

# Mohs Micrographic Surgery

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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 us.

## **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.

## **How is skin cancer treated?**

A variety of methods including 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.

## **Is skin cancer dangerous?**

Basal Cell Carcinoma and Squamous Cell Carcinoma 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.

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.

## **Causes of skin cancer and how it begins?**

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. 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.

Skin cancer begins in the uppermost layer of the skin, spreading along the surface and spreading roots downward. 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

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).

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.

Often, referrals for Mohs Micrographic Surgery occur because other treatments 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.

## 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 our CLIA certified laboratory.

## 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 (especially around the nose, eyes and ears) 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.

## 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. **Defect.** 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. **Scar.** 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 or other treatments are needed to improve the appearance of a scar.
3. **Wound healing.** At times, in spite of our best efforts, for various reasons (such as bleeding, poor overall physical condition, diabetes, smoking, 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. **Muscles and nerves.** 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. **Important structures.** 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. **Infection.** 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. **Bleeding.** 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. **Medication reaction.** 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.

# 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 3 days 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**

Eat a normal breakfast. Bring light snacks to consume during your visit. Appointments for surgery are scheduled to start in the morning based on the anticipated complexity of each case.

On the day of surgery, please do not apply any makeup or moisturizers. Because you will be with us for several hours, you and your companion may want to bring along a light snack and reading material or another quiet activity as there is waiting time between stages.

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. Buttons are better.

You will be brought into the surgery room where your blood pressure, pulse and medical history are checked and photographs taken. We will review the Mohs procedure with you, answer your questions, and have you sign a permission form.

The area is cleaned with an antiseptic solution and a local anesthetic called lidocaine is injected to numb the area. The local anesthetic is the only part of the surgery that is uncomfortable. You will notice a stinging or burning sensation that lasts for a few seconds.

Once the area is numb, the tumor is removed with a thin rim of surrounding skin. The small amount of bleeding is stopped with a cautery device that seals off little blood vessels. A temporary dressing is applied while you wait for the tissue processing. If a friend or relative has accompanied you, they can now return to the room to keep you company.

The removed skin is divided into pieces and carefully mapped to keep track of orientation, like on a clock face. By doing this, we are able to pinpoint the exact location of any remaining tumor detected during microscopic examination. The preparation and review of your slides takes approximately 20 to 40 minutes.

If more cancer is found, the area is cleaned again and additional anesthetic is injected to ensure your comfort. A second stage of Mohs surgery is performed, removing only tissue at the area with remaining cancer. The average tumor requires



two to four stages for removal. Do not be discouraged if your cancer is not removed in one stage. We are tracing the extent of the tumor very carefully, thereby removing as little normal tissue as possible. Only by removing small layers in stages can this be accomplished.

A sticky contact pad may 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.

The skin surrounding the skin cancer will be cleansed with an antiseptic soap. The doctor or assistant will then anesthetize (numb) the area of skin containing the cancer. The anesthetic agent is given locally by a small shot (needle) while you are awake. 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. In between stages you can sit up, talk, read, and get to the bathroom.

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. 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 30 (SPF 30) 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.

## **Post-surgery - What to expect and wound care**

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.
- 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 4th Week:**

- The incision line has about 10% 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

### **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:
  1. an increase in scar thickness
  2. 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.

Thank you for reviewing this material. If you have any questions, write them below and we will attempt to answer all of them. We want you to be as comfortable, relaxed and informed as possible.

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# MOHS SURGERY CHECKLIST

## 3 DAYS BEFORE SURGERY

1. Avoid alcohol starting now to minimize bleeding
2. Avoid NSAIDs (these are pain medications) such as naproxen/Aleve, ibuprofen/Advil/Motrin, and aspirin starting now (UNLESS you are instructed to take them by a physician).
3. Do not smoke (use nicotine gum or chantix 3 days prior and up to 7 days after).

## THE NIGHT BEFORE SURGERY

1. Wash the area thoroughly with bath soap such as Dial, Lever 2000 or Hibiclense.

## ON THE DAY OF SURGERY

1. Wash the area over and around the skin cancer again with Dial, Lever 2000 or Hibiclense soap.
2. If the skin cancer is on your face, do not put on any makeup or moisturizer.
3. Take your prescribed morning medications
4. Eat a light breakfast.
5. Bring some reading, music and/or a companion to keep you company
6. Plan to arrive 15-20 minutes before your appointment to check in

# Important Reminders

1. **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.
2. **Do** take your usual medications on schedule unless instructed otherwise by the doctor.
3. **Do** take any new medications the doctor prescribes for you.
4. **Do** prepare to have someone drive you home if necessary
5. **Do** discuss with the doctor when you may resume strenuous physical activities.
6. **Do** not consume alcohol, vitamin E, ibuprofen, or other NSAIDs 3 days prior to or 3 days after surgery.
7. **Do** not smoke 3 days prior to surgery and up to 7 days after surgery.
8. **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. Please let us know if you take any of the following blood thinning products (but do not stop any of these medications unless instructed to do so): aspirin, coumadin (warfarin), plavix (clopidogrel), vitamin E, fish oil.
9. **Do not** take ibuprofen (advil, motrin) or naproxen (naprosyn, aleve) 7 days prior to your surgery. If you take any of these medications by prescription, please discuss this with your prescribing doctor first. You may take acetaminophen (tylenol) for pain during this period.