

# Fundamentals and Management of Lumbar Drains

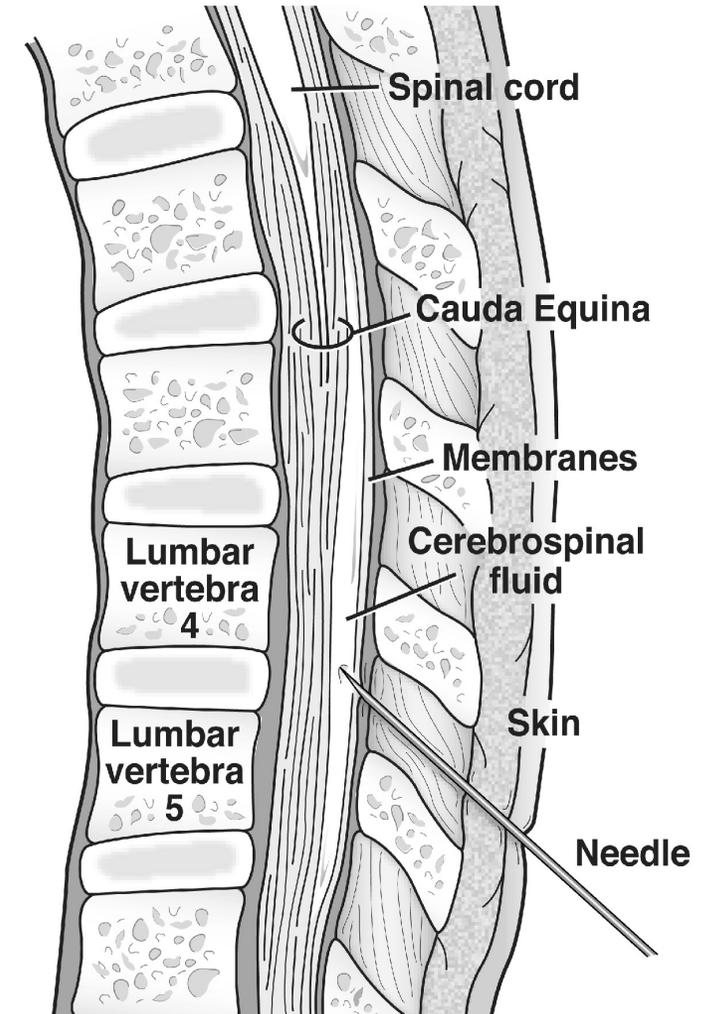
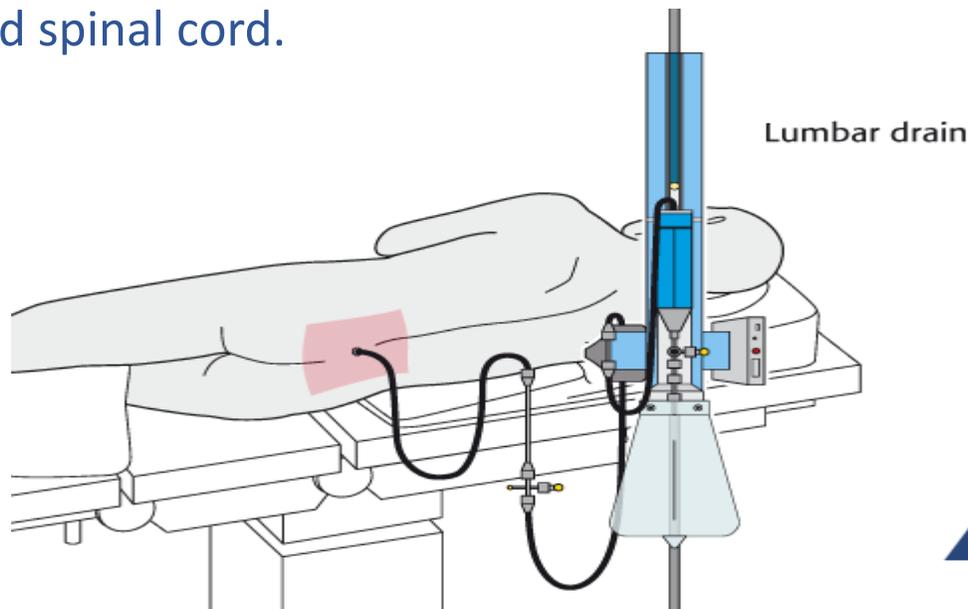


*Presented  
By  
Kaphne M. Harris, MSN, APRN, ACNP-BC*

# What is a Lumbar drain?

A small, flexible, soft plastic tube placed in the lower back (lumbar area) in the arachnoid space to drain cerebrospinal fluid (CSF).

