Care of Patient Post- Craniectomy (no bone flap)

Neurosurgery Education and Outreach Network NEON

CCSO Critical Care Services Ontario
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The Neurosurgery and Education Outreach Network (NEON)

- The Neurosurgery Education and Outreach Network (NEON) is comprised of Neurosurgical Nurse Educators (NNEs), Clinical Outreach Specialists/Advanced Practice Nurses, and hospital Administrators dedicated to the neurosurgical nursing program implementation and on-going educational and clinical support of nursing staff in the neurosurgical centers and the non-neurosurgical referral centers.

- As a neurosurgical educational support program, NEON reports directly to and works in conjunction with Critical Care Services Ontario (CCSO) and the Provincial Neurosurgery Advisory Committee who support system wide improvements for Ontario's neurosurgical services.

Disclosure Statement

- The Neurosurgery Education and Outreach Network (NEON) and Critical Care Services Ontario (CCSO) have no financial interest or affiliation concerning material discussed in this presentation.

- This presentation provides direction for how to provide nursing care to adult and paediatric patients post-craniectomy to ensure consistency within and across organizations. It was developed by a sub-group of clinical neurosurgical nurses and neurosurgical educators for Registered Nurses (RN) across Ontario. This presentation is not meant to be exhaustive and its contents are recommended but not mandated for use. RNs should use their clinical judgment and utilize other assessment parameters if determined necessary.

Learning Objectives

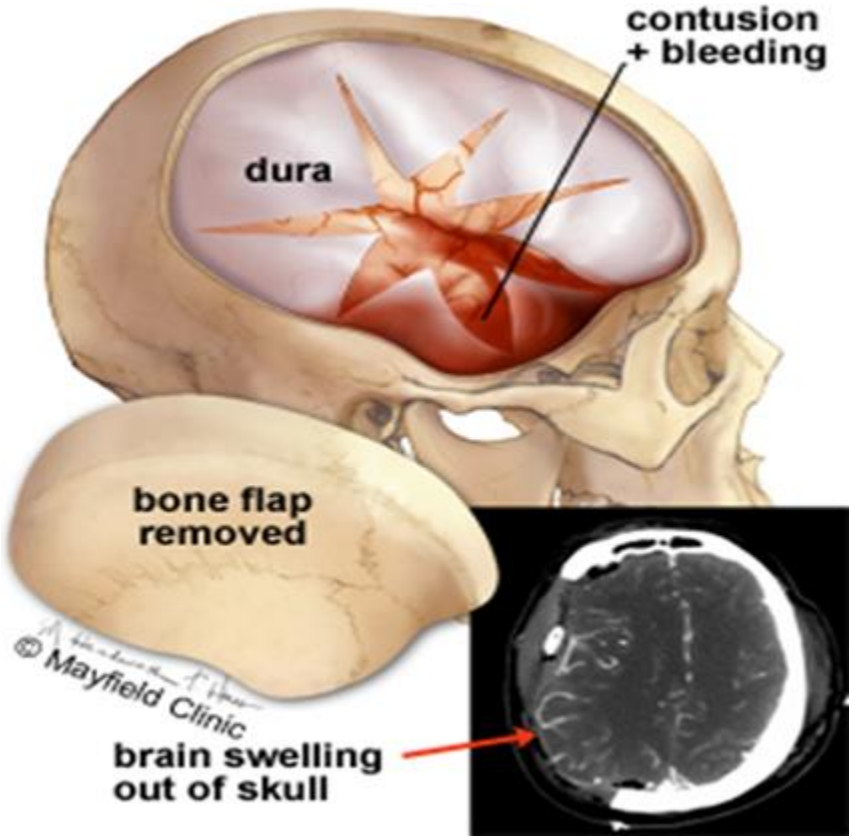
- The learner will be able to:
  - explain the difference between craniotomy and craniectomy
  - describe the implications for a craniectomy
  - summarize the risks and complications related to craniectomy
  - understand the nursing intervention related to caring for a patient with a craniectomy

Definitions

- **Craniotomy** defines a procedure where the cranial cavity is accessed through removal of bone to perform a variety of brain surgeries. Once the surgery is completed, the bone flap is returned to its previous position.
- **Craniectomy** differs from craniotomy in that the bone is not replaced to its previous position; instead it is stored for future insertion or may be discarded (depending on pathology – e.g. infection). This results in a cranial defect.
  - If the bone flap needs to be discarded, it is replaced with a custom-made implant.

