



University Hospitals Birmingham
NHS Foundation Trust



Mohs Micrographic Surgery

Building healthier lives

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www.uhb.nhs.uk/patient-information-leaflets.htm

What is Mohs micrographic surgery?

Mohs micrographic surgery is a specialised method of treating some skin cancers, including those that:

- are difficult to see the extent of
- are large or have grown into deeper tissues or around nerves
- are near sensitive areas such as the eye
- have recurred following previous treatments
- have a high chance of recurring because of their type

With the Mohs technique, surgically removed tissue is carefully mapped, colour-coded, and thoroughly examined immediately after surgery. Any skin cancer that may be left behind can be accurately located. Further tissue is then removed from these areas. The procedure is repeated until the whole skin cancer is removed. The wound is then repaired.

Why is it necessary to map a skin cancer?

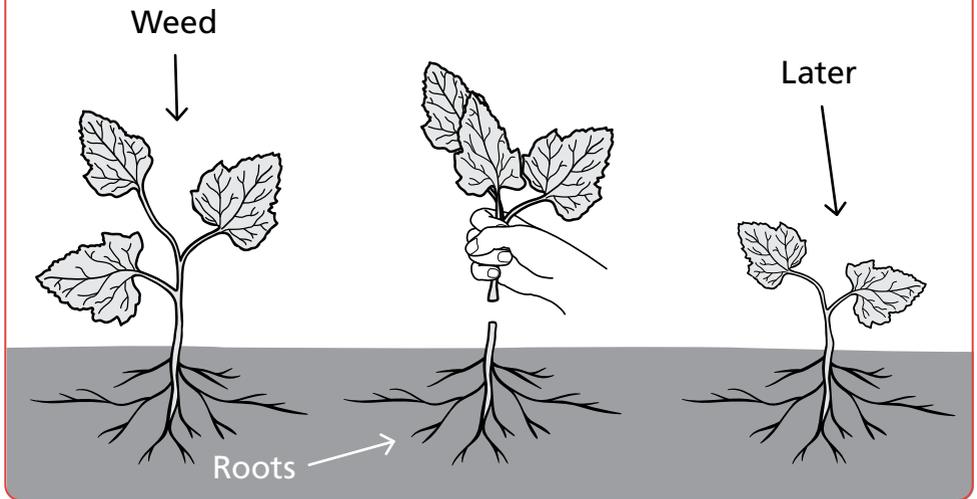
Some skin cancers grow in a similar way to a weed – that is to say that the skin cancer may have roots extending beyond the visible lesion. If all the roots are not removed, then it is likely that the tumour will grow back (as would a weed, as shown in the picture opposite). Mapping the skin cancer using the Mohs technique allows the roots to be traced to ensure none are left behind.

What are the benefits of Mohs surgery?

Mohs surgery provides confidence that the tumour, including all the roots, is completely removed prior to closure of the wound.

Mohs surgery leads to a higher cure rate and a lower rate of recurrence for some types of skin cancer.

Weed will regrow if roots are not treated. The same applies to skin cancer.



What are the alternatives?

Ordinary surgery or radiotherapy (using high dose X-rays to kill cancer cells) may be suitable alternatives for certain skin cancers. These will be discussed with you if appropriate.

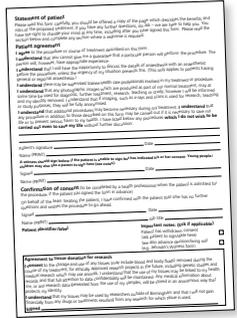
What does the procedure involve?

The Mohs surgical process involves surgical excision followed by microscopic examination of the tissue to assess if any skin cancer cells remain. If there is residual skin cancer, further localized surgery is carried out to remove it. This process goes on for as long as it takes to completely remove the skin cancer. Most skin cancers are removed with 1 to 3 excisions. Some skin cancers that appear small may have extensive roots beneath them, resulting in a larger surgical defect than would be expected. It is therefore impossible to predict the final size or depth until all surgery is complete.