Used to drain some of the cerebrospinal fluid that fills the ventricles of the brain and surrounds the brain and spinal cord.



# Perioperative Insertion

- Side lying position
- Sterile site prep of the lumbar spine
- Needle insertion at L3-L4 or L4-L5 into intrathecal space
- Cerebrospinal fluid flow confirmed
- Catheter advanced 5-7cm – (often times anesthesia will place stitch)
- Occlusive Dressing applied
- Transducer connected and leveled at the right atrium
- CSF drained to <10mmHg
- Somatosensory Evoked Potentials (SSEP) and Motor Evoked Potentials (MEP) monitoring
- In cases of a bloody tap, the procedure may be aborted



# Contraindications to placement of lumbar drain

- Recently on non ASA anti-platelet therapy or low molecular weight heparin
- coagulopathy
- History of cerebral hemorrhage
- Elevated intracranial pressure
- Emergent surgery

# Complications of lumbar drains

- Infection-meningitis
- CSF leak requiring blood patch
- Spinal headache
- Intracranial hemorrhage
- Neuraxial hematoma
- Nerve root irritation
- Catheter tip remaining in patient after catheter removed



The purpose of the lumbar drain in the TAAA surgery:

to reduce pressure in the spinal cord or brain by draining cerebrospinal fluid(CSF)

