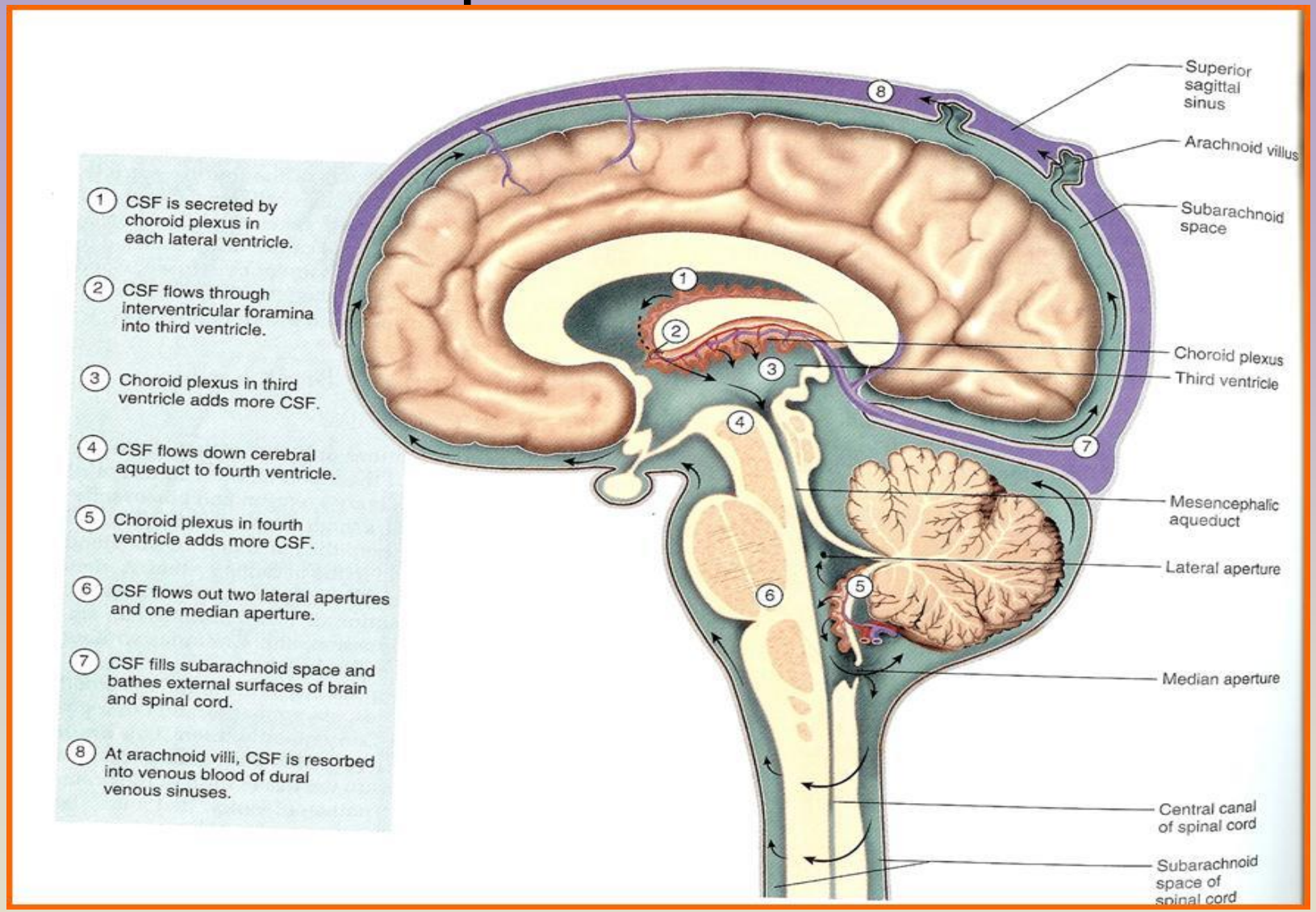
Lumbar Drain Education for the Surgical Patient

Post Thoracoabdominal Aortic Aneurysm Repair

Joan Walsh DNP, APRN-CNS Revised 11/13/19

Cerebrospinal Fluid Circulation



Lumbar Drain sits in the subarachnoid space of the spinal cord.

