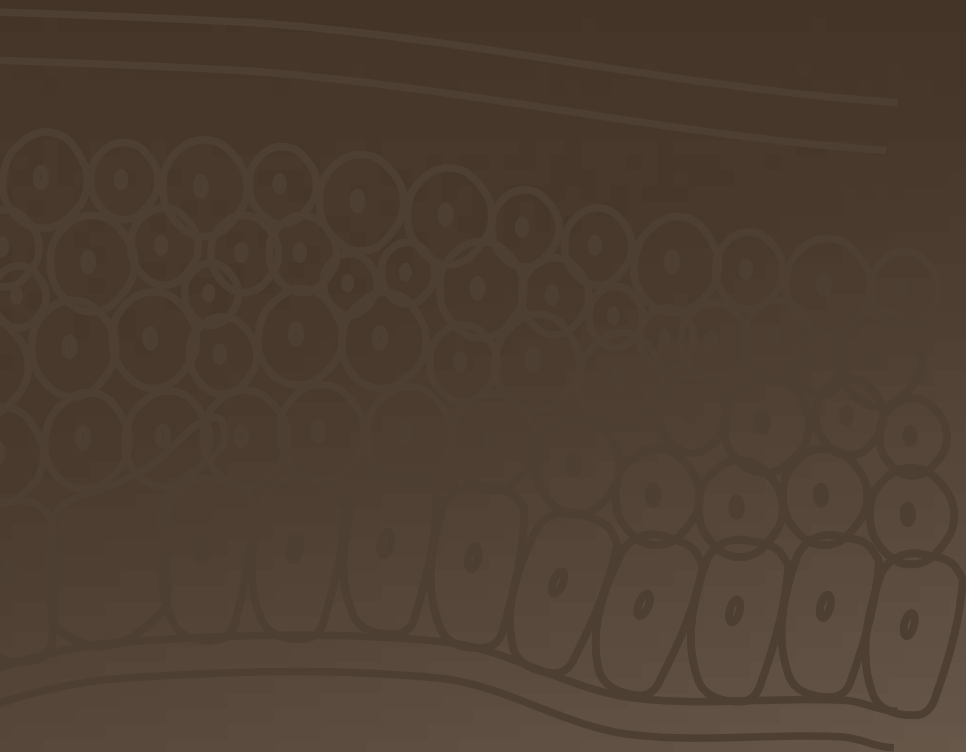
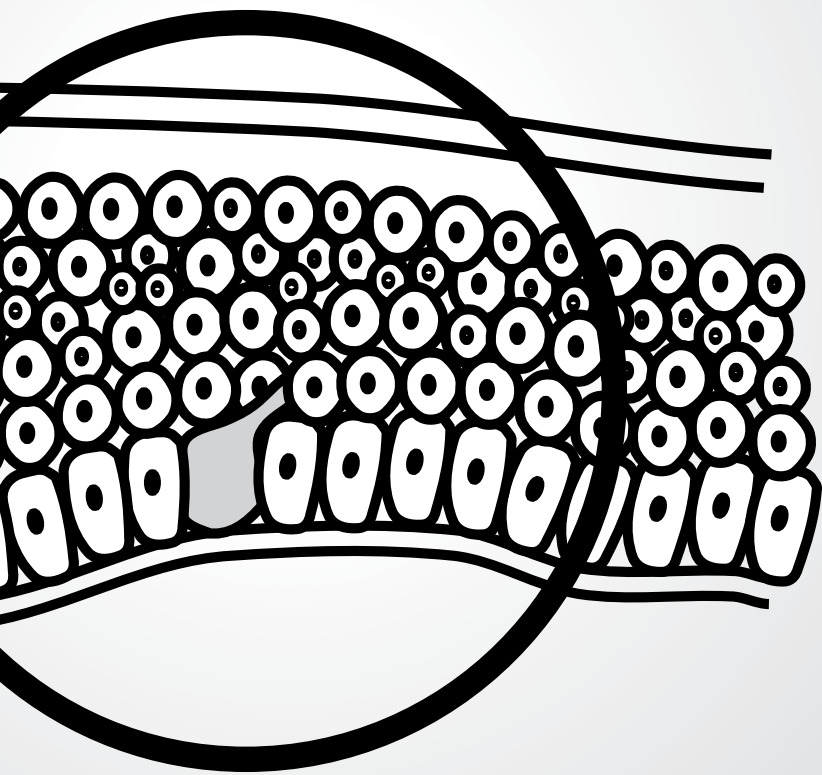


Mohs Micrographic Surgery

A handbook for patients



SKIN INSTITUTE



Introduction

Mohs micrographic surgery is the most advanced and sophisticated method of curing skin cancer and achieves cure rates that are higher than any other technique.

