

# A guide for the management of lumbar CSF drains

*for the purpose of preventing spinal cord ischaemia post aortic surgery*

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CSF drainage system	
<p> <ul style="list-style-type: none"> <li>Align main system stopcock with Patient's Foramen of Monro OR Exit of Lumbar Catheter.</li> <li>Attach the Pressure Transducer to the Main System Stopcock (remove the end-plug).</li> <li>OR attach the Pressure Transducer to the Patient Line Stopcock (remove injection site).</li> <li>Prerfill system using sterile technique. Use a 25-ga. needle to fill patient line to drip chamber with sterile normal saline at patient line injection site. Verify the absence of leaks and air bubbles.</li> </ul> <p><b>SYSTEM CONTROL</b></p> <ul style="list-style-type: none"> <li><b>To Set Pressure Head.</b> slide the drip chamber arrow to the desired pressure setting.</li> <li><b>CSF Drainage to Flow Chamber.</b> First, open the Main System Stopcock, then open the Patient Line Stopcock.</li> <li><b>CSF Drainage from Flow Chamber to Drainage Bag.</b> Open BOTH large drainage line slide clamps.</li> </ul> <p><b>For Pressure Monitoring and Patient Transport, refer to Instructions for Use.</b></p> <p><b>FLOW MONITORING</b></p> <ul style="list-style-type: none"> <li>Shut off flow chamber to collection bag with proximal drainage line slide clamp.</li> <li>Open both stopcocks so that the patient line communicates with the flow chamber.</li> <li>Record the fluid accumulation.</li> </ul> <p> <b>Medtronic</b>  <small>Manufacturer: Medtronic, Inc. Minneapolis, MN 55432 USA</small>  <b>REF# 27702</b>  <b>LOT# 209609891</b> </p> </p>	<p>This kit can be found in:</p> <p>White scale = cm H<sub>2</sub>O</p> <p>Grey scale = mmHg</p> <p>Set arrow to 10mmHg</p> <p>Zero on scale set at the level of the heart. Green line to patient</p>



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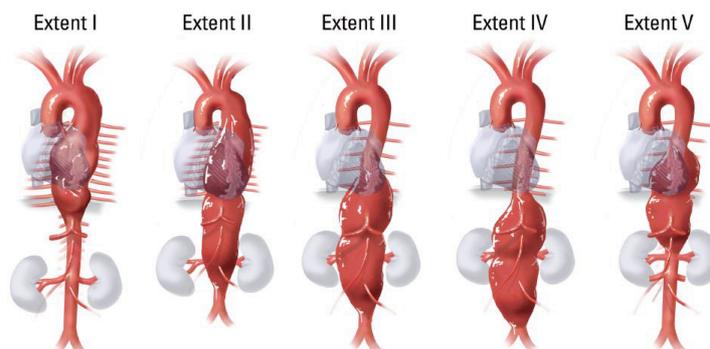
## Rationale

### Why do we have spinal drains?

One of the most devastating complications of thoraco-abdominal aortic aneurysm repair (by both open surgical repair and endovascular stenting) is the development of paraplegia due to spinal cord ischaemia. Spinal drains have been shown to reduce the incidence of paraplegia.<sup>1</sup>

The published incidence of paraplegia varies between 4-16%.

The risk of spinal cord ischaemia varies between as seen in the diagram and increases with the extent of the aneurysm repair, especially if it involves the T8-12 region of the aorta. Spinal cord ischaemia is potentially reversible if managed effectively.



Any deterioration in neurological status should be treated as a medical emergency and should be reported to the medical team and nurse in charge immediately. Delay in detection and treatment of spinal cord ischaemia can result in permanent paraplegia.

Lumbar CSF drainage to reduce the CSF pressure and optimisation of systemic arterial blood pressure are the two main ways of preventing or treating spinal cord ischaemia.

Spinal cord perfusion depends upon the difference between mean arterial pressure (MAP) and the mean CSF pressure. We can increase systemic MAP with fluids or vasopressors. CSF pressure can be reduced by controlled drainage of CSF via a lumbar CSF drain.

CSF drains can be associated with significant complications (such as meningitis, post-dural puncture headache, fistulation, spinal haematoma, intra-cranial haemorrhage) and therefore must be managed safely and effectively according to this guideline.

This document will guide you through the practicalities of using a CSF drainage system and what to do if certain problems are encountered. If you still don't know what to do after referring to this guide please seek advice from senior anaesthetic, vascular surgical or neurosurgical doctors.

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## Process for insertion of lumbar CSF drains

1 Lumbar CSF drains should only be inserted by consultants or senior trainees under supervision.

2 The decision to insert a CSF drain for the purpose of controlling the CSF pressure is made jointly by the consultant surgeon and consultant anaesthetist responsible for the case. The patient should be informed of the risks and benefits and why the team have on balance chosen to use a CSF drain.

3 We recommend using a standard portex 16g epidural kit unless the consultant anaesthetist inserting the drain has a reason to use another CSF drainage system used within the trust. This is because the portex catheters are easier to insert and are less prone to kinking.

4 We recommend performing the procedure in the lateral position (reduced loss of CSF whilst catheter is being inserted) at L3/4 or L4/5 levels using a midline approach if possible (reduced risk of epidural vein puncture) Full asepsis must be maintained. Aim to leave between 8-10 cm of catheter within the CSF, but withdraw if paraesthesia experienced until paresthesia subsides.

5 All accessible injection/aspiration ports in the CSF line should be labelled clearly warning against inadvertent injection.