The following summarises the main steps involved:

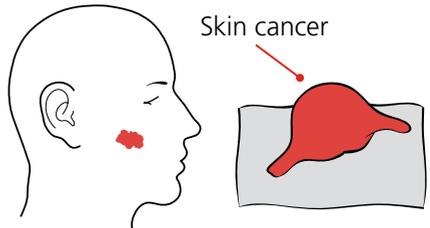
Step 1: Meet surgeon and complete consent form

You will meet your operating surgeon on the morning of surgery, who will explain your procedure and be able to answer any questions you may have. You will be asked to sign a consent form. Your operating surgeon may not be the same doctor you met at your outpatient appointment.



Step 2: Local anaesthesia

The skin cancer is identified and the surrounding skin is completely numbed with local anaesthetic injections.



Step 3: First stage – the visible skin cancer and a safety margin is excised

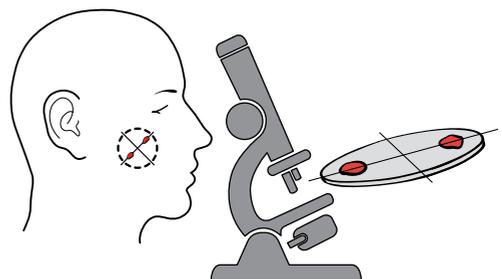
The skin cancer with a margin of surrounding skin is excised. An electric needle (cautery) is used to stop the bleeding. The wound is dressed. You are accompanied back to your bed-space/waiting room while the sample is analysed.



You can have a light snack but be careful of hot drinks if you have had an anaesthetic near the mouth.

Step 4: Mapping and analysis

The sample is sent to the laboratory for analysis under the microscope. This can take several hours. The surgeon or a member of his team will let you know the results when they are available.

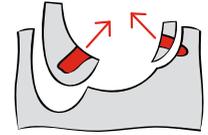


Step 5: Additional stages are performed as necessary to ensure all cancer cells are removed

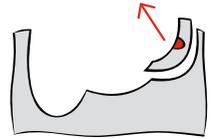
If the analysis shows that roots of the cancer may still be left behind then a further amount of skin in the affected areas is removed. As before, any excised tissue is mapped, colour-coded, processed and analysed for cancer cells. A stage is another name for the excision procedure.

If microscopic analysis still shows evidence of residual skin cancer, the process is repeated stage by stage until the cancer is completely removed. If needed, this is continued in to the following day.

'Stage two'
Residual cancer



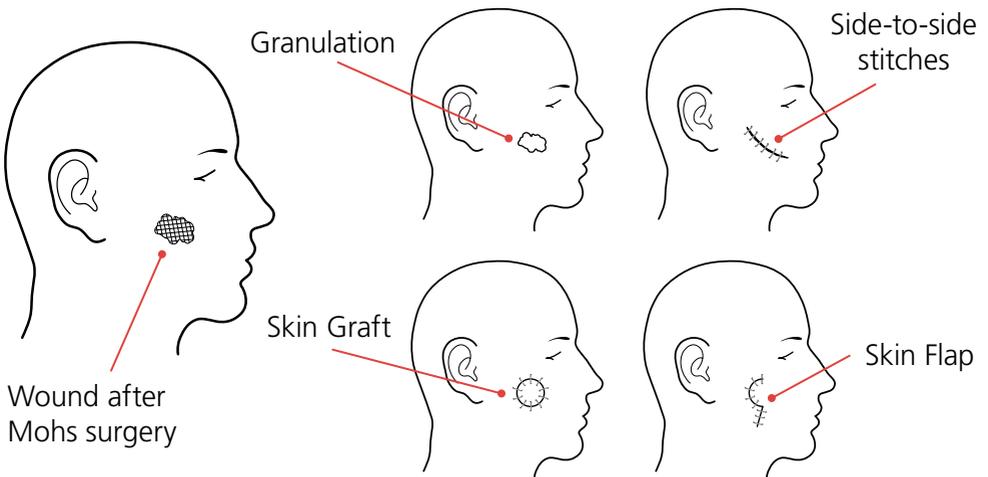
'Stage three'
Residual cancer



Step 6: The wound is repaired

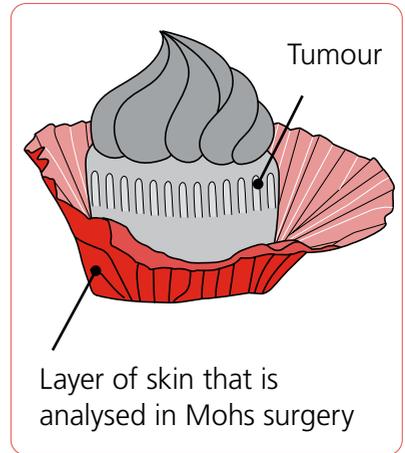
The best method of repairing the wound can only be determined after the cancer is completely removed, as the size and depth of the final defect cannot always be predicted prior to surgery.