This technique was devised almost 60 years ago by Dr. Frederic Mohs, at the University of Wisconsin. It was initially known as chemosurgery, but is now called Mohs micrographic surgery after its inventor. Because this method requires doctors who have highly specialised training, dedicated personnel and specific surgical facilities, few medical centres are equipped to offer such treatment.

This booklet attempts to answer some questions you may have as a patient concerning this mode of treating skin cancer. If you have any further questions, please do not hesitate to contact us.

About Us

The Skin Institute is uniquely positioned by having surgeons and physicians from several specialties who work together to provide the best and most advanced care for patients with skin cancer. Our team includes specialists from the following areas: Dermatology, Facial Plastic Surgery, Head and Neck Surgery, General Surgery, Ear Nose and Throat Surgery, Plastic Surgery and Radiation Oncology. Being the only facility in New Zealand having a multidisciplinary team of specialists dealing with skin cancer, we are able to provide a comprehensive and seamless service for all categories of patients and complexities of skin cancers.

Skin Cancer Specialists and Dermatologic Surgeons

Dr Mark Gray <small>MBChB, FRCPC, FRCPA, ABPath, ABDermPath, FASMS, FACCS</small>	Dermatologist	Dermatology, Pathology and Dermatopathology. Fellow of the American Society for Mohs micrographic surgery
Mr Mark Izzard <small>MBBS, FRACS (ORLHNS)</small>	Facial Plastic Surgeon	Facial Plastic Surgery, Head and Neck Surgery and Otolaryngology
Mr Isaac Cranshaw <small>MBChB FRACS</small>	Surgical Oncologist and General Surgeon	Specialised in general surgery, followed by international fellowship training in surgical oncology (melanoma, sarcoma, skin cancers)
Mr Julian Lofts <small>MBChB FRACS (Plast.)</small>	Plastic and Reconstructive Surgeon	
Dr Vania Sinovich <small>MBBCh MRCP(Lond) FRACP</small>	Dermatologist	
Dr Anthony Falkov <small>MBBCh (Wits), SRANZ, FRANZCR</small>	Radiation Oncologist	

All our specialists are on the New Zealand Medical Council Specialist Register and are recognised by insurers.

Dr Mark Gray



Dr Mark Gray is the lead Mohs Surgeon and has been performing Mohs surgery for over 12 years. He holds triple specialist qualifications in Dermatology, Pathology and Dermatopathology. Dr Gray is the doctor who will usually perform the procedure.

Mr Mark Izzard



Mr Mark Izzard is the lead Reconstructive Surgeon. He is specialised in Otorhinolaryngology, head and neck surgery and facial plastic surgery. Mr Izzard is trained in microsurgery and specialises in reconstruction of the face and nose. Mr Izzard may also consult you for the risk of spread of skin cancer to the lymph nodes of the neck.

Mr Isaac Cranshaw



Mr Isaac Cranshaw is a Surgical Oncologist who specialises in the treatment of skin cancer and melanoma both at Auckland City Hospital and the Skin Institute.

Support staff

In addition to the physicians, the team includes nurses who are experienced in caring for patients who have skin cancers at all stages of their diagnosis and treatment. Another important member of the team is a technician who quickly and skillfully prepares the tissue for microscopic examination. Finally, a patient care co-ordinator rounds out the team and is best qualified to handle your questions regarding insurance forms or other financial matters.

Our facilities

We have state-of-the-art consulting rooms and surgical facilities that are accredited to the highest New Zealand standards. Our theatres are equipped for undertaking surgery under sedation or general anaesthesia if needed, together with a day stay area for those requiring lengthier procedures.

Definitions

Benign Tumour

A non-cancerous growth that does not invade nearby tissue or spread to other parts of the body.

Biopsy

The removal and microscopic examination of tissue from the skin for purpose of diagnosis.

Cancer

A general term for many different diseases characterised by abnormal and uncontrolled growth of cells. The resulting mass, or malignant tumour, can invade and destroy surrounding normal tissues. In addition, certain types of cancer can spread (metastasize) through the blood to start new cancers in other parts of the body.

Malignant Tumour

Cancer. A growth of cancer cells (see definition of cancer).

Metastasize

The spread of cancer through the blood or lymph vessels from one part of the body to another.

