Mohs Surgery

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Skin cancer will affect one in five Americans in their lifetime. Non-melanoma skin cancers affect more than 3.3 million people each year and an estimated 87,110 people will have been diagnosed with melanoma in 2017. Skin cancers are primarily removed by two surgical techniques: re-excision with clinical margins and Mohs micrographic surgery. These procedures can be performed in the hospital operating room under general anesthesia, but are most commonly done in an ambulatory surgical center or office setting using a local anesthetic. This article will discuss the differences in skin cancers, detail the Mohs procedure and identify the role of the Certified Surgical Technologist for this surgery.

SKIN CANCERS

There are three main types of skin cancers: basal cell carcinoma, squamous cell carcinoma and melanoma. Both basal cell and squamous cell carcinoma are categorized as non-melanoma skin cancers. The deadliest form of skin cancer is melanoma, resulting in an estimated 9,730 deaths in 2017.[1] Skin cancer typically arises from exposure to sun or UV light, with tanning beds being a large contributor.

Basal cell carcinoma, the most common skin cancer, accounts for 80% of all skin cancers that are commonly diagnosed. It is usually found on the head, ears, face, shoulders and chest, or any other sun-exposed areas of the body. They may appear as a shiny bump or as an irritated, reddened area of the skin. Basal cell carcinoma does not spread anywhere else in the body, but when left untreated, it can result

LEARNING OBJECTIVES

- Learn about the three main types of skin cancers
- Identify the areas most commonly affected by these types of cancer
- Review the procedural steps required for both phases of this operation
- List the different types of closures that may be performed during Mohs surgery
- Recall how this type of procedure earned its name

Basal cell carcinoma

in a more local problem, growing wider and deeper in the tissue.

Squamous cell carcinoma is the second most common type of skin cancer with more than one million cases diagnosed each year. It is also found on sun-exposed areas, but also can arise on mucous membranes and genitals. When found, it typically presents as a thick, rough scaly patch or as a crateriform bump. Unlike basal cell carcinoma, if it is left untreated, it can spread to other areas of the body.

The deadliest form of skin cancer is melanoma. It arises from melanocytes that give skin its color. When melanoma is found early, it is highly treatable; however, it can spread to other areas if not caught at an early stage. It may appear as a new mole or in an existing mole, which usually appear as an irregular brown or black color. Melanoma also can be seen as a dark streak on the surface of a nail.

HISTORY OF MOHS

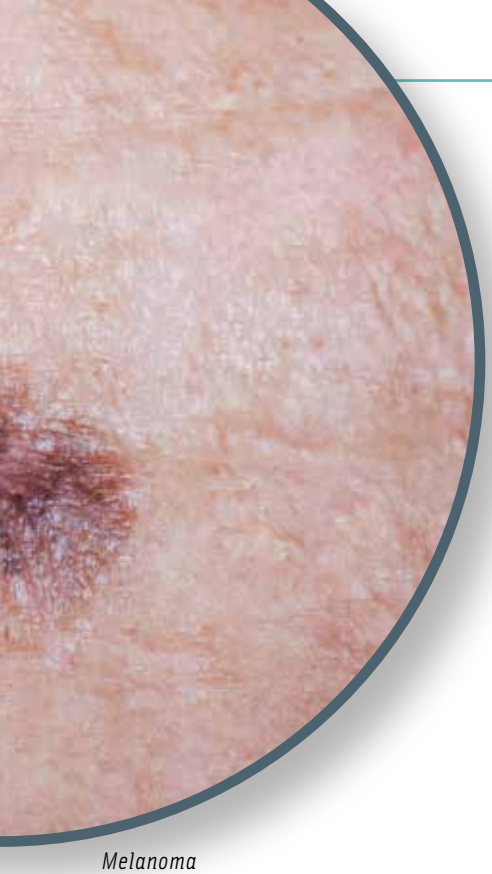
Mohs micrographic surgery is a tissue-sparing procedure that allows for 100% margin analysis. It was named after the founder of the procedure, Frederic E Mohs, MD (1910-2002). He first performed surgery for a squamous cell carcinoma on the lower lip in 1936 using his technique that required patients to wait days until the tissue was processed to get results. In 1953, he performed his first fresh tissue excision on an eyelid, which yielded excellent results in a quicker time frame. He would then go on to use the fresh tissue excision on all eye lid procedures, branching out to other areas of the skin, which is how Mohs surgery was created.

