting) or curettage (scraping).
2. The Mohs surgeon then maps out and removes a thin layer of normal-appearing tissue at the edges of the previous visible cancer.
3. The Mohs surgeon examines the excised tissue with a microscope to see if there is any cancer left.

Before the tissue is examined with the microscope, it is marked with colored dyes and processed with special stains. In doing so, we are able to document and pinpoint the exact location of the tissue that was removed and any remaining cancer. By examining the outside edges (including the depth) of the tissue, the Mohs surgeon is able to trace out and exactly locate any remaining areas of cancer. If cancer remains, steps 2 and 3 of the procedure are repeated but only in the areas that still have cancer.

The Mohs surgeon is trained to understand how skin cancers appear and grow, how they are removed and how they appear under the microscope. The processing of skin cancer tissue is done by histologic technicians in a laboratory next to the surgery room. The laboratory and technicians are under the direction of the Mohs surgeon in coordination with the policies and procedures of the Department of Pathology.

Advantages of Mohs Micrographic Surgery

Utilizing microscopic examination, the Mohs micrographic surgeon pinpoints areas involved with cancer and selectively removes only those areas. In this way, the skin cancer is traced out to its furthest extension or “roots.” This results in preserving as much normal tissue as possible with the highest chance for cure. Other forms of therapy have only a 50% to 70% chance for success in curing skin cancers that have previously been unsuccessfully treated. Using the Mohs Micrographic Surgery techniques, the percentage of success is very high, often 97% to 99%, even if other forms of treatment have failed. With this technique, an excellent chance of cure is achieved. However, no one can guarantee a 100% chance of cure.

The Highest Chance of Cure - Mohs Micrographic Surgery

Mohs Micrographic Surgery provides patients with the highest chance for cure of even complicated skin cancers. This method is highly specialized and not all medical centers in the United States are equipped with the personnel and training to offer this treatment.

A frequent reason for being referred for Mohs Micrographic Surgery is that other forms of treatment were unsuccessful. This does not mean that you are cancer prone or have a hopeless case. It merely means that the methods used to treat you in the past have not destroyed all of the skin cancer cells. Because Mohs

Micrographic Surgery uses complete systematic microscopic control to search out the “roots” of the cancer, it cures almost all patients, even those in whom skin cancer has persisted in spite of several other treatments.

Patients are also often referred for large tumors or tumors with indistinct borders. In these circumstances, Mohs Micrographic Surgery offers the highest chance for cure without the excessive loss of normal tissue. This advantage also applies to patients whose tumors are located near vital functional or cosmetic structures such as the eye or nose.

Preparing for Mohs Micrographic Surgery

The Preoperative Visit

Since not all skin cancers are alike, we need to know exactly what type you have before we can decide how to proceed. The preoperative visit allows the doctor the opportunity to examine your skin cancer, obtain your medical history, and determine whether the technique of Mohs Micrographic Surgery is the most suitable way of treating your skin cancer. It also gives you an opportunity to learn about the procedure and meet the members of the surgical team. Every person and every skin cancer is different and because of the high demand for Mohs micrographic treatment, careful scheduling is necessary. A date for surgery that is mutually acceptable will be arranged. When patients are referred to us, usually a biopsy (removal of a piece of tissue) has been performed and a pathology report stating the type of skin cancer is available. If we do not have this information, a biopsy may be performed at the time of the initial visit. The skin cancer and surrounding tissue will be photographed before the treatment as well as immediately after the surgery and again after healing. These photographs become part of your medical record and may be used for teaching purposes.

Will I need to be hospitalized?

Whenever possible, the surgery is performed on an outpatient basis in the clinic. Rarely we require that you stay in the hospital. At the time of your initial visit, we will inform you if we feel that it would be best for you to be hospitalized.

Getting Ready for Mohs Micrographic Surgery

Try to get a good night's rest and eat a good breakfast, unless directed otherwise. If you are taking any medications, take them as usual unless directed otherwise. If you are taking aspirin because of a blood-clotting or heart condition, please continue to take your aspirin. However, if you do not have these conditions, we request that you do not take any aspirin or aspirin-containing products such as Anacin or Bufferin for two weeks prior to the surgery. Aspirin-containing medications “thin” your blood and cause more bleeding and bruising. Also, please do not drink any alcoholic beverages prior to surgery because alcohol causes blood vessels to dilate and aggravates bleeding and bruising problems as well.