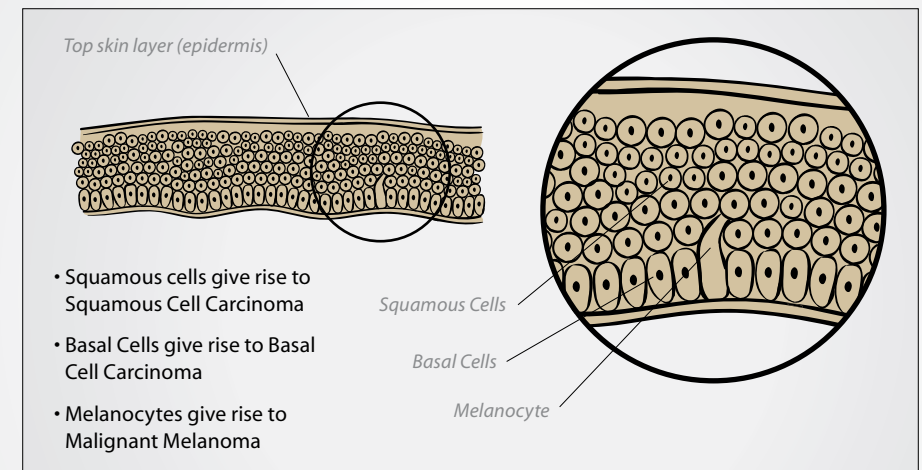
What is skin cancer?

Types of skin cancer

Cancer occurs when cells begin to grow at an uncontrollable and unpredictable rate. In the skin, there are three main forms:

- basal cell carcinoma (BCC)
- squamous cell carcinoma (SCC)
- malignant melanoma

The names refer to the cell types in the top skin layer (the epidermis) from which these cancers are derived.



Is it dangerous?

New Zealand has the highest rate of skin cancer in the world. Every year, almost 70,000 skin cancers are diagnosed, making skin cancer the most common cancer. Over 300 people die from skin cancer each year. Many deaths could be prevented by earlier diagnosis and management.

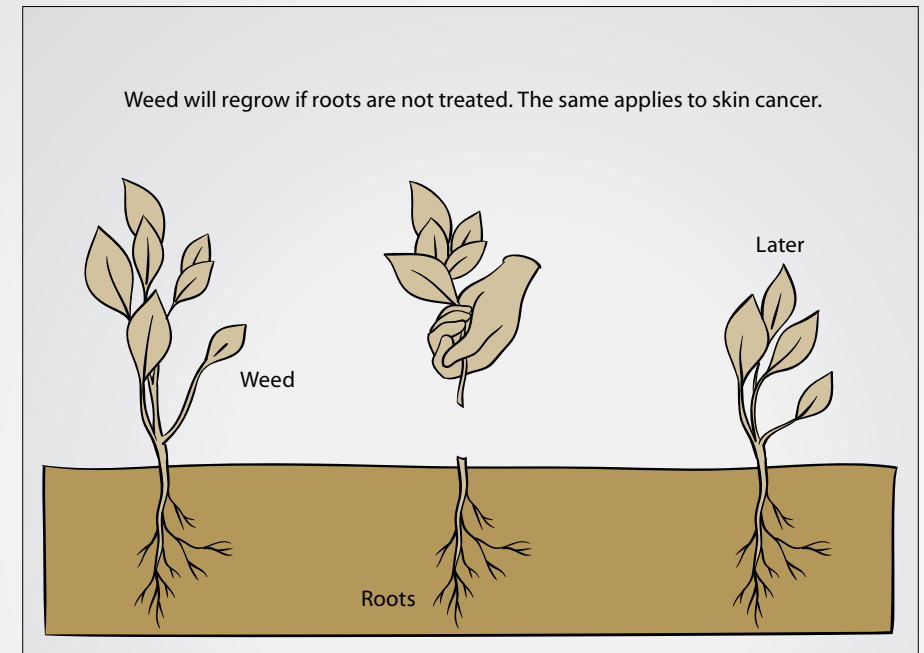
The most common types of skin cancer are basal cell carcinoma and squamous cell carcinoma. Both types enlarge from the point where they first occur and usually do not spread (metastasize) to distant parts of the body. If not completely removed, both will invade and destroy structures in their paths. Compared to other forms of cancer, these types of skin cancer can be recognised in their early stages and are therefore easily cured. Malignant melanoma, on the other hand, 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. Sometimes melanomas arise in moles that have been present for many years.