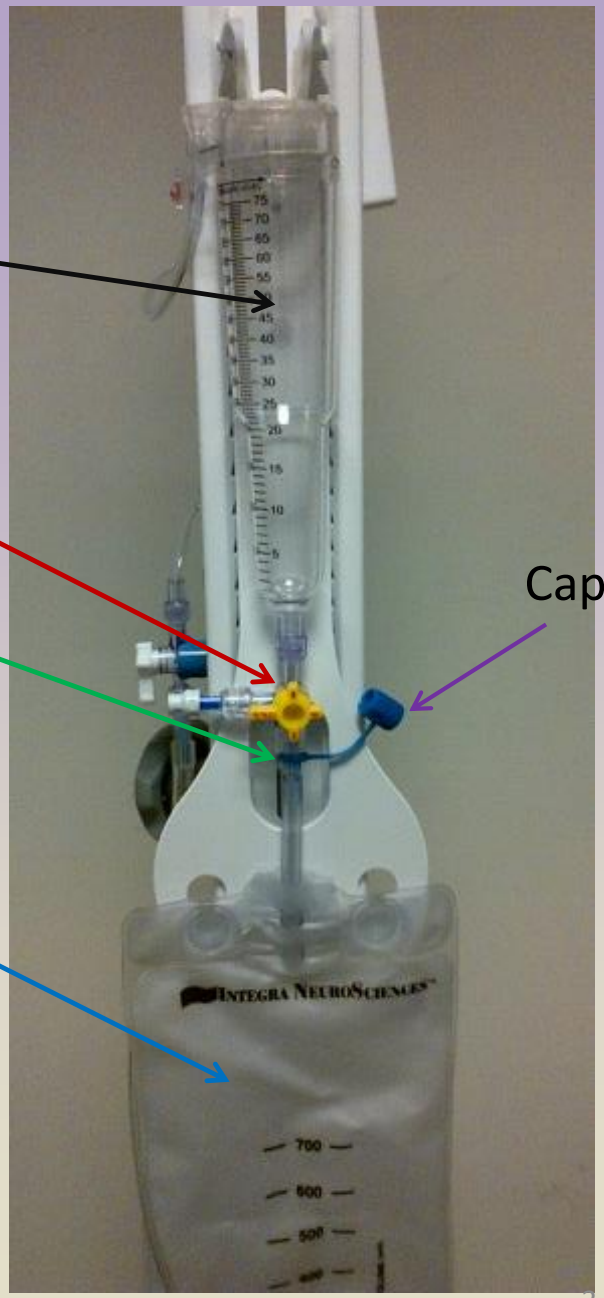
Integra AccuDrain Lumbar Drain

Drip Chamber

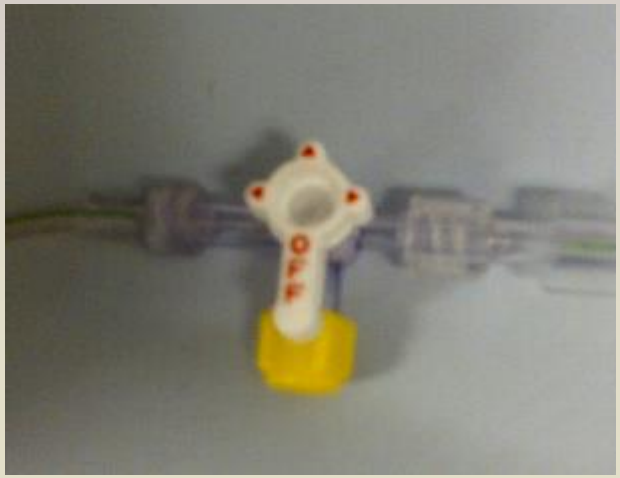
Drip Chamber Stopcock

Luer Lock Connector

Collection Bag

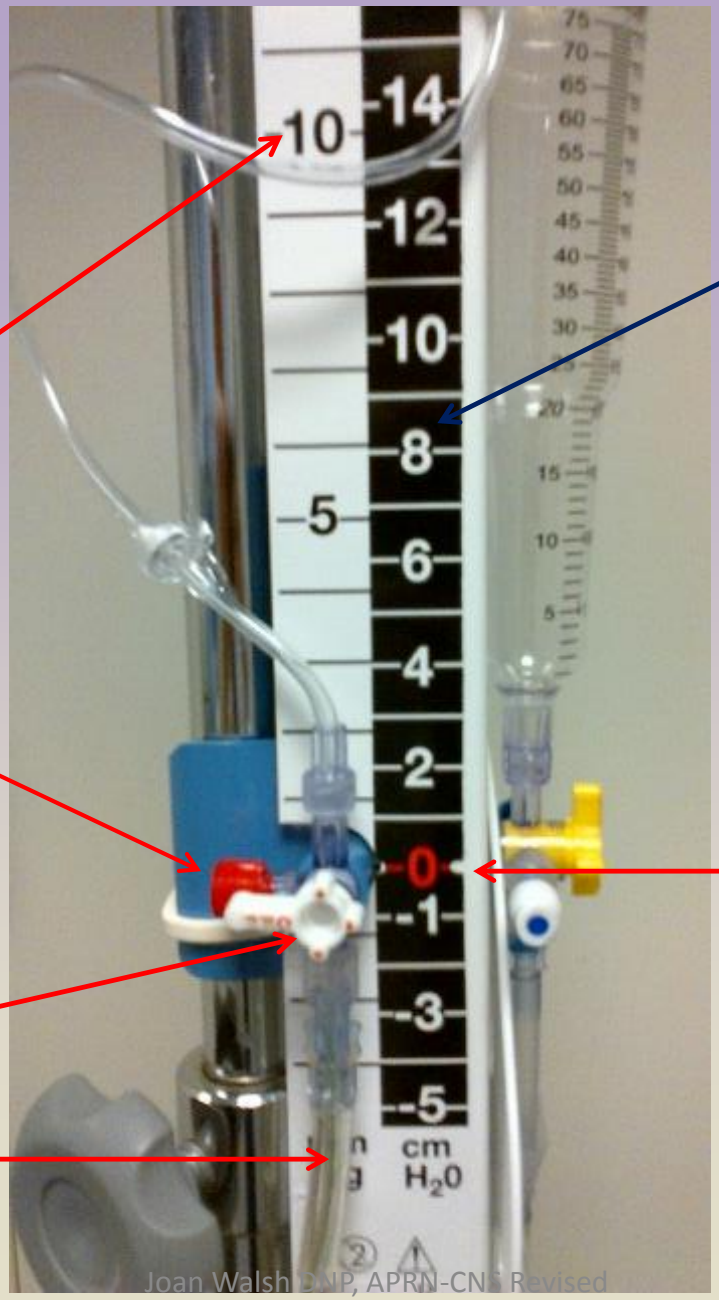


Stopcock Detail



Post-Thoracoabdominal Aortic Aneurysm Repair