 Increased Pressure =  Reduce blood flow

 Confusion

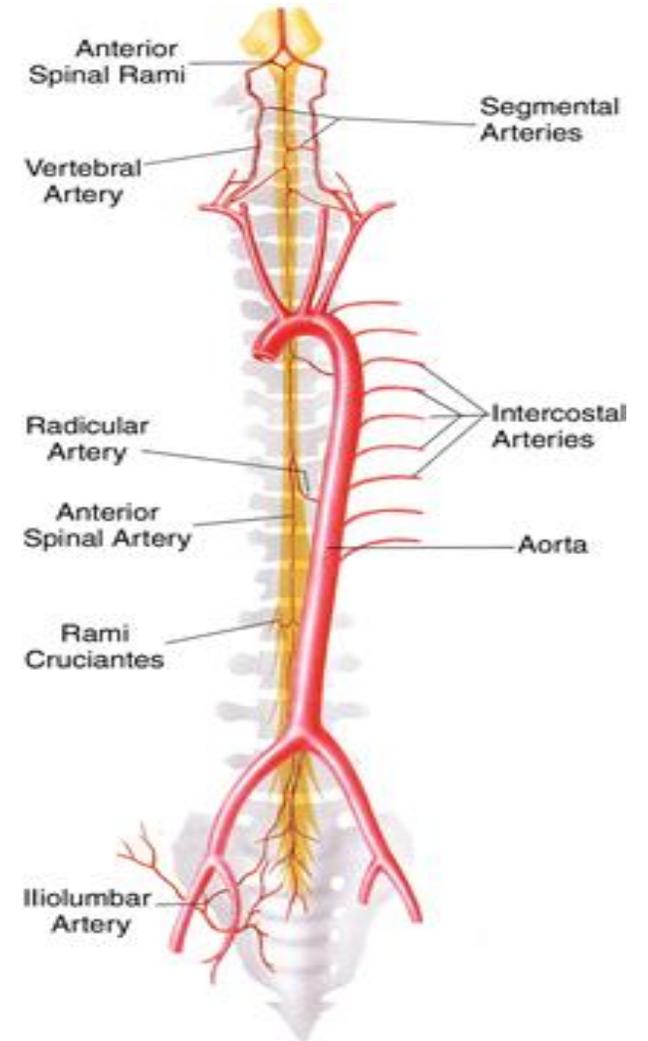
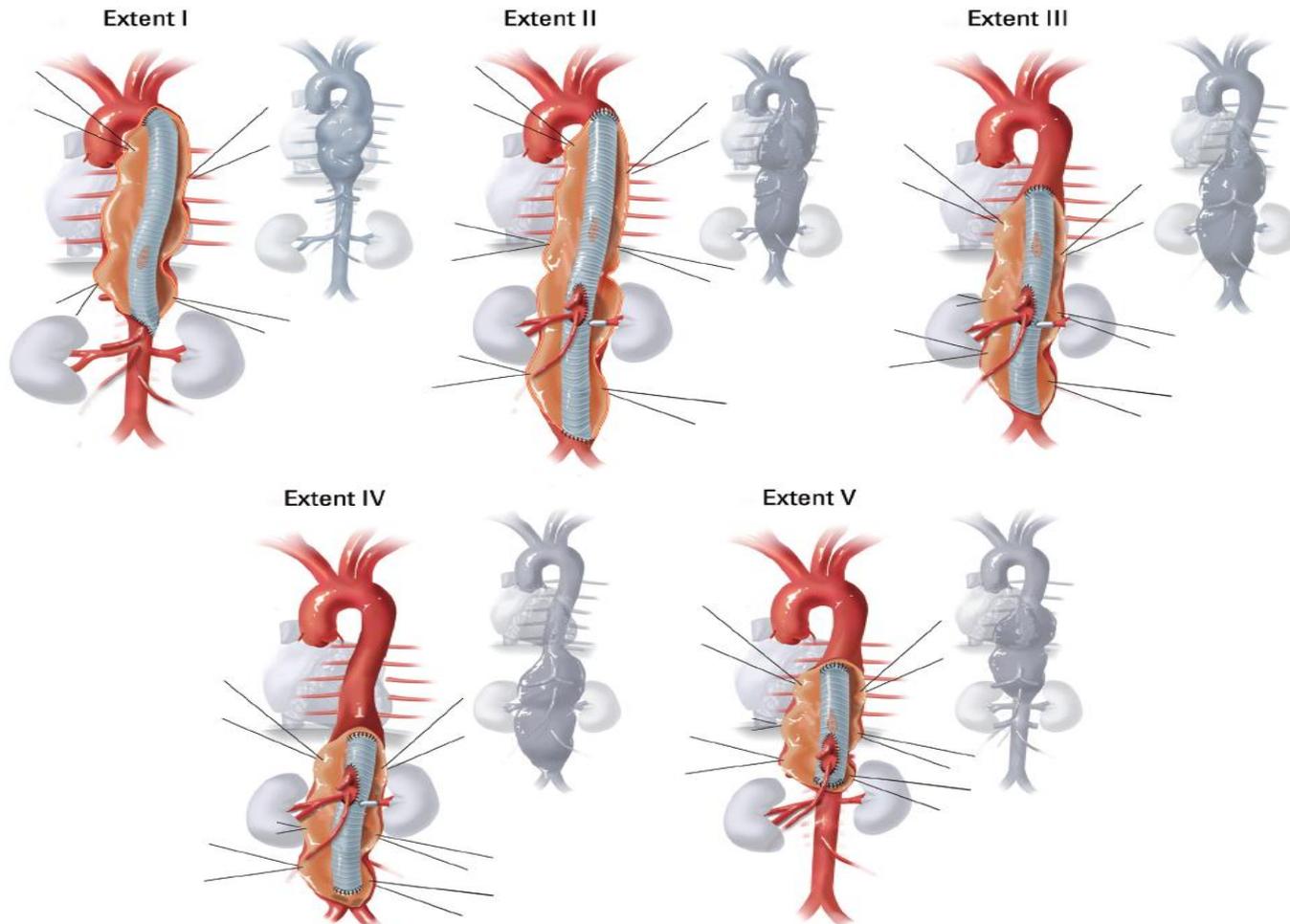
 Headache/Pain

 Weakness/Paraparesis

 Paralysis

# Spinal Cord Ischemia

Intra-operative ischemia of the spinal cord is thought to be, in part, related to interruption of blood flow to the arteries that supply blood to the spinal cord during surgery.