Sometimes the wound is repaired on the following day. If another consultant surgeon is repairing your wound, then this might occur later in the week or rarely in the following week.



How are the roots of the cancer analysed so precisely?

The Mohs technique is the only method that allows the entire edge of a piece of skin to be analysed. This is because of the special way in which the specimen is excised, colour-coded and prepared. If you imagine the skin that is removed to be like a muffin, then a thin layer all the way around it, akin to the wrapper, is shaved and tested with each Mohs layer. This allows a comprehensive assessment of all the roots.



Who will perform my procedure?

This procedure will be performed by a Mohs surgeon who is a member of the Skin Cancer Multidisciplinary Team.

How many stages are usually required?

Over all, 70% of patients require one Mohs stage (excision), 20% require two, and 10% require three or more.

How long does it take to complete surgery?

Sometimes the Mohs excision(s) and repair can be completed in one day. If it cannot, then the wound is dressed securely and you will be able to go home, for the procedure to be continued the following day. Occasionally your surgeon will require you to stay in hospital overnight. If another consultant surgeon is repairing your wound, then you will be given instructions on when to come back – this may be later in the week.

Are there any variations to this procedure?

There are a number of special circumstances when the Mohs technique is modified such that a large wide excision is performed from the outset, and the tissue is processed in the way explained above. This is generally in relation to skin cancers that require a wide safety margin as part of their standard treatment such as certain types of melanoma and rare skin cancers such as extra-mammary Paget's disease and some skin sarcomas. Modified Mohs is often performed as a single operation, sometimes under general anaesthetic, and the wound is repaired immediately after the lesion is removed. Your doctor will discuss this with you if appropriate.

What kind of anaesthetic will I require?

The majority of procedures are carried out under local anaesthetic. This means you are fully awake, and a series of numbing injections are given to area. Further injections may be needed throughout the day, usually before further stages are performed. Occasionally, some patients may need to have a general anaesthetic for some or all of the operation. This will have been discussed with you in the clinic before scheduling your surgery.

How big will the final wound be?

It is impossible to tell with certainty prior to surgery how wide or deep your wound will be. Although we have a general idea, it is best to wait until the entire skin cancer is removed before planning a definite repair.

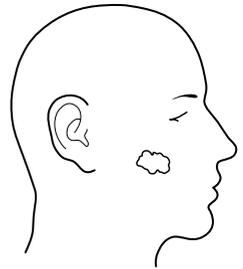
How will the wound be reconstructed?

There will be a wound following completion of the Mohs surgery. The way it is reconstructed (or 'mended') will depend on the site and size of the wound. In some cases, it is best to leave the wound to heal by itself but the majority will need some stitches, a skin graft or skin flap. It is usually possible to give some indication before the surgery as to the probable reconstruction but the final decision can only be made once the cancer is completely removed.

In certain situations, we may arrange for the reconstruction to be carried out by one of our other consultant surgeons. This will be discussed with you as necessary.

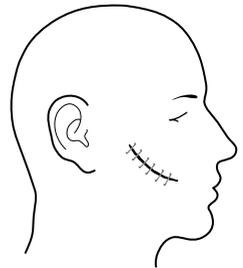
Granulation

This involves letting the wound heal by itself naturally. Certain areas of the body will heal naturally with a scar that is just as good or better than one from further surgical procedures. Healing time is approximately 1 to 2 months.



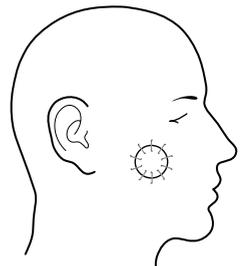
Side-to-side stitches

Closing the wound with stitches is often performed on smaller lesions. 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.



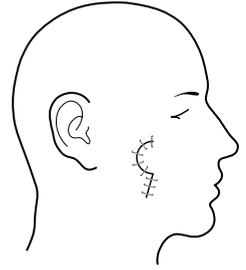
Skin grafts

Skin grafts involve covering the wound with skin from another area of the body. This patch of skin may be cut out and stitched up, or shaved off the skin surface.