What causes skin cancer?

The cause of skin cancer, like other forms of cancer, is not completely known. Excessive exposure to sunlight is the single most important factor associated with the development of skin cancers. Consequently, skin cancers most commonly develop on the face and the arms, the most sun-exposed parts of the body. Fair-skinned individuals develop skin cancer more frequently than dark-skinned individuals. Sunburns, especially in childhood, have been linked closely with BCC, whereas cumulative sun exposure over many years is associated with the development of SCC. The role of sunlight exposure in melanoma is less clear and genetic predisposition is perhaps the most important risk factor. Other possible causes of skin cancer include X-rays, trauma, virus, infection, smoking and certain chemicals.

How does skin cancer start?

Skin cancers begin in the uppermost layer of the skin (the epidermis) and grow to the sides on the surface of the skin and downward, below the skin surface, with root-like extensions. This is comparable to the roots of a weed (see illustration below).



How does skin cancer grow?

Unfortunately, root-like extensions of skin cancer cannot be seen with the naked eye. Therefore, what is apparent to the naked eye on the surface of the skin may actually be only the visible “tip of the iceberg.”

Skin cancer treatment

In addition to Mohs micrographic surgery, there are several methods of treating skin cancer including excision (surgical removal) and immediate closure (suturing or sewing), curettage and electrodesiccation (scraping with a curette and burning with an electric needle), radiotherapy (X-ray), cryosurgery (freezing), topical anti-cancer agents and Photodynamic Therapy (PDT). Which method we use depends on several factors, such as the location of the cancer, its size and previous therapies. Many patients ask about laser treatment of skin cancers. Laser treatment is simply another method to burn off skin cancers, similar to electrodesiccation mentioned above. The chart overleaf lists the points for and against the different skin cancer treatment methods. Except for Mohs micrographic surgery, all other methods of skin cancer treatments require guessing how wide and deep to treat. In Mohs micrographic surgery, removed tissue is examined under the microscope and the tumour is mapped so that guessing the extent of the tumour is eliminated.

Different skin cancer treatment methods

Treatment method	Points for	Points against
Mohs micrographic surgery	Highest cure rate; smallest scar	Time consuming; expensive
Excision with closure	Fast	May not remove all cancer, especially if treated before unsuccessfully
Excision and closure with frozen sections in operating room	Examines some tissue at surgery	Does not examine all tissue removed; expensive
Curettage and electrodesiccation	Fast; inexpensive	Likely to leave tumour if on face or if previously treated
Radiotherapy (X-rays)	Non-surgical	May scar; requires 15-20 treatment sessions; expensive
Cryosurgery	Fast; inexpensive	May not treat all of tumour; may scar
Laser	"Hi-tech"	Superficial and unlikely to cure deeper roots; expensive
Topical therapy (Efudix, Aldara)	Good cosmetic result; inexpensive	Unlikely to cure cancer if large or if deeper cancer roots
Photodynamic Therapy	Excellent cosmetic outcome	May not cure cancer if large or if deeper cancer roots; expensive