# Spinal Cord Ischemia

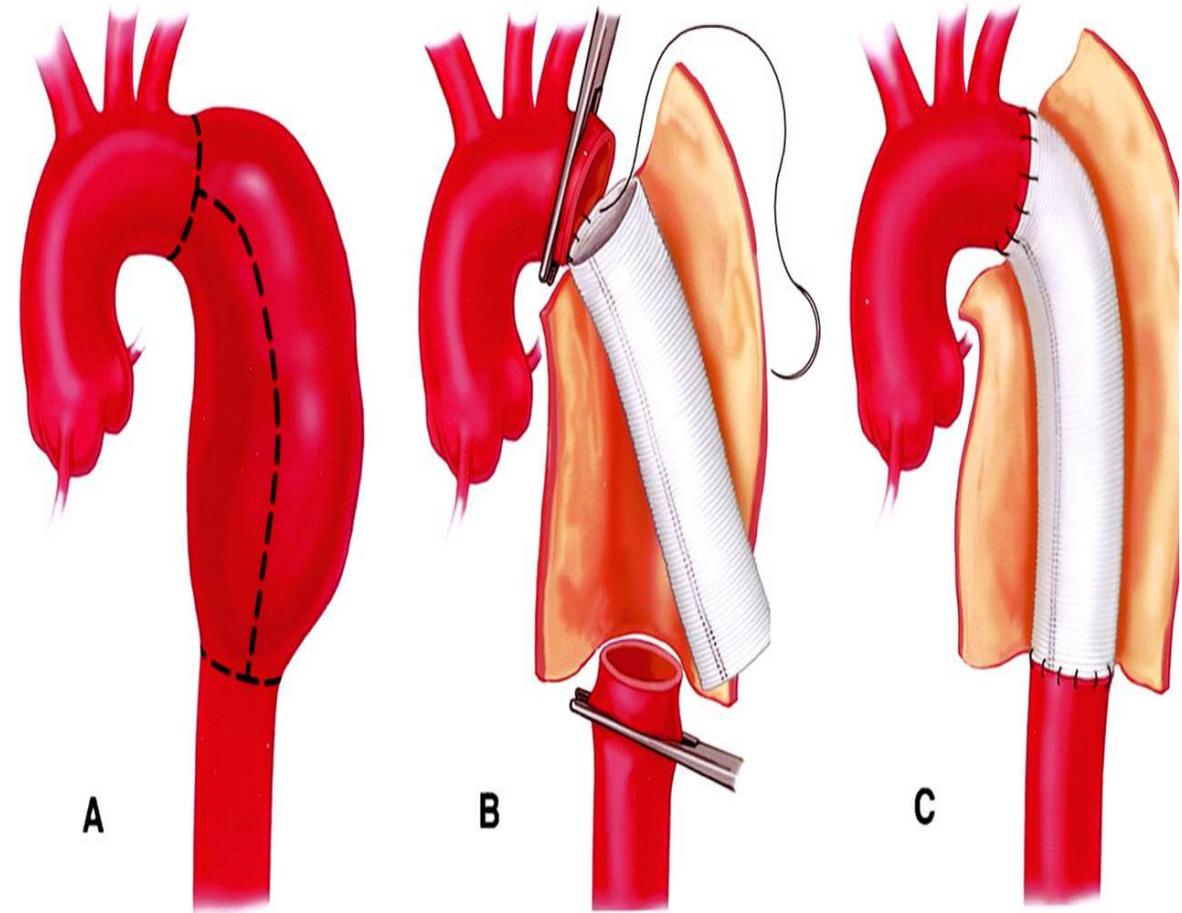
- ✓ The maintenance of an adequate blood pressure both during and after surgery is critical to maintaining spinal cord perfusion.
- ✓ CSF produced at rate of 25-30ml/hr
- ✓ Cerebrospinal fluid drainage is effective because acute changes in the spinal cord in response to ischemia or reperfusion may result in edema and increased CSF pressures during the procedure and for 48–72h.
- ✓ Maintain decreased ICP by keeping ICP <10 mmhg -Passive drainage at a rate of no more than 10-15 cc/hr recommended
- ✓ High Risk Patients avoiding ICP >5 mmHg is an effective strategy for preventing spinal cord injury #COPS