mm Hg
(white background/
black numbers)

NEURO PATIENTS
cm H2O
(black background/
white numbers)

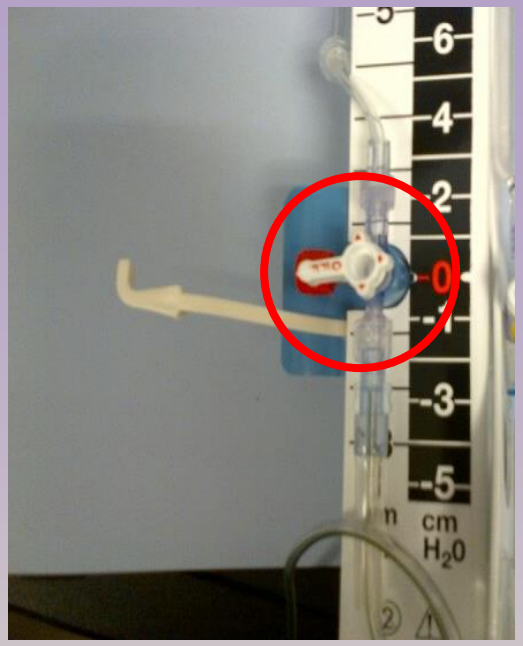


Transducer Port

Zero Point

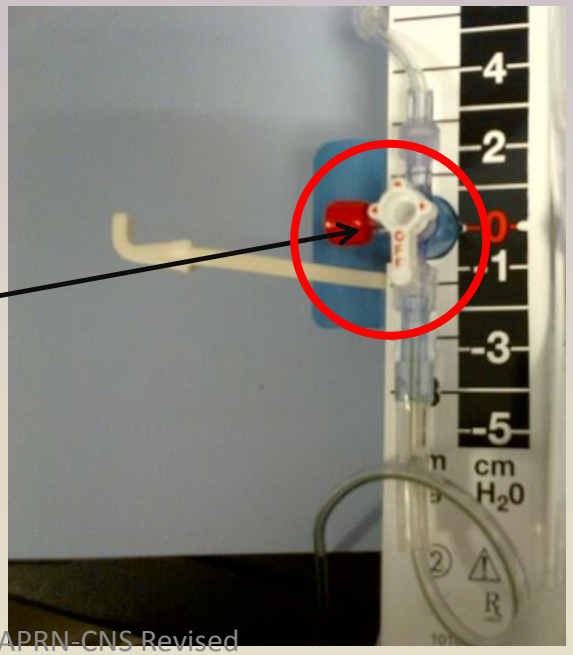
System Stopcock
(located at zero point)