It is a good idea to bring a book or magazine with you on the day of surgery. The procedure may take a full day, much of which you will spend in the waiting room while we process and examine the tissue removed. We are unable to exactly predict the amount of time this may take because of the varying depth of the skin cancer not visible to the naked eye. It may be relaxing to have company while you are sitting in the waiting room. We usually recommend that you have someone drive you home.

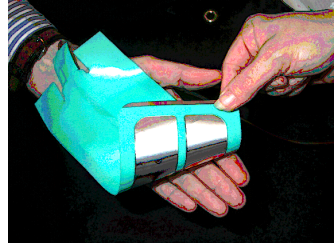
The Day of Surgery

Appointments for surgery are scheduled to start in the morning based on the anticipated complexity of each case. When you arrive for surgery, the nurse will take you to the surgery suite and help you prepare for the surgery. It is a good idea to wear loose-fitting clothing. It may be necessary to have you change out of your shirt or blouse and into a hospital gown for the surgery. Please keep this in mind when choosing your clothing. In addition, please avoid any “pullover” clothing.

If you have any additional questions, please feel free to ask them at this time. The doctor will again discuss the procedure with you and obtain your written consent for the procedure.

When you arrive in the surgery suite, you may be given a protective gown to wear and be comfortably positioned in a reclining position.

A sticky contact pad will be applied to your arm or hand; this pad is similar to an electric “ground” that enables the doctor to use an electric cautery device to seal off cut blood vessels (see photo at right).



The skin surrounding the skin cancer will be cleansed with an antiseptic soap. The doctor or nurse will then anesthetize (numb) the area of skin containing the cancer. The anesthetic agent is given locally by a small shot (needle). This will probably be similar to the shot you received when your biopsy was taken. After the tissue has been removed, the bleeding will be stopped with the cautery device or by applying pressure. Before you leave the surgical suite, the nurse will cover your wound with a bandage. It usually takes 30-45 minutes to prepare, obtain anesthesia, remove the involved tissue and place the bandage.

The removed tissue will be processed in our laboratory next to the surgery room. You will have to wait while the tissue is processed for examination, stained and examined by the doctor. Depending upon the amount of tissue removed, processing usually takes 30-60 minutes. However, it may take longer if the specimen is large or if the laboratory is busy. Unless you have been given a beeper (which gives you freedom to walk around the medical center), do not leave the waiting room without checking with the nurse. If examination of the removed tissue reveals that your tissue still contains cancer cells, the procedure will be repeated as soon as possible. Several excisions and microscopic exams may be done in one day. It is rarely necessary to discontinue the surgery for the day and return the following day for additional surgery. The average number of surgical sessions for most skin cancers is 2 or 3, so that most patients will have their entire cancer removed within 3-4 hours.

The Surgical Wound

When the skin cancer has been completely removed, a decision is made on the best method for treating the wound created by the surgery. These methods include:

1. Letting the wound heal by itself.
2. Closing the wound with stitches.
3. Closing the wound with a skin graft or a flap (moving in adjacent tissue).

We will recommend which of these methods will be the best for your individual case. Repairs may be completed by us or by other surgical specialists. Each patient is unique and we must individualize your treatment to achieve the best results.

When the repair is completed by other surgical specialists, that repair may take place on the same day or on a subsequent day. In most cases, you will have already met the doctor who is to perform your repair and you will know of the scheduling. There is no harm in delaying the repair for several days. If the repair is to be extensive, that portion of the operation may require hospitalization. Occasionally a tumor may turn out to be much larger than was initially anticipated. Under those circumstances, we may involve other surgical specialists after the procedure has begun.

The Healing Process

You may experience a sensation of tightness or drawing as the wound heals, but this is normal. As time progresses, you will feel this less and less. Frequently, skin cancers involve nerves and it may be months before your sensation returns to normal. In some cases, some degree of numbness may be permanent. As with any surgery, there will be a scar following your procedure. The Mohs micrographic procedure tends to minimize this as much as possible. Mohs micrographic surgeons try to remove only the tissues involved with the cancer and to preserve as much normal tissue as possible. We make every effort to obtain the optimal cosmetic results for you and work in conjunction with other surgical specialists in the field of cosmetic and cutaneous surgery, but our first goal is to remove the tumor. Sometimes a further reconstructive procedure may be recommended to fine-tune the result of the healing.