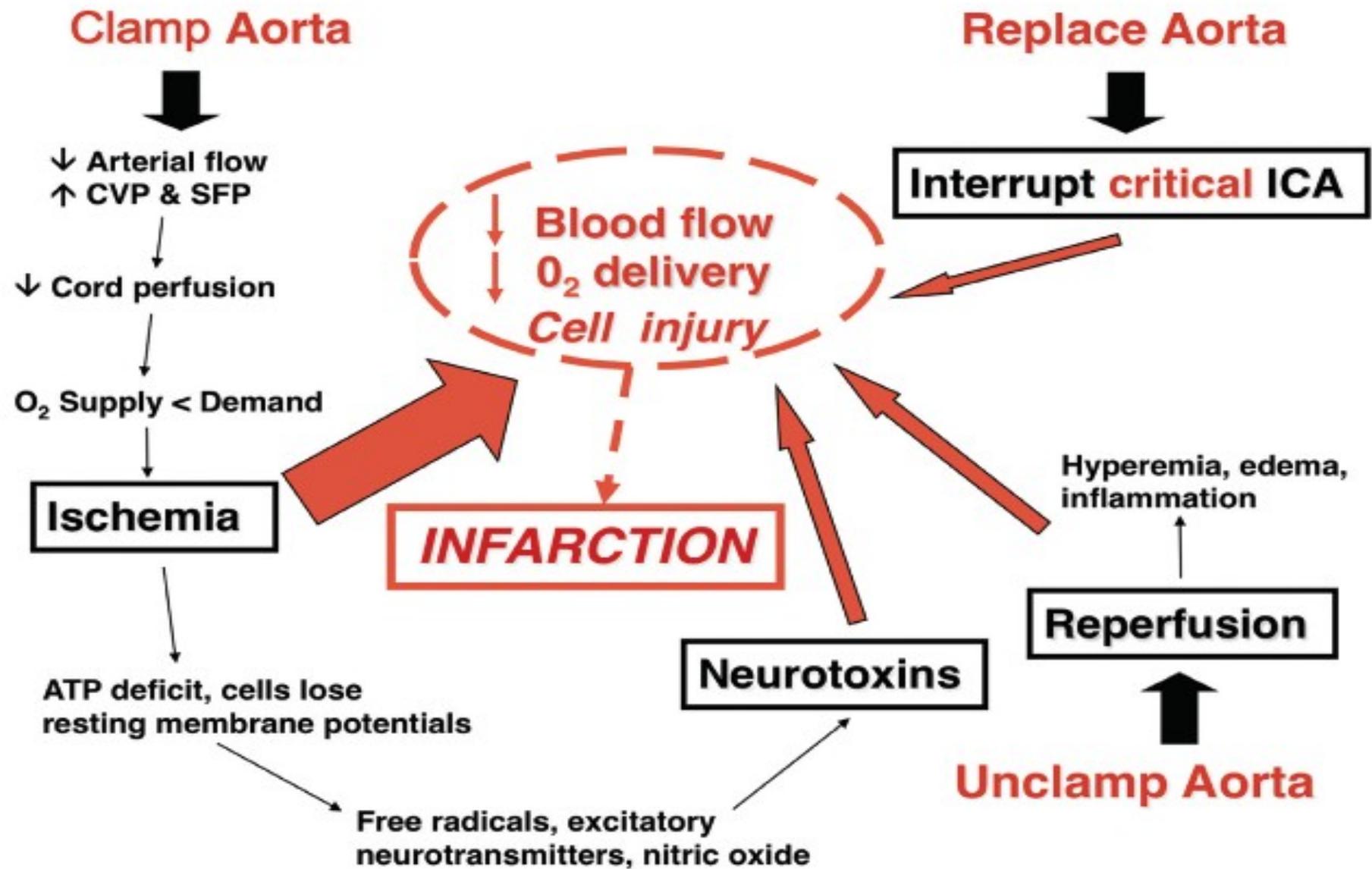
# Spinal Cord Ischemia Incidence

- Spinal cord infarction or ischemia with neurologic deficits can occur in 4%-13% of patients undergoing a thoracic endovascular aortic repair (TEVAR) and 7.1% in open TAAA surgery
- Decreased incidence since 2 decades ago where paraplegia/paraparesis was up to 32%

# Why does this happen?

- Aortic cross clamping reduces the distal mean arterial pressure (MAP) and the spinal cord perfusion pressure (SCPP)
- Clamping reduces the perfusion to the spinal cord and can cause ischemia and edema
- Then end result may be partial or incomplete paresis or complete paraplegia





# What increases the risk of spinal cord ischemia?

1. Emergency (dissection/rupture)
2. Increased Clamp Time
3. Extensive Aneurysms
4. Long Segment coverage of aorta
5. Intra-op and Post-op Hypotension
6. Increased Age
7. Previous Aneurysm Repair
8. Diabetes (comorbid diseases)



# CSF drains

Evidence from randomized and nonrandomized trials and from cohort studies support the use of CSF drainage as an adjunct to prevent paraplegia when this adjunct is used in centers with large experience in the management of TAAA.