Craniectomy

- Is a neurosurgical procedure that involves removing a portion of the skull, where the patient's scalp is closed without re-implantation of the bone, leaving a resultant cranial defect.



https://www.mayfieldclinic.com/PE-TBI.htm

Role of a Craniectomy

- Increases buffering capacity of cranium.
- Allows outward herniation of brain tissue.
  - preventing compression of brainstem structures.
  - reestablish brain perfusion.
- Intracranial pressure (ICP) reduction 15-85% depending on size of bone removed.

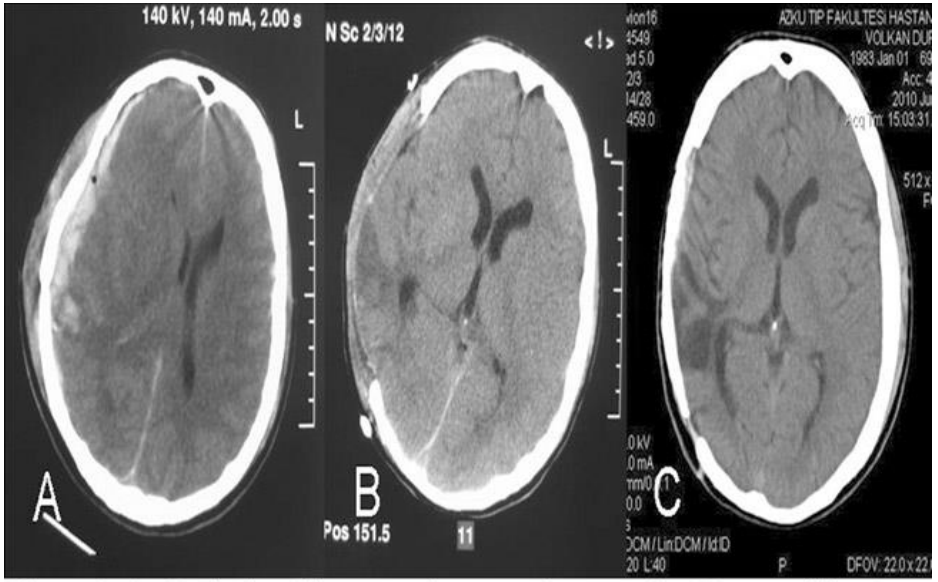


Figure-1: A- Cerebral axial computed tomografic scan of a 22-years-old patient, depicting an acute subdural haematoma due to traffic accident with a 12-mm shift to the left, obliterating the basal cisterns. B- He had immediate decompressive craniectomy. C- The patient was neurologically intact at 6th month following discharge.

http://www.jpma.org.pk/full_article_text.php?article_id=3932

Indication

- **Craniectomy** may be used in non-emergent circumstances to augment the opening of a craniotomy.
- **Decompressive Craniectomy** is used in urgent or emergent conditions where there is substantial brain swelling from bleeding, stroke or infection.

Procedure

- The neurosurgeon makes an incision in the scalp, and once the skin and underlying tissues have been cut and moved out of the way, a drill is used to make holes in the skull. The holes are connected with a saw, and a portion of the skull bone is removed.

http://www.neurosurgic.com/index.php?index_php?view=article&id=1814&tmpl=component&print=1&task=printblog&option=com_myblog

Procedure Cont'd

- Once the bone is removed, and any underlying clot that is compressing the brain is evacuated, or any bleeding around the brain has been controlled, relieving pressure in the brain, the skin and connective tissue overlying the brain are closed with sutures.

https://www.google.ca/search?tbm=isch&q=craniotomy+incision&spell=1&sa=X&ved=0ahUKEwiZxMyDrMbXAhVrxYMKHbi6AD0QvwUITigA&biw=1280&bih=917&dpr=1#imgrc=oYrY2tEgnJM14M:&spf=1510946956887

Bone Flap Storage After Craniectomy

- After a decompressive craniectomy for brain swelling, bone flaps need to be stored in a sterile fashion until cranioplasty.
- Temporary placement in a subcutaneous pocket (SP) and cryopreservation (CP) are the two commonly used methods for preserving bone flaps.

Storage of bone flaps

Each Neurosurgical Centre stores the bone flaps in freezers.