APPROPRIATE-USE CRITERIA

Appropriate-use criteria exists to help determine when Mohs surgery should be performed. These criteria include tumor sites on the face, scalp, neck, hands, feet, pretibial legs and genitals. If a tumor is greater than two centimeters or on the trunk, upper or lower extremities, it also a candidate for Mohs surgery. If the cancer is in areas outside of these areas, it qualifies for a re-excision with clinical margins, with margins usually being between 0.4 and 1 centimeter. Margins for the Mohs procedure are initially 0.1 to 0.2 centimeters.

SURGICAL TRAINING

In order to become a board-certified Mohs surgeon, the surgeon must complete the appropriate training. This training begins with the completion of their undergraduate degree, medical school and a dermatology residency. Once the previ-



Melanoma

Squamous cell carcinoma

ous levels are completed, they must participate in a fellowship in Mohs surgery.

MOHS MICROGRAPHIC SURGERY PROCEDURE

After the patient has been admitted, photos will be taken for record and placed in the patient's chart. The site of the surgery will be measured and prepped with a chlorohexidine wash. The surgeon and surgical technologist will enter the room to explain the surgical procedure, and to inform the patient how long the procedure may take.

> The advancement flap is the most common nonlinear reconstruction and is classified with subtypes: classic, unilateral and bilateral. It is the oldest and most straightforward adjacent tissue transfer used to alter redundancy.

The site of the surgery will be marked with a skin pen and verified with the patient. While the surgeon marks the area, the surgical technologist will open the pack of instruments that include one blade handle, which is surgeon's preference, one pair of Metzenbaum scissors, one pair of Adson forceps, one pair of sharp curved iris scissors, gauze, a skin marker and a 15 or 15C blade, also surgeon's preference, as well as a non-stick pad onto the field. This part of the Mohs procedure is typically a clean procedure where non-sterile gloves will be used. A time out will be performed and then a local anesthetic will be administered into the site of surgery. Most surgical procedures are performed on the head and neck, which allows for the patient to remain in the supine position. Depending on the surgical site, the patient also may be positioned in a lateral or prone position.

The surgeon will cut around the area marked with the appropriate blade into the superficial fat, about ⅛th of an inch, scoring one to four times in the skin to mark orientation. Scoring is surgeon's preference and is dependent on how the surgeon maps out the area. Once the scores are in the skin, the surgeon will dissect the tissue from the surrounding tissues and will place it on a non-stick pad.

A cautery machine will help to maintain hemostasis. The tissue will be mapped onto either a paper map where the surgeon draws the shape of the tissue marking the scores in the skin or via a photo taken of the tissue that is removed and the area of where it was taken from.

The area will be bandaged and the patient will be instructed to firmly place pressure to the area for five minutes. Their family members can wait with them during the 45 to 60 minutes it takes for the tissue to process in the onsite lab.

As previously mentioned, there are two ways to map out the tissue. If the surgeon uses the paper method to map the tissue, he or she will draw the tissue and scores in one of the blocks on the sheet. Each block represents a layer of tissue taken with the possibility of multiple layers taken throughout the duration of the patient's stay. A layer of tissue will be taken each time cancer cells show in the remaining tissue samples. When the paper map and tissue are taken to the onsite lab, the tissue will be sectioned into pieces according to the scores and each end of the piece is inked. If the surgeon uses the electronic map option, they will take a photo of the tissue next to the area it was removed from and use that as their map. The histotechnologist will mark on the photograph where the inks are placed and number the pieces of tissue, the same as the paper map. The tissue will then be frozen, cut microscopically thin, placed onto slides and stained. Once all of the tissue is processed and the slides are ready, the surgeon will look at the slides under a microscope to look for any cancer cells that may remain. They will then mark on their map exactly where the cancer cells remain, if any.

All tissue preparation for staining will be performed by the histotechnologist in the onsite lab. They will prepare the tissue first by cutting it into two sections and then inking the tissue. Inking the tissues ensures that the physician will accurately be able to pinpoint any remaining cancer cells on the slide. Once they are inked, the tissues will be placed into the cryostat where the histotechnologist freezes, sections and places the tissue onto slides. The tissue will be placed onto the slide so that 100% of the peripheral and deep margins will be present. Once on the slides, the staining process begins. The two main types of staining that are used based on a surgeon's preference are hematoxylin and eosin and toluidine blue. Hematoxylin and eosin, or H&E, is the most widely used and uses blues, violets and reds in the staining process. Toluidine blue staining uses blues and purples in the staining process, and is helpful because it highlights basal cell carcinoma. Once the staining process is completed, cover slips will be placed over the stained tissues on the slides and given to the surgeon for review.