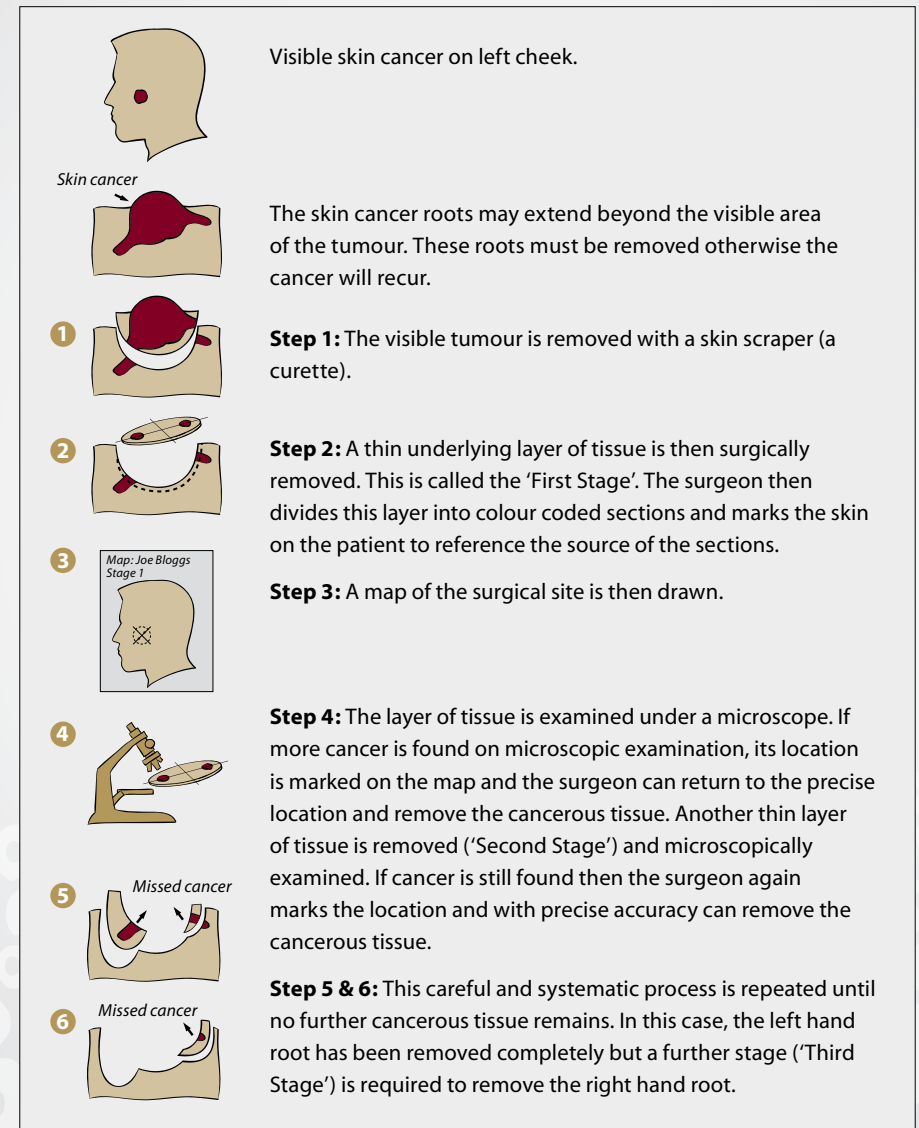


Mohs micrographic surgery

Mohs micrographic surgery involves surgical excision of cancer containing tissue and systematic microscopic examination of all cut surfaces at the time of the operation. It is a highly specialised procedure for the total removal of skin cancers.

How is Mohs micrographic surgery performed?

Mohs micrographic surgery is performed as a day case procedure, usually under local anaesthetic. Sedation or general anaesthesia can be provided to patients who require major surgery. This method involves six separate steps:



How long does it take?

Complete removal of a skin cancer, which may involve several surgical stages, is usually completed in half a day. After the surgery, a decision is made as to the best way to manage the wound created by the surgery. This will be discussed below.

How effective is Mohs micrographic surgery?

Using the Mohs micrographic surgical technique, the cure rate is very high, often 95% to 98%, even if other forms of treatment have failed. This is the highest cure rate among all treatments available for treating skin cancer.

What are the advantages of Mohs micrographic surgery?

- Mohs surgery has the highest cure rate for skin cancer.
- It is especially suited for poorly defined tumours, recurrent tumours and tumours known to behave in an aggressive manner.
- Mohs surgery provides the surgeon with confidence that the tumour is completely removed prior to closure of the wound (if required).
- With Mohs surgery, less adjacent normal skin is sacrificed resulting in smaller wounds and therefore smaller scars.

What are the disadvantages?

- Mohs surgery is more time consuming than routine surgery.
- It involves more staff and equipment and because it takes longer to perform, Mohs surgery is more expensive than routine surgery.

Will the surgery leave a scar?

Yes. Most forms of therapy will leave a scar. However, the Mohs micrographic surgical procedure allows any scars to be as small as possible.

How does Mohs micrographic surgery differ from cancer removal in the operating room with "frozen sections"?

Some doctors who are not trained in Mohs surgery remove skin cancers and have a pathologist check the margins of excision by doing frozen sections at the time of surgery. This

is not the same as Mohs surgery. In such cases the tissue is processed by a pathologist who samples representative radial sections of the excised tissue, rather than processing the entire surgical margin as in Mohs surgery. This is analogous to examining a few slices in a loaf of bread rather than examining the whole crust of the loaf. In Mohs micrographic surgery the entire sides and under-surface of the excised tissue is examined for possible tumour and it is possible to know exactly where any potential residual tissue remains.