The new skin that grows over the wound contains many more blood vessels than the skin that was removed. This results in a red scar and the area may be sensitive to temperature changes. This sensitivity improves with time and the redness gradually fades. If you are having a lot of discomfort, avoid extreme temperatures. The healing process goes on for a long time and may take 6-12 months to complete.

Follow-up After Mohs Micrographic Surgery

Follow-up observation is necessary after the wound has healed. You will be asked to see a doctor for a skin cancer check in a few weeks or months and annually thereafter. Your follow-up may be handled by your referring physician. Should there be any recurrence of the skin cancer it then may be detected at once and treated while it is still small. Experience has shown that if there is recurrence, it usually will be in the first 1-2 years following surgery. Studies have shown that once you develop a skin cancer, there is a possibility that you will develop others in the years ahead. We recommend that you be seen at least once a year by your referring physician or dermatologist so that he or she may evaluate whether you have developed any new skin cancers. Should you notice any suspicious areas, it is best to check with your referring physician to see if a biopsy is needed.

Sun Exposure After Mohs Micrographic Surgery

We do not think that sunshine is harmful to you as long as you use adequate protection, avoid burning, and use discretion. As mentioned, sunlight probably is the main contributing factor in the development of skin cancer, and patients who have developed one skin cancer often will develop more at a later time. When you go into the sun, we recommend that you liberally apply a sunscreen with a protection factor of 15 (SPF 15) or higher to exposed areas, including the tops of your ears. It is best to apply the sunscreen early in the day before going outdoors. Be sure to reapply it liberally after swimming or exercising since many sunscreens wash off with water or perspiration. In addition to a sunscreen, you may wish to wear a broad-brimmed hat and utilize clothing to further protect yourself from the sun. By using these simple precautions you can lead a normal lifestyle.

Risks of Mohs Micrographic Surgery

Because each patient is unique, it is impossible to discuss all the possible complications and risks in this discussion. Below are discussed the general risks associated with many of these procedures. The doctor will discuss these matters with you and any additional potential problems associated with your particular case.

1. The defect created by the removal of the skin cancer may be larger than anticipated. The ability to “track” the extent of the tumor is actually an advantage of the Mohs method. However, the tumor may be much larger than estimated from the surface appearance. There is no way to predict prior to surgery the exact size of the final defect.
2. There will be a scar at the site of removal. We will make every effort to obtain optimal cosmetic results, but our primary goal is to remove the entire tumor. The cosmetic outcome cannot be guaranteed. Sometimes further surgery is needed to improve the appearance of a scar.
3. There may be poor wound healing. At times, in spite of our best efforts, for various reasons (such as bleeding, poor overall physical condition, diabetes, or other disease states), healing is slow or the wound may reopen. Flaps and grafts utilized to repair the defect may at times fail. Under these circumstances, the wound will usually be left to heal in on its own.
4. There may be a loss of motor (muscle) or sensory (feeling) nerve function. Not infrequently, the tumor invades nerve fibers. When this is the case, the nerves must be removed along with the remainder of the tumor. At other times, the tumor or the tissue moved in the reconstruction of the defect is adjacent to nerve fibers. At these times, nerves may also be severed or injured. If a sensory nerve is injured or removed,

numbness results. Sensation will usually, but not always, return. It may take up to 24 months for sensation to return. If a motor nerve is involved, you may be unable to move the muscle that nerve served. An example of this would be the inability to wrinkle your forehead. In most, but not all circumstances, this nerve function will return over a prolonged period of time. If a major motor nerve has been involved, microsurgical or other surgical repair may be required. Prior to your surgery, the doctor will discuss with you any major nerves that might be near your tumor.