Skin flaps

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



What are the risks?

The procedure is time-consuming as a series of operations are required. The procedure takes place over 1 to 2 days (occasionally longer). If the procedure lasts longer than a day, you may be sent home with a dressed wound.

The amount of skin that needs to be removed is not predictable, as the procedure is continued until the skin cancer is excised in its entirety. Consequently the methods, with which the area can be reconstructed after the skin cancer is removed, can only be discussed with you once the excision is complete. An idea of what is likely to be required can be given beforehand but this is not guaranteed.

Side effects include:

- **Scars** – All surgery carries a risk of scarring. Scars are generally red for 3-6 months and then gradually become paler. Blood vessels (telangiectasias) can form around scars. Some individuals have a tendency to heal with raised and thick (keloid) scars. Scars can stretch, especially if they are near areas of the body that are mobile.
- **Bruising** – around the site is common, and swelling can persist for 4 weeks.
- **Pain** – can develop once the local anaesthetic wears off. It is best to have your usual painkillers ready.
- **Numbness** – or altered sensation around the scar is common. This usually recovers after several months but may be permanent. Occasionally numbness can extend to larger areas if sensory nerves have been cut during the procedure.

In some areas of the body, there is a risk of motor nerve damage which can lead to muscle weakness (such as weakness in raising the eyebrow). This is mainly in relation to skin cancers in the temple, jaw line and middle of the neck. Damage to nerves that affect the muscles is rare. It usually occurs because the skin cancer is very close to or involves a nerve, but can also result from injury during surgery from the diathermy, injection needles, or because the nerve has been accidentally cut.

- **Bleeding** – (see 'After the procedure').
- **Infection** – (see 'After the procedure').
- A small number of skin cancers can still **recur** despite undergoing this procedure.

How do I prepare for the day of surgery?

- Mohs surgery is usually completed as a day case over 1 or 2 days. The best preparation for surgery is a good night's rest followed by a light breakfast. Since you can expect to be at hospital for most of the day, it is wise to bring a book or a few magazines to read. Also, because the day may prove to be quite tiring, it is advisable to have someone accompany you to provide company and to escort you home. Refreshments and a light meal will be provided, though you might also prefer to bring along some snacks with you.
- Avoid alcohol for 3 days before and 3 days after surgery as this increases the risk of bleeding and poor wound healing. Smoking should be avoided 2 weeks before and 2 weeks after for similar reasons.
- Prepare a list of any tablets or medicines you are taking, and note any allergies you have, and bring this with you. You should continue taking your normal medicine unless you have been specifically advised not to.
- Continue taking aspirin and clopidogrel (unless you have been specifically asked not to).

Important advice if you are on warfarin

Your INR needs to be 2.5 or less for the procedure to be carried out. Please inform your anticoagulation service of this and of the date of your procedure and arrange to have an INR test 5 days before your surgery date:

- If the INR is 2.5 or less 5 days before surgery, stay on the same dose of warfarin. A further INR test is not required
 - If the INR is greater than 2.5, 5 days before surgery, please ask your anticoagulation service to reduce your dose accordingly. Arrange a further INR test before 1 or 2 days before surgery if you can
 - Bring your Yellow Warfarin Book with you to your surgery
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- Make sure you have a supply of your usual painkiller, such as paracetamol, at home to take for discomfort after your operation.
 - You should not drive or travel unaccompanied so please arrange for someone to collect you.
 - If you are having a local anaesthetic, you may continue to eat and drink normally, however, light meals are preferable on the day.
 - Wear loose clothing that is easy to remove if needed. For procedures on the feet or lower legs wear loose footwear, slippers or sandals that can accommodate dressings.
 - Do not wear any make-up, jewellery or perfumes. Avoid moisturising creams and lotions on the day of surgery as this prevents dressings from sticking.
 - It is advisable to have a shower or bath the night before or the morning of our operation. If your operation is to the head area, please wash your hair the night before or day of surgery.

What happens on the day of surgery?

Please check your appointment letter for where you need to attend. This will usually be at the Dermatology Department in Area 4 Outpatients at Queen Elizabeth Hospital Birmingham.

The time you need to arrive at will also be mentioned on the letter.