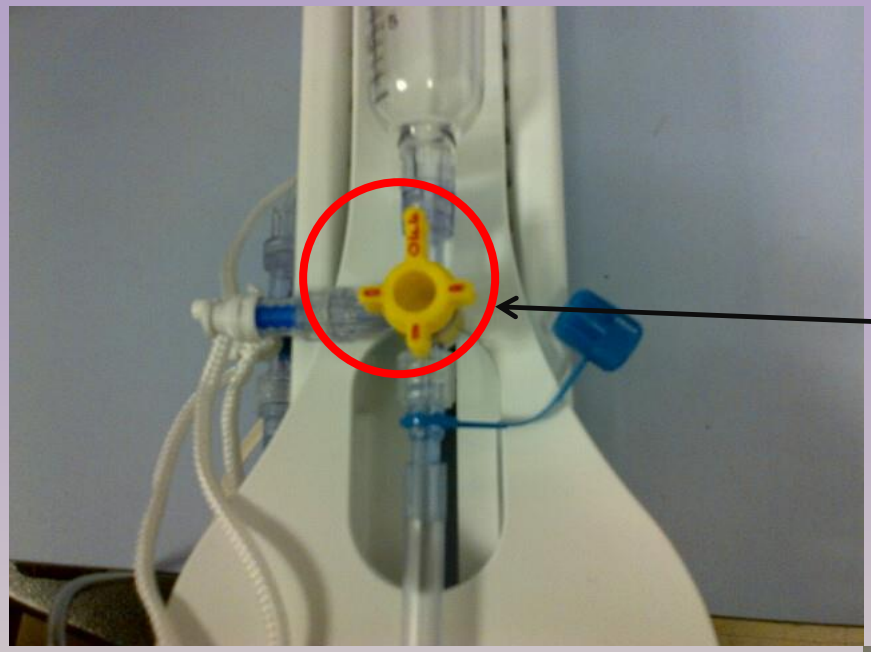
Tubing to Patient
(Green Line is pressure tubing)



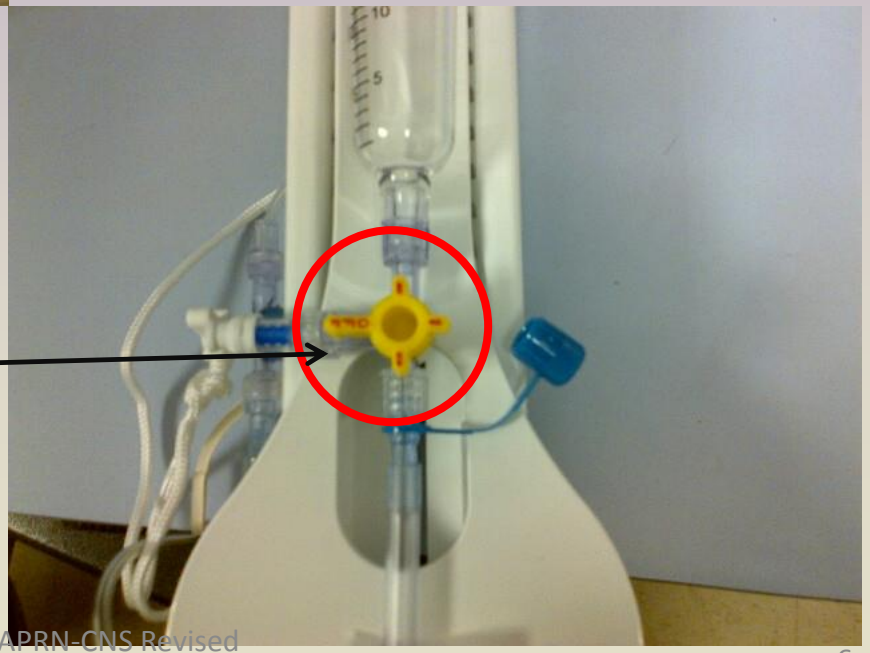
System Stopcock
Open to Patient =
Drain is Open

System Stopcock
Closed to Patient =
Drain is Closed





Drip Chamber Stopcock Closed to Drainage Bag



Drip Chamber Stopcock Open to Drainage Bag to Empty Drip Chamber

Lumbar Drains (LD)

- Closed sterile system
- Allows drainage of CSF from the subarachnoid space
- Inserted below L2 space in order to avoid injury to the spinal cord (ends at L1-L2)
- May cause radicular nerve pain if it brushes against a spinal nerve root
- This pain may be transient or persistent

IMPORTANT POINTS

- Make sure stopcocks are dead-ended to prevent contamination or air entering system
- Make sure drip chamber stopcock is turned off to the collection bag to ensure accurate measurement of CSF
- Never use IV or pressure bags
- RN never flushes the drain
- Qualified RN must always accompany patient with LD off the floor to procedures
  - RN must remain with patient until handoff to qualified RN occurs