Preoperative visit

The preoperative visit gives the physician an opportunity to examine your skin cancer, take a pertinent history and determine whether the technique of Mohs micrographic surgery is the most suitable way of treating your skin cancer. Also, it gives you, the patient, the opportunity to learn about the procedure. At the time of the preoperative visit, we need to know about your medications, allergies and any current medical problems. Also, we need to know if you have any artificial joints, pacemakers or heart valves. Every skin cancer is different and because of the length of the treatment, careful scheduling is necessary. A suitable date for surgery that is mutually acceptable will be arranged as soon as possible.

Usually a small biopsy of the tumour will be obtained to confirm the type of tumour present and its pattern of growth. All patients are photographed before and after surgery and after healing. These photographs become part of your medical record and may be used for teaching or research purposes.

Will I need to be hospitalised?

Virtually all patients are able to go home after surgery. Hospitalisation is only required if extensive surgery is required. This will be discussed with you if applicable.

Should someone come with me on the day of surgery? Do I need someone to drive me home?

Yes. It is recommended that you have someone drive you home - and it may be pleasant to have company while sitting in the waiting room. 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, most of which you will spend in the waiting room. We will provide you with refreshments and light snacks.

Day of surgery

Appointments for surgery are usually scheduled early in the day. This allows us to continue the surgical steps throughout the entire day, if necessary. The nurse will escort you to an operating room where a physician or nurse will review your health history. You will then be injected with a local anaesthetic, usually Xylocaine, around the skin cancer to numb the skin and prevent discomfort during surgery.

The next step is for the surgeon to remove a thin layer of tissue involved by the cancer. After this tissue has been carefully removed, bleeding is stopped with a machine called a cautery. You may feel a slight amount of heat in the wound. Before you leave the operating room, the nurse will apply a bandage to your wound and by the time you get to the waiting room, the removed tissue will be in the laboratory where it is prepared for microscopic examination. The most difficult part of the procedure is waiting for the results of the surgery. It usually takes between one to two hours to prepare the slides, although occasionally it may take somewhat longer. While you are waiting, you may go out as long as you can be contacted by cell phone. Please do not consume alcoholic beverages. Alcohol dilates blood vessels and may promote bleeding. If examination of the slides reveals that your tissue still contains skin cancer cells, the procedure will be repeated as soon as possible. Several surgical excisions and microscopic examinations may have to be done in one day and occasionally it is necessary to have a patient return the following day for additional surgery to clear the skin cancer.

How should I prepare myself for Mohs micrographic surgery?

Try to get a good night's rest, eat a light breakfast and come to the clinic at the time that has been set-aside for you. If you are taking any medication, take it as usual unless we direct otherwise. You should bring your medications to the clinic and take them as usual.

Preoperative medications

Blood Thinners. If you are on a blood thinner like Warfarin or Aspirin, we recommend that you continue taking it as prescribed.

Number of stages

How many stages or levels (sessions) of Mohs micrographic surgery will I need?

This depends entirely upon how deep or extensive your skin cancer is. Unfortunately, there is no way to determine this prior to surgery. On average, skin cancer requires two to three stages for complete removal.

How long does surgery take?

The surgery to take the levels only takes a few minutes. However, after the surgery, it usually takes between one to two hours or longer for the slides to be prepared for the physician to complete the complex microscopic examination. Several surgical stages and microscopic examinations may be required.



Wound repair

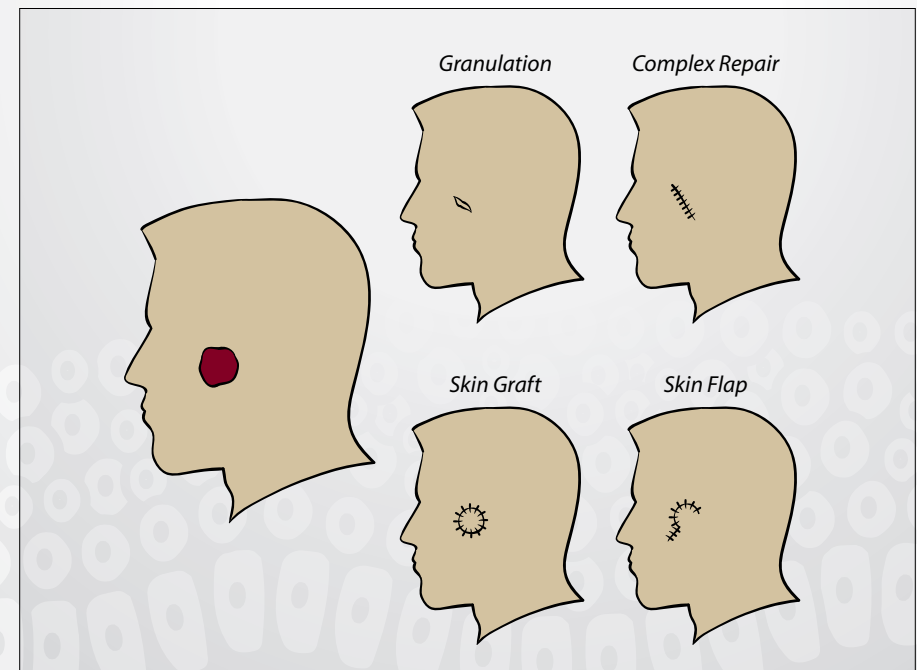
When we have determined that the skin cancer has been completely removed, a decision is made about what to do with the wound created by the surgery. Usually there are two choices: (1) to let the wound heal by itself ("granulation") or (2) to repair (close) the wound with stitches (either by bringing the wound edges together or with a skin flap or skin graft). The following chart compares these two methods. We will discuss with you which of these choices will be best in your individual case.