You will be admitted by the nursing staff, and asked to change into a gown. The operating surgeon will come and see you before your procedure and you will have the opportunity to ask questions.

The procedure will take place in an operating theatre. Each operation takes 30 to 60 minutes. You will be accompanied back to your bed space or waiting area between operations, usually with a temporary dressing and bandage over the wound.

The most difficult part of the surgery is waiting for the results, which can take several hours. The surgeon or nurse will let you know the results. If the results show that your tissue still contains skin cancer then you will require a further stage. You will be accompanied back to the operating theatre for this. If the procedure cannot be finished on the same day, you will be invited to return the following day for the procedure to be continued. If you are coming from a large distance, or on your own at home, then it may be possible to stay in hospital overnight.

Once we are sure that we have totally removed your skin cancer, we will discuss our recommendations for repairing with your surgical wound.

Is lunch provided?

Yes, a sandwich lunch is provided. Drinks are provided throughout the day. Additional refreshments can be purchased from the trolley service.

When will I be able to go home?

You should be able to go home soon after the operation is completed. If the wound is on your face, you may find that certain types of dressings can cover your eye or impair your vision. For your safety and that of others please arrange for a friend or relative to take you home after your operation. We advise all patients, following Mohs surgery, not to travel home alone. If you are planning to travel home by car, someone else should drive. Your car insurance may be void if you drive after a local anaesthetic, or if the anaesthetic or dressings impair your ability to drive.

After the procedure

- **Rest** – It is important to rest for 72 hours. You should not drive for at least 24 hours following the anaesthetic, or longer if dressings interfere with your vision. Instructions on stitch removal and care of the wound will be provided before you leave hospital.
- **Pain** – The local anaesthetic will wear off in one to two hours. Take regular paracetamol if there is any pain or discomfort (follow the instructions on the packet for the dose).
- **Numbness** – Numbness from the local anaesthetic can spread inside the mouth following procedures on the mid and lower face. It is important to avoid hot food and drinks for 4 hours or until full sensation in the mouth has returned, as burns can develop.
- **Bleeding** – It is normal to experience minor oozing in the first 24 hours. If your wound bleeds do not dab it, but press it gently but firmly without stopping for 15 minutes with a clean tissue, towel or dressing. If your wound is on your arm or leg, lift the limb upwards as this will help to stop the bleeding. If the wound is on your head, ensure that you are sitting upright and avoid bending forwards. If bleeding persists repeat the pressure for another 15 minutes; an ice

pack may also be helpful, and a bag of frozen peas covered by a tea towel applied to the wound can work well. If there is severe or persistent bleeding, please contact the Dermatology department or attend your local Accident and Emergency department.

- **Infection** – A small red area may develop around your wound. This is normal and does not necessarily indicate infection. However, if the redness does not subside in two days or the wound becomes more painful, hot to the touch or discharges pus, please contact your GP or the Dermatology department as you may need antibiotics.
- **Swelling and bruising** are very common following Mohs surgery, particularly when performed around the eyes. This usually subsides within four to five days after surgery.
- You will be given information on the stitch removal, wound care, advice on showering, and future clinic appointments before you leave.
- You can usually begin gentle work within a week or two, but you might need to wait a little longer for more vigorous activity.
- It is not uncommon to feel a bit 'down' after any operation, so do ask your doctor or nurse if you feel you need more psychological support.

Where can I get further information?

National organisations

- **Cancer Research UK**
www.cancerresearchuk.org
- **Macmillan Cancer Support**
Freephone 0808 800 1234
www.macmillan.org.uk
- **British Association of Dermatologists**
www.bad.org.uk
- **Patient UK**
www.patient.co.uk

Our contact details

Experienced staff are available to help you. Please tell your nurses or doctors about any concerns that you have, they will try to help you resolve them.

Dermatology Outpatients	0121 371 5469
Skin Cancer Specialist Nurses	0121 371 5111
Skin Surgery Bookings Coordinator	0121 371 5460
Dermatology Secretaries	0121 371 5121 / 5122 / 5123

Notes

Date of Mohs surgery

Location

Consultant

Other notes

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Dermatology
Queen Elizabeth Hospital Birmingham
Mindelsohn Way, Edgbaston
Birmingham B15 2GW
Telephone: 0121 371 5469