Lower limb neurologic deficits occurred in 12% of patients who underwent CSF drainage and 33% of control subjects.

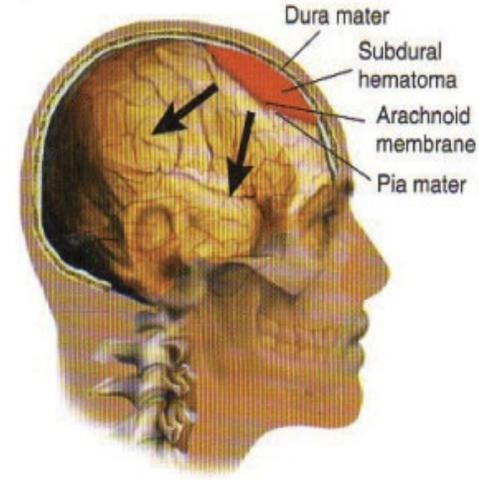
# ICU Management Orders



- Transduce Cerebrospinal Spinal Fluid Pressure (CSFP)** (sometimes called ICP)
  - Position patient HOB 30°
  - Level transducer to phlebostatic axis or right atrium
  - Continuously transduce CSFP
  - Turn stopcock off toward the cylinder
  - Read waveform on end expiration
  - Document the CSF pressure every 1 hour for 3 days
  - In the neurologically intact patient: Drain CSF to goal pressure of <10mmHg. However, do not drain more than 15ml per hour. (One can tolerate a higher CSF pressure as long he is moving. This reduced drainage may reduce the risk of ICH.)

# Risks of Draining CSF Continuously

Inadvertent **sudden drainage** of a large volume of CSF may cause a precipitate fall in intracranial pressure and lead to tearing of subdural vessels within the patient's skull, leading to cerebral damage from **subarachnoid hemorrhage**.



## Safety Measures:

- A three-way tap is turned on the drainage line to allow a controlled release of CSF into the drainage reservoir before turning the tap back again so that the spinal drain is again open only to the transducer.
- RN must remain at bedside and watch for neuro changes
- If Patient on COPS Protocol continuous drainage may be indicated –to reduce ICP, **Must be ordered by Attending Physician** and RN must stay in room until goal of ICP is obtained.

# ICU PostOp Management Orders

## Neuro Vital Signs

- Neuromuscular Checks q1h x24 hours

- Neurovascular Checks q1h x24 hours

- Notify MD/NP/PA for any changes immediately

## Maintain Lumbar Drain

- 72 hours for open repair

- 24-48 hours for endovascular repair

  - Will clamp after the first 12-24 hours, if no neurological deficit drain will be removed



# ICU PostOp management



- NO anticoagulation/VTE prophylaxis while lumbar drain in place
- Bedrest for the first 24 hours.
  - OOB to chair after 24 hours with drain in place as long as no neurological deficits
  - Do Not drain CSF while patient is OOB

# ICU PostOp Management Orders



- Monitor for Pink/Bloody CSF.
  - If CSF Pink/Bloody clamp drain and notify CV surgeon and CV Anesthesia. arrival, should assess the lumbar drain site.
    - Document color and whether drain is patent
- Maintain Hemoglobin  $>9\text{mg/dl}$ 
  - Notify NP/PA/MD for possible transfusion order.
- Maintain Cardiac Index  $\geq 2.5$
- Maintain SBP  $\geq 140\text{ mmHg}$ 
  - If becomes hypotensive can give fluid boluses
  - If refractory to fluid boluses, can start vasopressor

# Delayed Paraplegia

Evidence does suggest that CSF drainage is an effective rescue maneuver for patients who develop delayed-onset paraplegia.