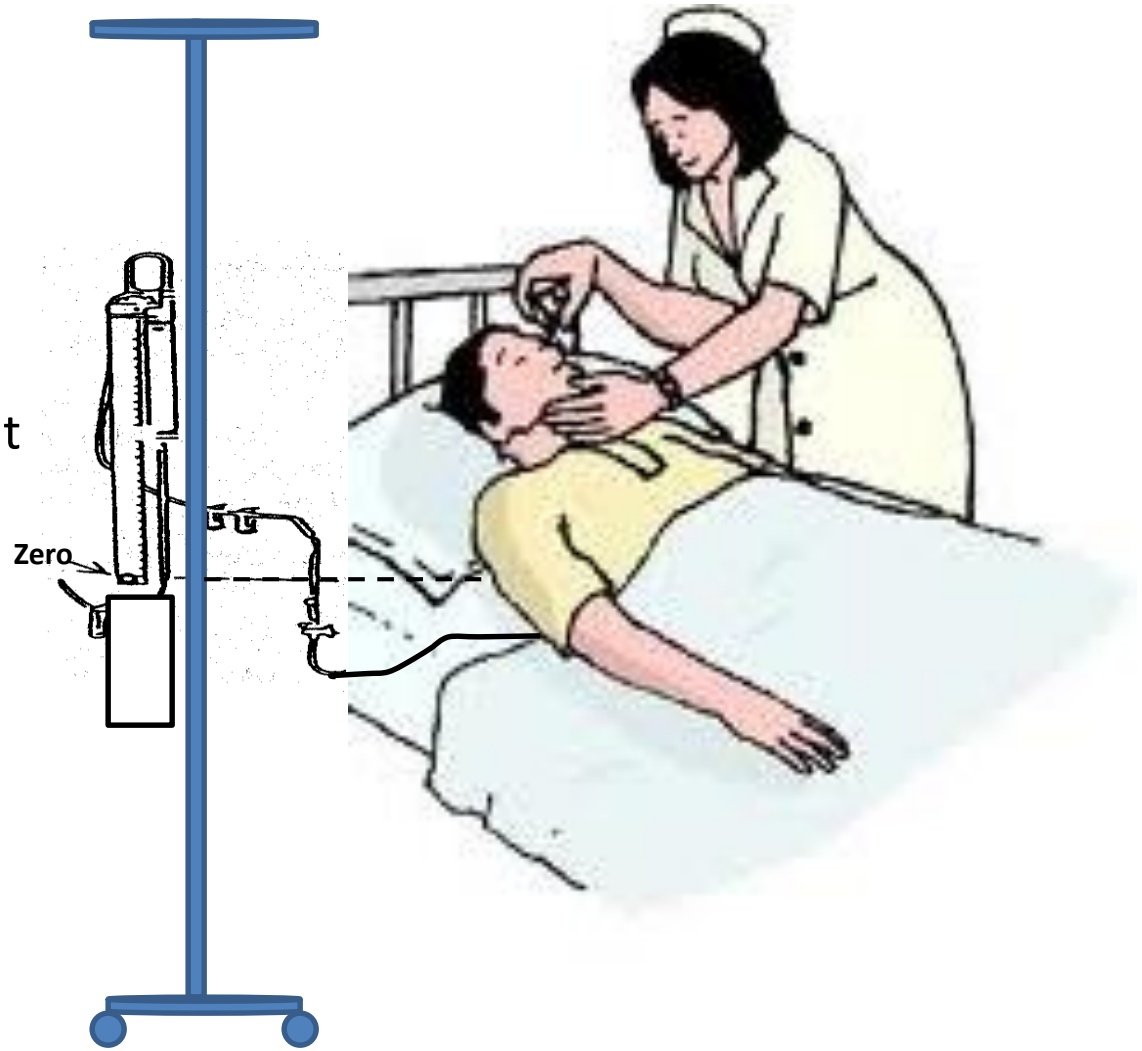
Spinal Cord Related Concerns Post Thoraco-AAA Repair

- Patients are at risk for decreased spinal cord perfusion pressure leading to ischemia and potential paraplegia
- This could be due to:
  - Cross-clamping of the aorta during surgery
  - Hemodynamic response to aortic cross-clamping
    - ↑ cerebrospinal fluid (CSF) pressure r/t hypercarbia after clamp release
    - ↓ blood flow to areas distal to cross clamping (including areas of the spinal cord)
    - Hypotension after clamp release leading to ischemia
    - Spinal cord edema as a result of reperfusion injury

Why a Lumbar Drain after Thoraco-AAA Repair?