For and against

	Points for	Points Against
Natural healing (granulation)	No further surgery; less expensive	Takes 4-8 weeks to heal; noticeable scar may result
Sutures (repairs)	Fast healing (usually 1 week); maybe less noticeable scarring	Further surgery required; more expensive

What are the methods of wound repair?

A wound may be closed by repair immediately after Mohs micrographic surgery by either (A) bringing the wound edges together and trimming excess skin (a side-to-side/complex closure repair), or (B) a skin graft, or (C) a skin flap (see illustration below). A skin graft is a piece of tissue the same size as your wound; it is tissue taken from elsewhere on the body (usually from behind the ear or over the collarbone). After the skin graft is taken it is sutured onto your wound. A skin flap is skin that is nearby the wound; this skin is shifted into the wound by a series of complex incisions.



Should repair (reconstructive) surgery be performed? If so, when?

It is impossible to tell with certainty prior to surgery, how deep or wide your wound will be. Although we have a general idea prior to Mohs micrographic surgery, we prefer to wait until the entire tumour is removed before thinking about whether to repair the wound immediately or what kind of repair to select. This concept is like walking over two bridges. One has to cross the first bridge before getting to the second bridge. Furthermore, it may be preferable to wait for a few days after Mohs micrographic surgery before a repair is done. Some repairs are more likely to be successful if they are delayed.

If the wound is allowed to heal by itself, what is the procedure?

If the wound is allowed to heal by itself (or “granulate in”), it usually heals in 4 to 8 weeks. The dressing must be changed every day until the wound heals completely. All wounds normally drain and dressings are changed daily to rid the wound of such drainage so that it does not accumulate into a crust. Also, the dressing keeps the wound moist and this helps the wound heal faster with less of a scar. Leaving a wound open to the air will cause a crust to form that will delay healing and may cause more of a scar. The nurse will instruct you on how to perform dressing changes and will give you a written instruction sheet.

If the wound is repaired, what is the procedure?

If we close the wound with sutures, keep the wound clean and dry for 24 hours. After that, you may get the wound wet. If you see foul smelling fluid coming from the wound, call our clinic immediately. This may mean that the wound has become infected and an antibiotic may be necessary.

What happens after the wound has healed?

You may experience a sensation of tightness (or drawing) as the wound heals, but this is normal. After several months, you will feel this less and less. Frequently, tumours involve nerves and it may take up to a year, or even two, before feeling returns to normal, or near normal. Sometimes the area stays numb permanently. Only time will tell. The new skin that grows over the wound contains many more blood vessels than the skin that was removed. The new blood vessels result in a red scar and the area may be sensitive to temperature changes (such as cold air). This sensitivity improves with time and the redness gradually fades, but, if

you are having a lot of discomfort, try to avoid extremes of temperature. Patients frequently experience itching after their wound has healed because the new skin that covers the wound does not contain as many oil glands as previously existed. Scars may also itch. Vaseline petroleum jelly will help relieve the itching. If this problem is particularly bothersome, an injection of a steroid may be helpful.

Will I have pain after surgery?

Most patients do not complain of pain. However, pain is an individual experience and, if you are uncomfortable, we recommend taking 2 Panadol tablets every 4 hours. Avoid aspirin-containing medicine compounds as these may produce bleeding.

What about bleeding after surgery?