Slide review is a crucial part of the Mohs procedure. The slides are reviewed under the microscope by the surgeon where the mapping process becomes vital. As the review process proceeds, any area that is still positive for cancer cells are marked on the map. The paper maps will be taken back in with the surgeon and surgical technologist and used to denote where more tissue will be taken from in the next layer, if necessary. The tissue taken may be from any of the surgical margins deep or laterally. If the surgeon uses the electronic mapping process, the photograph will be marked with color where the positive margins are located and the image will be brought up in the room for use like the paper map. The next piece of tissue will be excised as the first, and rebandaged. The patient again will be instructed to hold pressure for five minutes and the process repeats until the margins are clear. When the margins are clear, the patient is taken to the operating room for reconstruction and the instruments are sent for decontamination.

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CLOSURE

The reconstruction of the surgical defect is typically a sterile procedure. Four main types of closures are used for the reconstruction of the surgical defect: linear closures, advancement flaps, transposition flaps, full thickness skin grafts and xenografts. The nurse(s) will prepare the patient for the closures by positioning them appropriately dependent on their surgical site and applying the Bovie pad to the patient. Depending on a state's regulations, some surgi-

cal technologists will be allowed to assist the surgeon in closure. *(AST Disclaimer: Please check the regulations in your state followed by the rules of your facility.)*

Linear closures

Linear closures or straight-line closures, are used in areas of good skin laxity. If the surgical defect is located on the cheek, the linear closure is hidden in a pre-existing cosmetic junction such as the nasolabial fold. Surgical defects on the forehead can be closed vertically or horizontally. Vertically closed defects heal almost invisibly, where the horizontal closure is best used for smaller defects. If the defect is located on the patient's temple, for example, either closure will work well as the surgical scar will be hidden in the patient's hairline.

Advancement Flaps

The advancement flap is the most common nonlinear reconstruction and is classified with subtypes: classic, unilateral and bilateral. It is the oldest and most straightforward adjacent tissue transfer used to alter redundancy. When used to correct the surgical defect, it allows for a small amount of tension release, but no tension redistribution.

Transposition Flaps

The transposition flap is used for tension redirection and redistribution. The skin will be elevated from an area of laxity, lifted over the adjacent area and transposed into the surgical defect. Two common transposition flaps are the nasolabial and bilobed flaps, that are often seen in nasal and extranasal surgical repairs.

Full Thickness Skin Grafts and Xenografts

Full thickness skin grafts and xenografts are used when laxity isn't present in the defect. The full thickness skin graft may come from another area of the body, ie, the clavicle or the post auricular region. The xenograft is widely used in surgical defects of the scalp, areas where there is a limited blood flow, and in deep surgical wounds where a full thickness skin graft would not restore the contour to the area. The closure decision is made once the surgical team enters the operating suite, completes a surgical scrub and evaluates the area of the defect.

For this closure, the surgical technologist will need to lay out the following items: gauze, a marking pen, a steam indicator strip, one 15-blade, one pair of straight Mayo scissors, one pair of straight iris scissors, one pair of curved iris scissors, one needle driver, one hemostat, one pair of Metzenbaum scissors, one blade handle, two skin hooks and one metal bowl for sterile saline. The supplies opened include syringes for the local anesthetic, an 18-gauge needle to draw up the local anesthetic, 30-gauge needles for injection of the local anesthetic, a nonstick pad, a sterile fenestrated drape, a skin prep, the appropriate sutures for closure and petroleum jelly for the surgical site after stitching. While the tech scrubs in for the case, the nurse will remove the bandage from the defect and will take a photograph of the surgical defect for the patient's chart. The surgical technologist will set up the tray keeping all sharps to one side in a specific location known to all parties scrubbed in for the closure. The local anesthetic will be drawn up. No counts are needed since the surgical defects are minimal and they do not go into any cavity. The cautery hand piece will be thrown off the field and plugged in and a time out will occur.

The surgeon will inject the patient with the local anesthetic and the tissue will be prepared for closure. The tissues will be retracted and then the surgeon will prepare for closure and hemostasis will be achieved. The surgeon will then begin to stitch the defect. Two layers of sutures will be used to close the defect. Deep sutures, or intradermal sutures, will be placed first. These type of suture chosen will be dependent on the surgeon's preference. The sutures will be cut down to the knot to ensure integrity to the wound. Once all the intradermal sutures have been placed, the top layer of sutures will be placed. These can be running, mattress, interrupted sutures or a mixture of both running and interrupted. The top layer of sutures are usually nylon sutures or polypropylene sutures.

The drapes then will be removed from the patient, and the surgical site will be cleaned with sterile saline. A photo will be taken to show the closure and added to the patient's chart.