- The goal is to improve spinal cord perfusion by reducing CSF volume and therefore reduce pressure on the spine and spinal arteries; perioperative spinal cord protection
- CSF volume and pressure may increase over the next few days
- This pressure can compress arteries perfusing the spinal cord, as well as the spinal cord itself
- Spinal cord ischemia or infarction can result
- Removing CSF will ↓CSF pressure
- ↓ CSF pressure will↑ spinal cord perfusion
- Injury may be prevented
- Drain will remain in place an average of 2-3 days

Leveling the drain's zero point to the phlebostatic axis



Open or Closed?

- Drain's zero point (= system stopcock) will be leveled to the phlebostatic axis
- Drip chamber will be set at 10 mmHg per order
  - Use the White Background/Black Number scale (marked mmHG)
  - The Red Pressure Level Indicator near the top of the drip chamber should align with 10 mmHg
  - Provider may order a different setting for specific patients
- Drain is left Open (System Stopcock open to patient) for continuous drainage
- Drip Chamber stopcock is kept closed to collection bag but opened hourly to empty the drip chamber
- Frequent monitoring of drainage amount

Monitoring and Documentation

- Hourly assessments
  - CSF amount, color, and characteristics
  - Neurologic Assessment (GCS, pupils)
    -Noting change in mental status/LOC, headache, N/V
  - Spinal Assessment-Spinal Cord Motor Function LE
  - Neurovascular assessment (Bilat Lower extremities)
- Every four hours AND prn
  - Insertion site assessment
    - Drainage , fluid leaks, erythema, fluid pocket, dressing integrity

Lumbar Drain, GCS and Pupil Assessments

Lumbar Drain	
Lumbar properties	Placement date/time/location (from LDA)
Drain status	Open to drainage, 10 mL/hr, 15 mL/hr, 20 mL/hr, 25 mL/hr, 30 mL/hr, clamped, clamped, opened hourly, Flushed by LIP, occluded, to pressure monitoring, other (comment)
Drain level	Free text
CSF Color	Clear, cloudy, particulates noted, pink, purulent, rust colored, sanguineous, serosanguinous, tan, yellow, other
Site description	Bleeding, s
Dressing status	CDI, clean, dry, intact, new drainage, old drainage, removed, other(comment)
Output (mL)	Free text
Glasgow Coma Scale	
Eye opening	4= spontaneous, 3=to speech, 2=to pain, 1= none
Best verbal response	5= oriented, 4=confused, 3=inappropriate words, 2= inappropriate speech,1=none
Best motor response	6=obeys commands, 5=localized pain, 4=withdraws from pain, 3=flexion to pain, 2= extension to pain, 1=none
Glasgow Coma Scale score	Auto-populates
Pupil Assessment	
R pupil size	1-9, other
R pupil shape	Round, oval, keyhole, other
R pupil reaction	Brisk, sluggish, nonreactive=fixed, unable to assess
L pupil size	1-9, other
L pupil shape	Round, oval, keyhole, other
L pupil reaction	Brisk, sluggish, nonreactive=fixed, unable to assess
Consensual response present	Yes, no

R and L Neurovascular Assessments

RLE neurovascular assessment	
R femoral pulse	+1= weak, +2=moderate, +3=Strong, +4 bounding, doppler, absent, unable to assess, other (comment)
R popliteal pulse	+1= weak, +2=moderate, +3=Strong, +4 bounding, doppler, absent, unable to assess, other (comment)
R posterior tibial pulse	+1= weak, +2=moderate, +3=Strong, +4 bounding, doppler, absent, unable to assess, other (comment)
R dorsalis pedis pulse	+1= weak, +2=moderate, +3=Strong, +4 bounding, doppler, absent, unable to assess, other (comment)
Assess site location (if applicable)	Femoral, other(comment)
RLE Capillary Refill	Less than/equal to 2 seconds, 3 seconds, greater than/equal to 4 seconds, exception
RLE Color	Acrocyanosis, appropriate for ethnicity, ashen, black, bronze, cyanotic, dusky, ecchymosis, flushed, gray, jaundice, mottled, pale, pink, purple, red , ruddy, unable to assess, other(Comment)
RLO Temperature/moisture	Cool, cold, warm, hot, dry, clammy, diaphoretic, other (comment)
RLE Motor response	Responds to commands, normal extension, normal flexion, tremors, flaccid, abnormal extension, abnormal flexion, localizes, movement to painful stimulus, no movement to painful stimulus, non-purposeful movement, no tremor, spastic, unable to assess, other (comment)
RLE Sensation	Decreased, no sensation, numbness, pain, tingling, full sensation, no numbness, no pain, no tingling, unable to assess, other (Comment)