Photo: property of HHS – HGH site OR

Photo: property of HHS – HGH site OR

Bone flaps can be kept there for months – years

Bone Flap Appearance (site)

- As the swelling begins to decrease, the patient's head may be depressed until the skull is re-inserted.
- If the bone is being stored in the patient's abdomen, you will feel a hardened area in the abdomen when palpating.

https://openi.nlm.nih.gov/detailedresult.php?img=PMC3115275_SNI-2-72-g002&req=4

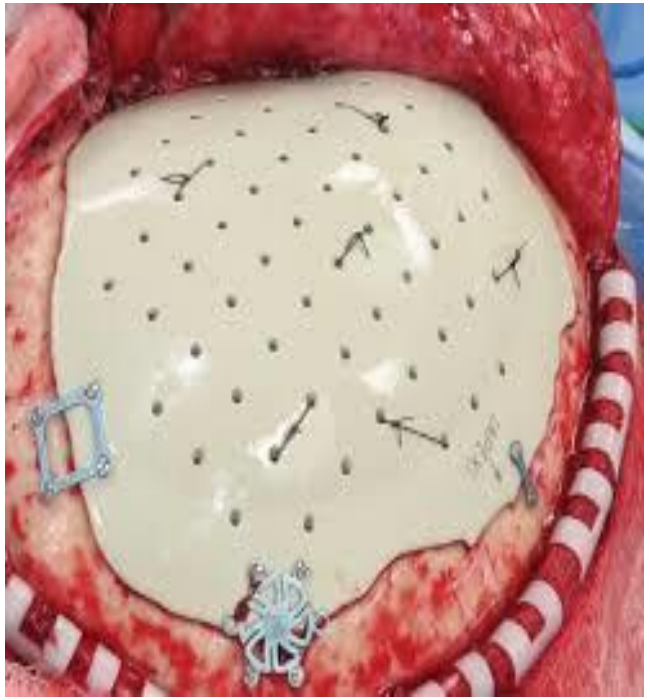
http://seattle.cbslocal.com/2012/09/28/doctors-store-skull-in-womans-stomach-for-42-days-following-brain-surgery/

Bone Flap Replacement

- Once the patient's brain swelling has subsided and his or her condition is stable, the bone or other form fitting artificial material is implanted in a procedure called a cranioplasty.
- This procedure can occur weeks to even years after the bone flap removal.