## Predictors of DP include:

1. Increased age
2. Greater extent of TAAA (I,II,III),
3. CSF drain complications
4. Intraoperative loss of MEP (motor evoked potentials)
5. Post operative renal replacement therapy
6. **Unstable *systolic blood pressures* and spinal cord perfusion pressures**

# Recognizing Neurological Deficits

A new neurologic deficit developing after the patient awakened from the operation with a *normal* examination.

Deficits can be graded as:

0 = no muscular contraction

1 = a barely detectable flicker or trace of contraction

2 = active movement with gravity eliminated

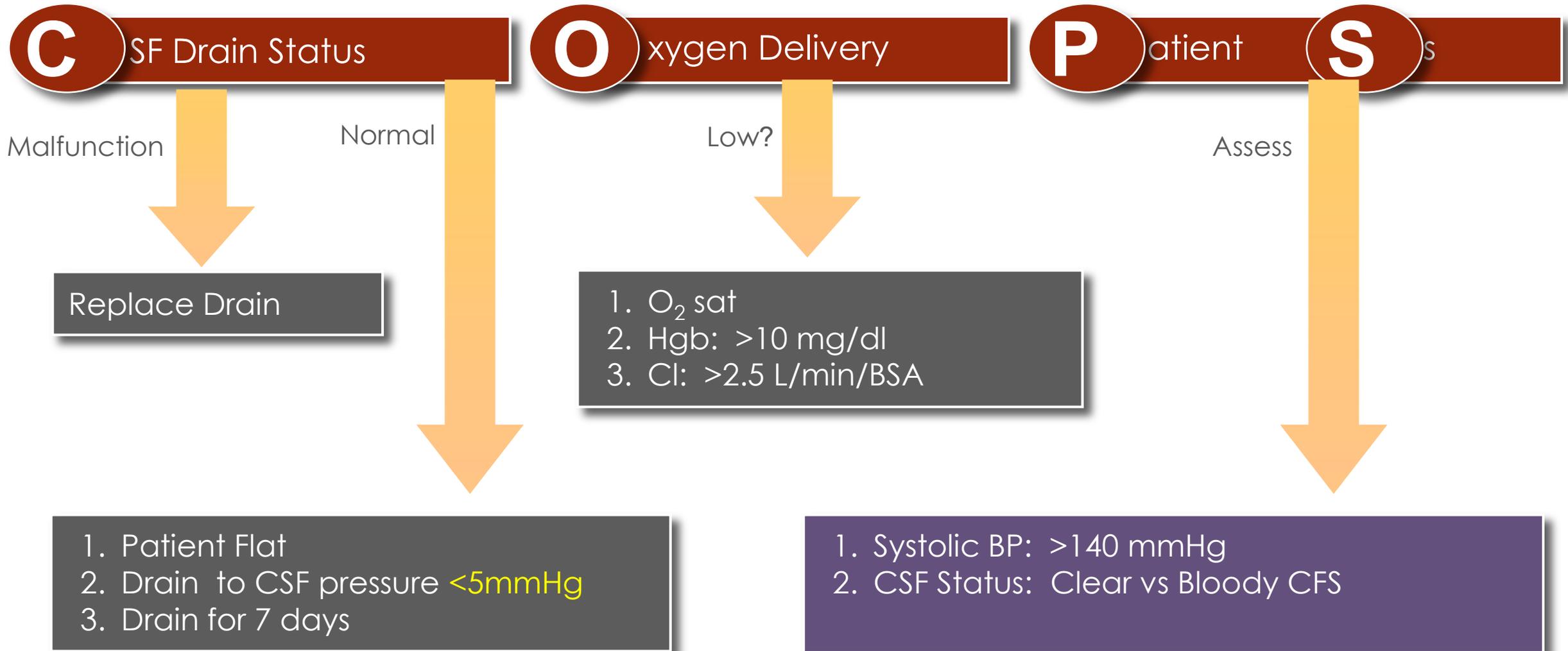
3 = active movement against gravity

4 = active movement against gravity and resistance

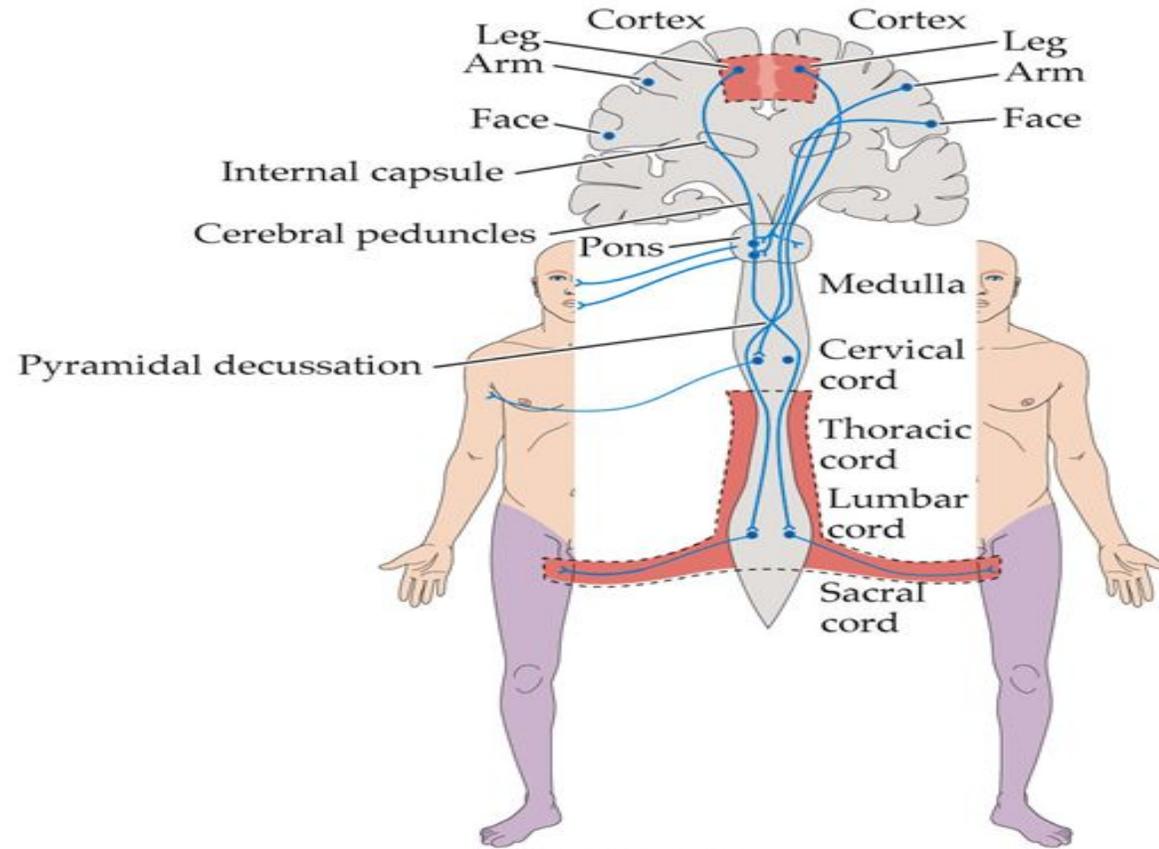
5 = normal.

A significant improvement in paraplegia or paraparesis defined as an improvement of at least two motor grades.

# Delayed Neurologic Deficit Management



# Paraplegia



Lufukuja G.

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Paraplegia remains one of the most devastating complications of thoracoabdominal aortic surgery and is associated with a significant increase in both morbidity and mortality (Fedorow, et al., 2010).

# Delayed Paraplegia

## DP is reversible

- assessment

- Initiation of COPS protocol

## Partial recovery or NO recovery

- Case management consult (rehab facility, ie TIRR)

- Rehab (PM&R, PT/OT)

- Support groups



# Lumbar Drain Removal & Monitoring post removal

- ✓ MD/NP/PA to remove drain in sterile fashion
- ✓ Site inspected and covered with 2x2 and clear occlusive dressing
- ✓ Patient to lay flat with spine aligned for 2-4 hours
- ✓ Monitor for headache due to continued CSF leak
  - ✓ 1. fluids
  - ✓ 2. Fiorcet
- ✓ Notify CV anesthesia if symptoms do not resolve
  - ✓ If CSF leak continues, CV anesthesia consulted for evaluation and possible blood patch

# References

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