5. The tumor may involve an important structure. Because so many tumors occur on the head and neck, many are near or on vital structures such as the eyelids, ears, nose or lips. If the tumor involves these structures, portions of them may have to be removed with resulting cosmetic or functional deformities. Furthermore, repair of the resulting defect may involve some of these structures. The doctor will discuss this with regards to the particular location of your tumor prior to surgery.
6. The wound may become infected. A small number of surgical wounds (less than 5%) may become infected and require antibiotic treatment. If you are a particular risk for infection, you may be given an antibiotic prior to surgery.
7. There may be excessive bleeding from the wound. Such bleeding can usually be easily controlled during surgery. There may also be bleeding after surgery. This is very rarely a significant amount of blood loss but bleeding into a sutured incision, graft or flap may inhibit good wound healing.
8. There may be an adverse reaction to medications used. We will carefully screen you for any history of past problems with medications. However, new reactions to medications may occur.

Important Reminders

- ✓ **Do** remember the procedure may take a full day; much of your time may be spent waiting for tissue to be processed. Bring books, activities and a companion and anticipate there will be waiting periods.
- ✓ **Do** take your usual medications on schedule unless instructed otherwise by the doctor.
- ✓ **Do** take any new medications the doctor prescribes for you.
- ✓ **Do** bring someone with you to drive home.
- ✓ **Do** discuss with the doctor when you may resume strenuous physical activities.
- ✓ **Do not** consume alcohol, vitamin E, ibuprofen, or other NSAIDs 24 hours prior to or 24 hours after surgery.
- ✓ **Do** take your aspirin or blood-thinner if you have been prescribed to take it for a blood-clotting or heart condition. If you do NOT have these conditions, do not take aspirin or aspirin-containing products for two weeks prior to surgery. If in doubt, please call us at least two week prior to your surgery to discuss.

What you can expect and what to look out for in the care of your surgical wounds

The following information is written with sutured wounds specifically in mind. It is also true for wounds left to heal by themselves, except there will be an initial stage in which the wound will need to heal over, which can take from 2 weeks to 2 months depending on the size of the wound.

Day 1 - 2:

- Most patients have very little pain. What you can do to reduce pain and enhance healing and minimize scarring: rest and relax, especially in the first hours and day of surgery. This is because we want the cut surfaces to stop bleeding and start mending.
- Swelling may be quite noticeable around the eyes if there has been surgery in the mid face (upper nose, upper cheeks, eyelids) or lower forehead
- Bruising may be noticeable around the eyelids, cheeks or neck.
- You may cleanse the wound after a day or two, unless we have told you specifically not to touch the wound (e.g., in a skin graft).

Days 2-4:

- Swelling and bruising, if present, usually reaches its maximum.
- If there has been pain, it is usually better. Exception: areas with a lot of swelling or bruising.

- **NOTE:** Signs of infection include:
 - ◆ increasing pain
 - ◆ increasing swelling
 - ◆ increasing drainage (except a small amount is expected from open wounds)
 - ◆ redness beyond a quarter of an inch from the wound.

Days 4-7:

- Swelling and bruising, if present, usually is resolving.

End of 1st Week:

- The incision line has about 5% of its original strength

Weeks 2-4:

- The incision line is usually becoming firm or ridge-like as the tissue strengthens and heals.

End of 2nd Week:

- The incision line has about 10% of its original strength

End of 3rd Week:

- The incision line has about 20% of its original strength

End of 4th Week:

- The incision line has about 40% of its original strength
- You may start massaging the incision line to help soften the tissue.

Weeks 5-12:

- The incision line is starting to soften as the body remodels the healed tissue

End of 6th Week:

- The incision line has up to 80% of its original strength; most incisions will not get any stronger.

Months 0-3:

- The area of surgery may feel numb; occasionally the area of numbness extends beyond the area of surgery. In some, occasional twinges are felt; this is a sign of nerves healing.

Months 3-12:

- Sensation in the area of surgery will gradually get more normal.
- In general, the incision area will gradually become less red, except in those with a reddish complexion.
- In most cases, the incision line is more white than the surrounding skin.
- NOTE: If the scar worsens during or after this time, bring it to the attention of a doctor.
- NOTE: Signs of a skin cancer coming back are:
 - ◆ an increase in scar thickness
 - ◆ scaling, redness, bleeding or crusting in or at the edges of the treatment area.

Months 12-24:

- In most people, the scar becomes as soft as it will ever be.

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Dartmouth-Hitchcock Medical Center is a charitable organization and has a financial assistance policy.



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