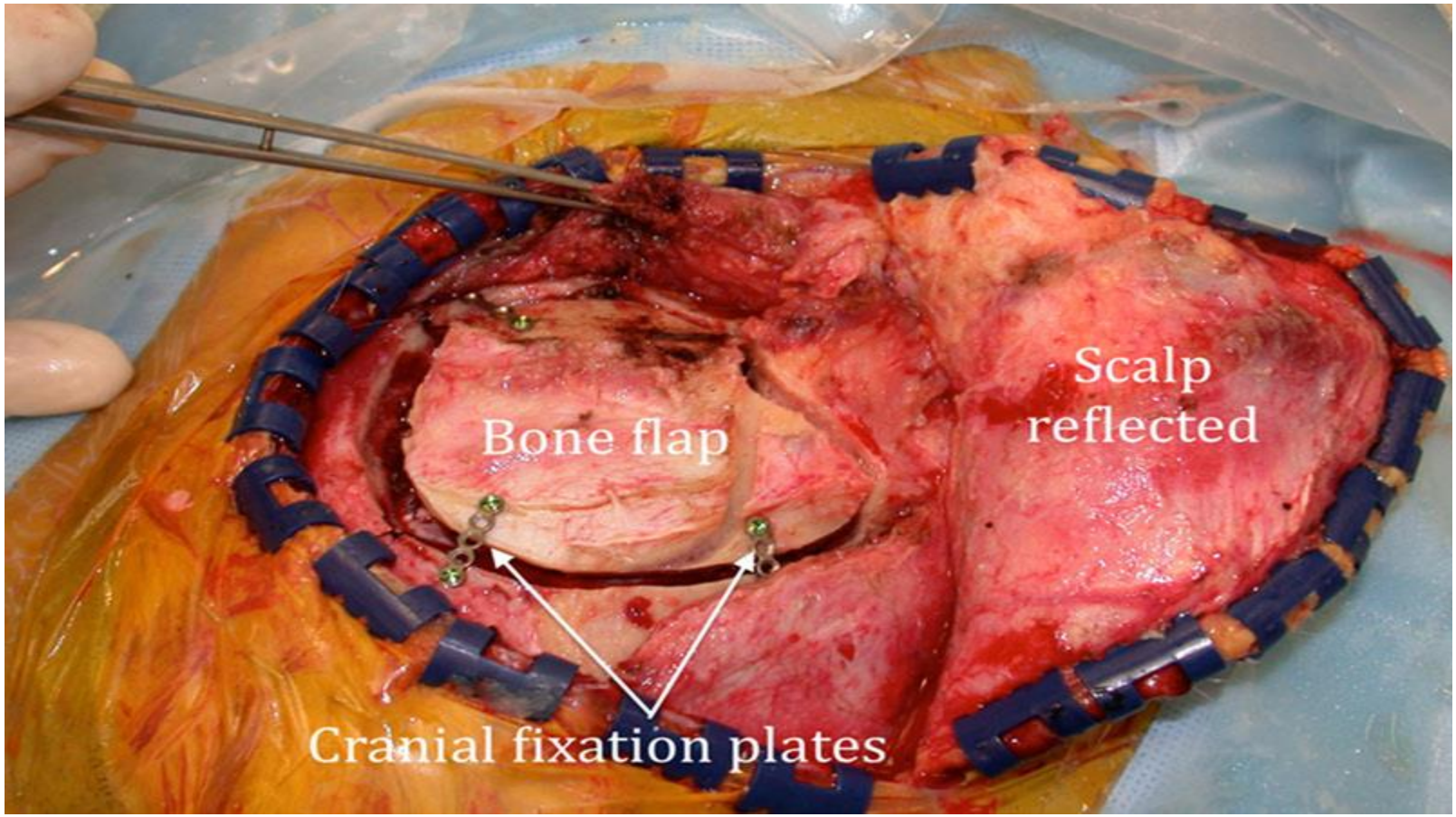
Definitions

- **Cranioplasty** is a surgical procedure to correct a deformity or defect of the skull. Reconstruction of the skull-cranioplasty may be performed with titanium mesh or other artificial products.



http://thetraumapro.com/2017/03/15/everything-you-wanted-to-know-about-cranial-bone-flaps/

Cranioplasty - Re-implantation of the bone flap. Typically, rigid fixation is achieved with small MR compatible titanium fasteners (plates) that do not activate metal detectors in airports.



https://www.northjerseybrainspine.com/procedures-cerebrovascular-and-neuroendovascular-craniotomy-craniectomy-cranioplasty.php

Complications

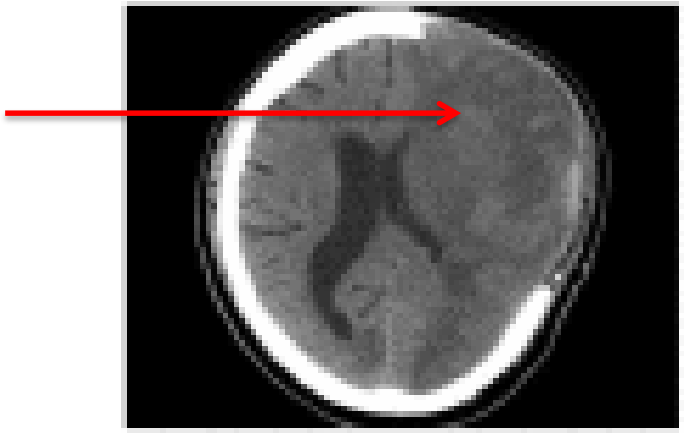
The major risks of craniectomy include the following:

- bleeding
- infection
- seizures
- abnormalities in cerebrospinal fluid (CSF) absorption
- further damage to the brain
- stroke
- death

Complications

Post Cerebral contusion expansion:

- usually occurs within first two days.



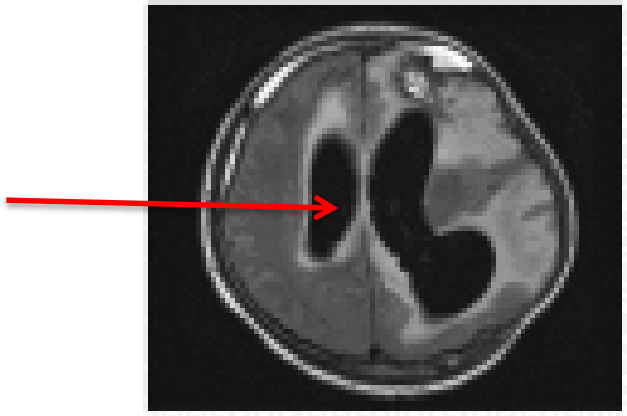
Bleeding complications include:

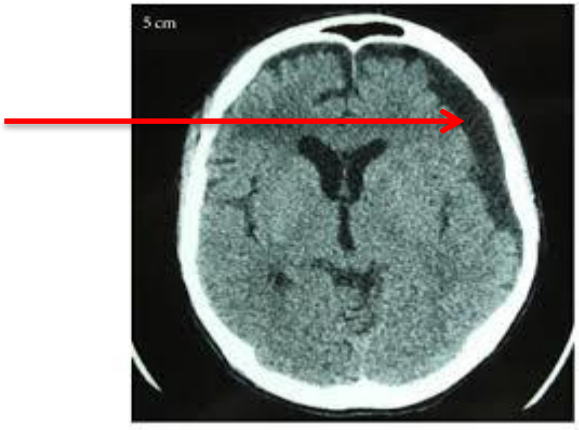
- newly developed subdural or epidural hematomas potentially within the first few hours (for epidurals) or a few days post-operative.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2966727/

Complications

- Post traumatic hydrocephalus can occur one month post-operative.
- Subdural hygroma due to alteration in the dynamics of CSF circulation.





https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2966727/

Syndrome of Trephine

- Sinking skin flap syndrome.
- Caused by changes in the pressure gradient of intracranial pressure and atmospheric pressure.
- Patients with this syndrome benefit having the bone flap replaced sooner rather than later.

Note: Midline shift

http://www.ruralneuropractice.com/articles/2015/6/2/images/JNeurosciRuralPract_2015_6_2_225_150281_f1.jpg

Surgical Site Infection (SSI)

… is a serious complication of cranioplasty.

Dehiscence: Defined as a diastase of facing flap borders occurring along the line of suture, with different degrees of exposure of underlying tissues.

Dehisced incision

https://www.ncbi.nlm.nih.gov/pubmed/19485722/

Surgical Site Infection

Ulcer: Defined as a loss of substance occurring inside the skin flap, usually distant from the line of suture, constantly presenting with underlying tissues exposure.

Ulceration of Incision

https://www.ncbi.nlm.nih.gov/pubmed/19485722/

Surgical Site Infection

Necrosis: Defined as a large, discolored area of complete loss of skin viability, both on flap contour and on the surrounding skin border.

Necrotic Incision

https://www.ncbi.nlm.nih.gov/pubmed/19485722/

Nursing Interventions

Nursing Considerations for a Patient with a Removed Bone Flap

- Patients who have had a bone flap removed may still have their hair washed.
- Do not submerge the incision until all staple sutures have been removed or as per direction of your physician.
- Be gentle when handling this area and do not rub too vigorously.
- Use a mild shampoo with no strong perfumes.
- Do not direct shower head directly to site.

Wound Care

- Inspect the incision on the head and abdomen (if present) to ensure edges remain well approximated, and staples/sutures are intact.
- Monitor for redness around the incision, discharge, and any other signs of infection.

Wound Care

- Incision is usually left open to the air, dependent on the physician's order and preference.

- Sutures are usually removed in 2 weeks; however, practice differs between physicians.

Wound Care

- Topical agents on the incision may or may not be prohibited by the physician.
  - Ointments commonly used are topical antibiotic ointments
- Incision should be covered if patient is going outside to prevent sunburn.
  - May cover incision using a clean/new hat or scarf, if not contraindicated by physician.

Safety Considerations

- When used, a helmet should be fit to the patient by an orthotics specialist to minimize pressure on the open cerebrum as well as skin over the skull.
- Helmets should be removed when patient is in bed and when bathing.
- Each facility and physician have different protocols and varying use of helmets.

http://www.tbo.com/storyimage/TB/20151027/ARTICLE/151029299/AR/0/AR-151029299.jpg

Safety Considerations

- Positioning may be supported with towels, pillows, and positioning devices to prevent pressure onto the cerebrum and attempt to stay off the site.
- Signage above the patients bed allows all health care providers to recognize that patient has no bone flap.

Safety Considerations

Post-op craniectomy patients are at an increased risk for falls.

Some falls prevention strategies to consider:

- ✓ Keep bed at lowest level.
- ✓ Ensure room is not cluttered.
- ✓ Ensure patient is supervised at all times during mobilization (may use a helmet during this time if part of patient's care).
- ✓ General supervision as much as possible.
- ✓ Ensure patient uses non-slip shoes when necessary.
- ✓ May want to have patient's room near nursing station so staff can better monitor.
- ✓ Purposeful rounding (e.g. assess patient's need to use bathroom prior to bedtime).
- ✓ May consider using bed rail pads on the patient's bed in case patient hits head on bed rails (e.g. while asleep, during seizure).

Safety considerations

Always remember…..

conduct regular neurological assessments on patients post-craniectomy!

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