POST-OPERATIVE

When bandaging a patient, a pressure dressing will be necessary to aid in hemostasis. The pressure dressing will consist of the petroleum jelly on the suture line, a piece of nonstick pad over the suture line, gauze tightly rolled and dressing retention tape overtop applying pressure to the surgical site. Before leaving the surgical center, the patient will receive their postoperative instructions sheet that also includes any antibiotics they are to take. They will also be advised on their suture removal date. Postoperatively, the patient will leave the pressure dressing on for 48 hours, icing 20 minutes out of every hour for the first day to help with any swelling and bruising that may occur. The patient may not get the pressure dressing wet for the first 48 hours. After 48 hours, they will need to remove the pressure dressing and wash the area with soap and water, followed by applying petroleum jelly over the suture line and covering it with a band aid until their suture removal date. If the patient experiences any extreme swelling, bruising or drainage occurring in the area, they should call the doctor, but some redness, swelling and bruising are normal for the healing process. The surgeon will advise over-the-counter pain medicine for any pain and/or discomfort. Depending upon the area of the surgical site, the patient may be advised to have limited mobility for the first 48 hours with no heavy lifting until the sutures are removed as to not increase their risk of bleeding.

INSTRUMENTATION DECONTAMINATION

The Mohs instruments and surgical repair instruments will be cleaned and placed into an enzymatic solution for 10 minutes. Once the instruments have completed the 10-minute soak, they will be placed into a machine that

uses ultrasonic pulses to make sure any bioburdens have been removed from the box locks of the instrumentation. Once the sonic has completed its cycle, the instrumentation will be placed into instrument milk to maintain the ease of movement when in use. The instruments then will be wrapped – blue wraps for surgical repair instruments and a large peel pack for Mohs procedure instruments.

For Mohs procedures, not one patient or operation is the same. Each patient responds differently to the anesthetic, and each skin cancer presents differently and each closure differs. Mohs micrographic surgery has been growing in utilization since its inception in the 1940s due to its high cure rate with rare reoccurrence in the same area. Each year, more people are diagnosed with skin cancers. Patients will be advised to have a skin exam every six months following a diagnosis of basal or squamous cell carcinoma and every three months after they have been diagnosed with melanoma. Since most skin cancers are caused by sun exposure, those who have had a skin cancer previously are more prone to having another in other parts of the body so follow-up care is critical to preventing the spread of the disease

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Ashley Adams has been a Certified Surgical Technologist for four years since obtaining her associates of science of surgical technology degree from Pittsburgh Technical College. She spent the first part of her career on the kidney/liver transplant, general surgery and general robotic surgery team at UPMC Presbyterian Hospital before moving into Mohs surgery at Vujevich Dermatology and Associates.

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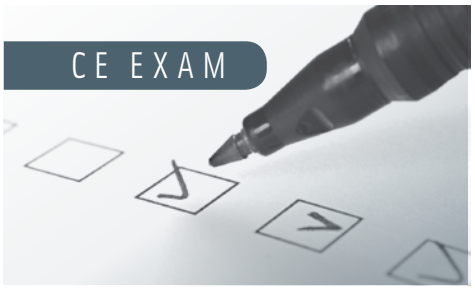

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Mohs Surgery

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1. **Which type of skin cancer(s) is the most common, occurring in 80% of diagnosed cases?**
a. Melanoma
b. Basal cell carcinoma
c. Squamous cell carcinoma
d. Both b and c

2. **This type of skin cancer(s) also can be identified as a dark streak on the surface of a nail.**
a. Basal cell carcinoma
b. Squamous cell carcinoma
c. Melanoma
d. Both a and c

3. **Frederic E Mohs first performed a fresh tissue excision on a patient's _____.**
a. Ear
b. Nose
c. Eyelid
d. Lower lip

4. **Some of the areas of the body where Mohs surgery are commonly performed are:**
a. Face
b. Scalp
c. Extremities
d. All of the above

5. **When this type of procedure is performed on the head or neck, the patient is placed in which position?**
a. Supine
b. Prone
c. Lateral
d. Lithotomy

6. **After the initial phase of this procedure, the tissue is taken and stained with ink to identity any remaining cancer cells. Which stain is most widely used?**
a. Toluidine
b. Eosin
c. Hematoxylin
d. Hematoxylin and Eosin, or H&E

7. **If a patient possesses good skin laxity, which closure is used?**
a. Transposition flaps
b. Xenografts
c. Linear closures
d. Advancement flaps

8. **When no laxity is present in the defect, which closures may be utilized?**
a. Xenografts
b. Full thickness skin grafts
c. Neither a nor b
d. Both a and b

9. **One of the common uses of transpositions flaps are seen in ____ surgical repairs.**
a. Nasal
b. Hernia
c. ACL
d. Achilles

10. **Xenografts are commonly used in surgical defects of the _____.**
a. Arms
b. Scalp
c. Genitals
d. Calves

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