Spinal Cord Motor Function-Lower Extremity

Spinal Cord Motor Function- Lower Extremity	
Hip flexion Right (L2)	0=total paralysis, 1= palpable or visible contraction, 2=active movement gravity eliminated, 3= active movement against gravity, 4=active movement against some resistance, 5= active movement against full resistance, 5*= normal corrected for pain, disuse, NT= not testable
Hip flexion Left (L2)	0=total paralysis, 1= palpable or visible contraction, 2=active movement gravity eliminated, 3= active movement against gravity, 4=active movement against some resistance, 5= active movement against full resistance, 5*= normal corrected for pain, disuse, NT= not testable
Knee extension Right (L3)	0=total paralysis, 1= palpable or visible contraction, 2=active movement gravity eliminated, 3= active movement against gravity, 4=active movement against some resistance, 5= active movement against full resistance, 5*= normal corrected for pain, disuse, NT= not testable
Knee extension Left (L3)	0=total paralysis, 1= palpable or visible contraction, 2=active movement gravity eliminated, 3= active movement against gravity, 4=active movement against some resistance, 5= active movement against full resistance, 5*= normal corrected for pain, disuse, NT= not testable
Ankle Dorsiflexion Right (L4)	0=total paralysis, 1= palpable or visible contraction, 2=active movement gravity eliminated, 3= active movement against gravity, 4=active movement against some resistance, 5= active movement against full resistance, 5*= normal corrected for pain, disuse, NT= not testable
Ankle Dorsiflexion Left (L4)	0=total paralysis, 1= palpable or visible contraction, 2=active movement gravity eliminated, 3= active movement against gravity, 4=active movement against some resistance, 5= active movement against full resistance, 5*= normal corrected for pain, disuse, NT= not testable
Long toe extension Right (L5)	0=total paralysis, 1= palpable or visible contraction, 2=active movement gravity eliminated, 3= active movement against gravity, 4=active movement against some resistance, 5= active movement against full resistance, 5*= normal corrected for pain, disuse, NT= not testable
Long toe extension Left (L5)	0=total paralysis, 1= palpable or visible contraction, 2=active movement gravity eliminated, 3= active movement against gravity, 4=active movement against some resistance, 5= active movement against full resistance, 5*= normal corrected for pain, disuse, NT= not testable
Ankle Plantar Flexion Right (S1)	0=total paralysis, 1= palpable or visible contraction, 2=active movement gravity eliminated, 3= active movement against gravity, 4=active movement against some resistance, 5= active movement against full resistance, 5*= normal corrected for pain, disuse, NT= not testable
Ankle Plantar Flexion Left (S1)	0=total paralysis, 1= palpable or visible contraction, 2=active movement gravity eliminated, 3= active movement against gravity, 4=active movement against some resistance, 5= active movement against full resistance, 5*= normal corrected for pain, disuse, NT= not testable
Voluntary Anal Contraction	Yes, no

Positioning

- In general, HOB will be ordered at 30 degrees and lumbar drain open for at least 24 hours
  - Drain must be clamped when patient is ambulating, changing position, or moving from bed to chair
  - Relevel and open drain after position change
  - Patient may turn side to side in bed without significant change in drainage (unless drain proves to be positional)
  - Consider bed control lockouts for noncompliance/cognitive impairment
  - Instruct patient not to get OOB or raise/lower bed without notifying nurse

Clamping the Drain

- Clamp the drain for the following:
  - Drainage more than 10 ml
    - Notify provider
  - When traveling with patient
  - When repositioning and suctioning
  - When changing the level of the patient: ie. ambulating, going from bed to chair

Documentation

- CSF drainage
  - Amount (Record hourly amounts)
  - Color
  - Clarity
- Level of the drain
- Continuous drainage
- Assessment every hour
  - Spinal assessment (lower extremities)
  - Neuro assessment
  - Integrity of site/dressing/connections
    - Reinforce dressing if needed
    - Alert provider to change dressing

Complications

- Coughing, sneezing, and straining can increase rate of drainage
- Post-procedure headache
- Lumbar-sacral nerve injury
- Spinal cord ischemia
- CSF leak
- Meningitis
- Spinal or epidural hematoma
- Subdural or subarachnoid hemorrhage
- Cerebral herniation

When Should I Alert the Provider

- CSF suddenly becomes bloody or cloudy
- The patient's neurologic/neurovascular assessment changes or new onset/worsening H/A, nausea or vomiting
- CSF drainage >10 ml/hr (shut system stopcock off to patient and notify provider)
- Drainage/leakage/ fluid pocket at the insertion site
- The drain won't drain
- The lumbar drain becomes disconnected (infection risk)

Excessive CSF Drainage

- Symptoms
  - Sudden onset or increase in headache
  - Nausea/vomiting
  - Change in mental status
- Notify LIP immediately if over-drainage or neurologic condition changes (and shut system stopcock off to patient)