Occasionally there is continued bleeding following surgery. If this occurs, lie down, remove all of the bandages and with gauze, place steady, firm pressure over the wound to the area that is oozing blood. Apply pressure continuously for 20 minutes. Do not lift the bandage to check on the bleeding. If the bleeding persists after 20 minutes of steady pressure, notify our clinic or go to the nearest hospital or emergency centre. Alcoholic beverages or heavy exercise may bring about bleeding after surgery.

What are some tips to help avoid complications?

Sometimes complications are inevitable. However, we have found that there are three things you can do to help your wound to heal:

1. Put the wound at rest. Stress on wounds promotes bleeding and scarring. In addition, wounds under stress take longer to heal. Therefore, avoid heavy exercise, bending or lifting for one week after surgery.
2. Keep the wound covered. A moist wound heals faster with less scarring than a wound uncovered and exposed to air. Therefore, keep your wound bandaged until it is healed completely.
3. Avoid alcohol for 48 hours and do not smoke for 2 weeks before the surgery and 2 weeks after.

What are other complications?

All wounds normally develop a small, surrounding halo of redness that disappears gradually.

Severe **itching** with extensive redness usually indicates an allergy to the ointment used to dress the wound or a reaction to adhesive tape. You should call our clinic if this develops.

Rarely, **nerves** are severed while removing your skin cancer. Nerves give feeling to your skin and enable you to control your muscle movement. We will discuss with you before surgery if we feel this is a likely situation in your case. Nerves may be injured during surgery, especially if your tumour is near, wraps around, or invades nerves. Nerve damage may result in loss of muscle function or sensation. Loss of muscle function is rare after Mohs micrographic surgery; loss of sensation is more common. Loss of sensation usually gets better with time. All wounds normally drain, which is why we usually insist on frequent dressing changes.

Infection is unusual. If it does occur, the wound will be very red and tender and pus may be present.

Tissue **swelling** around wounds is very common and will resolve with time, usually a few days. Eyelid swelling can be particularly extensive for surgery done on and near the eyelids, nose or forehead. Using two pillows to rest your head when lying down may minimise eyelid swelling. Ice or cold compresses may also help to minimise swelling. Some **scarring** is present after Mohs micrographic surgery. Usually this is minimal. How to improve scarring is discussed below. Other possible complications include mild bleeding during the operation and a reaction to the local anaesthetic used: the latter being a very rare problem.

How can I improve my scar?

Nearly everyone has an opinion about what to use to help make a scar less noticeable. Slight elevation of scars or lumpiness (usually from sutures) can be improved by firm pressure massage for one minute repeated several times a day. This massage is generally begun one month after the wound is healed until several months later. Contrary to popular opinion, we do not feel that oral vitamin C, topical aloe or topical vitamin E significantly help wound healing or scars.

What happens if I do not have my skin cancer treated?

All types of skin cancer will grow and invade nearby tissue. How fast a skin cancer will grow is unpredictable and varies from person to person. Sometimes skin cancer will destroy important structures, such as the nose, lip or eye. Occasionally, skin cancers can spread and cause death.

How often must I return for follow-up once the wound has healed?

Studies have shown that once you develop a skin cancer, there is a high risk you will develop others in the years ahead. We recommend that you be seen at least once a year for the rest of your life by your dermatologist or referring physician so he or she may determine whether you have developed any new skin cancers. Also, should you notice any suspicious areas on your skin, it is best to check with your referring physician to see if a biopsy is required.

Will my insurance reimburse me for Mohs surgery?

Some health insurance policies cover the total cost of Mohs micrographic surgery. Most cover at least part of it. Each policy is different. Please check with our patient care co-ordinator if you have any questions regarding costs and insurance forms.

Later on, must I avoid the sun?

No, not entirely. We do not think that sunshine will be harmful to you as long as you provide yourself with adequate protection, avoid burning and use discretion. As mentioned earlier, sunlight probably is the main cause of skin cancer and patients who have developed one skin cancer often will develop more at a later time. Therefore, in the future, when you go into the sun, we recommend that you liberally apply a sunscreen (with an "SPF" of 15 or greater) to all exposed areas, including the tops of the ears. We recommend using broad-spectrum sunscreens that provide both UVA and UVB protection. It is best to apply the sunscreen about 15 to 30 minutes before going outdoors. Be sure to reapply it liberally after swimming or exercising since most sunscreens wash off with water or perspiration. In addition to a sunscreen, you may wish to wear a broad-brimmed hat and wear clothing to further protect you from the sun. Remember, it may not be necessary for you to restrict your outdoor activities or to change your lifestyle if you follow this advice.

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