Disconnections/Dislodgements

1. Don sterile gloves and a procedural mask.
2. **Disconnection:** Secure the open end of the patient's catheter:
    a. Attach a sterile dead-end cap to catheter luer-lock connector, if present; or
    b. Clamp the catheter with a Kelly clamp and cover the open end with a 2x2 gauze. Secure with tape.
    c. Obtain a new EVD drainage system in preparation for the ordering/covering provider's arrival.
    d. Notify the ordering/covering provider immediately after capping/clamping the catheter.
3. **Dislodgement:** If the catheter has become completely dislodged, cover the site with gauze and an occlusive transparent dressing.
    a. Alert the ordering/covering provider.
    b. Monitor the patient for neurological changes; document in the EHR.
4. Dispose of the contaminated EVD system in the biohazards waste bin.
5. Document an event note in the EHR.

Troubleshooting

- No CSF drainage in drip chamber
  - Lower drip chamber briefly to assess flow into drip chamber
  - Assess integrity of system
    - Are all stopcocks open to drainage
    - Is the tubing kinked
    - Is the tubing disconnected
  - Notify provider if troubleshooting does not fix the problem
- Tubing becomes occluded by blood or debris and will not drain
  - Notify provider
  - Nursing **does not** flush the drainage system
- Excessive CSF drainage
  - Clamp drain and notify provider

Transducing Cerebrospinal Fluid Pressure (CSFP)

- On occasion the provider may choose to transduce CSFP
- The RN **does not** prime the transducer, replace the transducer, or flush, the drain
- The transducer must **never** be attached to an IV bag nor a pressure bag and **must** have sterile dead end caps on all ports
- The provider will attach the transducer to the "transducer port" which is at the system stopcock at the site of the red dead end cap. The provider will prime the transducer
- To obtain an accurate CSF pressure reading, the system stopcock must be shut off (temporarily) to the drip chamber. Remember to open the drain back up after the pressure reading by opening the system stopcock to the drip chamber.
- When the LD is being transduced, the RN alerts the provider if the LD has air, blood, or other matter in the drainage tubing as this will interfere with the accuracy of the CSFP

Changing the Collection Bag

RIH Policy: *EVD and Lumbar Drains: Changing the Collection Bag*

Supplies

EVD/lumbar drain collection bag
Non-sterile gloves
Sterile dead-end cap
Procedural mask
Sterile gloves
Providone iodine pads/swabs
(chosen over CHG because CHG requires a friction rub)

Procedure

1. Perform hand hygiene and don sterile gloves
2. Turn system stopcock off to drip chamber/collection bag
3. Scrub the luer lock connection between the collection bad and drip chamber for 15 seconds using povidone iodine pad/swab. Air dry for at least 1 minute.
4. May lower drip chamber/collection bag temporarily so that it hangs below the white/black plastic panel. This will make it physically easier to change the collection bag.
5. Remove non-sterile gloves and perform hand hygiene
6. Place the new collection bag package on a clean, flat surface. Open the package to expose the new collection bag (maintain sterility of new collection bag luer lock connection)
7. Don procedural mask and sterile gloves
8. Disconnect the old collection bag at the luer lock connection site and immediately attach the new bag, maintaining sterility of luer lock connection throughout (attach the luer lock connection of the new bag before removing the old bag from hangers to prevent contamination)
9. Place sterile dead-end cap on the luer lock connection of the old bag, remove it from the hangers and discard in biohazard waste
10. Attach the new collection bag to hangers.
11. Remember to set drip chamber back to 10 mmHg by aligning red pressure level indicator to 10mmHg.
12. Turn the system stopcock open to the drainage line.

References

Care of the Patient Undergoing Intracranial Pressure Monitoring/External Ventricular Drainage or Lumbar Drainage: AANN Clinical Practice Guideline Series. (2012). American Association of Neuroscience Nurses.

Fedorow, C., et al. (2010) Lumbar Cerebrospinal Fluid Drainage for Thoracoabdominal Aortic Surgery: Rationale and Practical Considerations for Management. International Anesthesia Research Society. DOI: 10.1213/ANE.0b013e3181ddddd6

Hepburn-Smith, M., et al. (2016). Establishment of an external ventricular drain best practice guideline: The quest for a comprehensive, universal standard for external ventricular drain care. (2016). *Journal of Neuroscience Nursing*, 54-65.

Lele, A., et al. (2017) Perioperative management of adult patients with external ventricular and lumbar drains: Guidelines from the society for neuroscience in anesthesiology and critical care. Journal of Neurosurgical Anesthesiology, 191-210.