6 The catheter should be connected to the (CODMAN) CSF drainage system and CSF drainage should be prevented using the three way tap until the patient is secured on the operating table. The CSF collection chamber should be secured to the operating table to avoid inadvertent change in drainage pressure due to increase or decrease of operating table height. Whilst the patient is supine the zero level can be placed in line with the tragus or the patient's ear. The pressure level is usually set to 10 initially.

7 Intra-operatively the anaesthetist should ensure that the CSF does not drain at a rate of more than 20 mls an hour. Faster or sudden drainage of a larger volume of CSF can lead to a rapid reduction in intracranial pressure associated with tearing of sub-dural vessels leading to sub-dural haemorrhage.

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## Management of Lumbar CSF drains in Recovery or critical care unit

Patients should routinely be woken as soon as possible after the procedure to allow for neurological assessment.

The following check-list is to be used on arrival in recovery after monitoring and routine handover have been completed

Check	Arrival Checklist Criteria
	Patient should be semi-reclining with upper body at no more than a 30 degree angle
	The 'zero' level should be at the height of the heart (as with other pressure transducers)
	All 3 way taps in the CSF drainage system should be labelled 'CSF drain'
	Maintain MAP > 90mmHg unless specified otherwise by team (anaesthetic/ surgical) responsible for patient
	Set drainage pressure to 10mmHg
	Commence the hourly checklist chart

Check	Hourly CSF drain Checklist Criteria
	Patient should be semi-reclining with upper body at no more than a 30 degree angle
	The CSF collection chamber should be zeroed at the level of the heart
	All 3 way taps in the CSF drainage system should be labelled 'CSF drain'
	Maintain MAP > 90mmHg unless specified otherwise by team (anaesthetic/ surgical) responsible for patient
	Drainage pressure should be set to 10mmHg unless otherwise specified
	Check CSF is dripping into the collection chamber
	Record the hourly drainage and empty the contents of the CSF collection chamber into the CSF drainage bag following procedure on the following page. If more than 20 mls of CSF drains in an hour inform medical team.
	Complete hourly neurological observations (see appendix for chart)
	Observe for any change in colour or consistency of the CSF fluid drained

Check	Management of neurological deterioration
	Patient should be laid supine and CSF drain zero level with heart.
	Check the insertion site for evidence of inflammation or leakage (of pus or CSF)
	MAP should be increased to 100mmHg (or 90mmHg if previously significantly less than 90mmHg. If no improvement at 90mmHg increase to 100mmHg) using vasopressors. Ensure adequate hydration.
	Clotting should be checked and any heparinisation reversed
	Oxygen delivery to the spinal cord should be optimised, oxygen saturation should be maintained above 95% and haemoglobin should be maintained > 100g/l
	Reduce set drainage pressure by 5 mmHg. Reassess in one hour and reduce CSF drainage pressure again if limb weakness does not resolve. Inform medical team.
	If there is no CSF drain in-situ, it should be inserted if paraplegia does not resolve after MAP and oxygen delivery are optimised, once clotting is normal.
	If paraplegia does not resolve with increasing MAP and reducing CSF pressure consider MRI of lumbar spine.

## Trouble-shooting

### No drainage of CSF in the last hour

Check the system for blockages, kinks or inadvertent closure or 3-way tap

Check the insertion site for evidence of inflammation or leakage (of pus or CSF)

Reduce the CSF drainage pressure to 5mmHg. If CSF starts dripping into the chamber the system is patent. If there have been no concerns regarding neurological deterioration increase the drainage pressure level back to where it was (usually 10mmHg)

If there is no obvious kinking and the 3 way taps are aligned to allow CSF to drain into the collection chamber and CSF still does not drain after reducing the CSF drainage pressure alert the medical team as the CSF catheter may be clogged.

### Blood seen in the CSF

Blood in the CSF is not an uncommon occurrence.

Check CSF drainage rate has not been excessive.

Check clotting, reverse heparinisation

If blood in CSF is accompanied by neurological deterioration/ reduced GCS immediate imaging (MRI) should be considered

## Excessive Drainage of CSF (> 25mls/hr)

Increase drainage pressure by 2mmHg each hour until drainage is less than 20mls. If neurological deterioration occurs when CSF drainage pressure is raised reduce pressure back to previous level and inform medical team.

## Disconnection of the system

If any part of the system from the catheter to the CSF collection chamber becomes disconnected alert the anaesthetic team. Depending on where the disconnection occurs the collection system may be replaced, or the the catheter may need to be removed. The decision to remove the CSF catheter will depend upon a risk balance analysis of reconnecting after cleaning with antiseptic versus removal.

Monitor for signs of neuraxial infection (headache, photophobia, neck stiffness, pyrexia, nausea and vomiting, reduction in GCS, redness or pus at insertion site)

## Removal of the CSF drain

Following medical decision to remove the drain it should be clamped for 6 hours. During these 6 hours neurological observations should continue on an hourly basis. Clamping allows the CSF pressure to return to its normal level.

If neurological deterioration occurs whilst drain is clamped it should be unclamped and CSF pressure reduced to 10mmHg again.

Ensure clotting is normal and platelet count is above 50. Ensure at least 12 hours has elapsed since administration of LMWH, or 4 hours after unfractionated heparin.

If no neurological deterioration occurs after 6 hrs the drain can be removed. Place the patient in the lateral position, remove the dressing and pull the drain out using a slow steady motion. If there is any resistance ask the patient to flex (curl up) as much as possible before trying again. If the drain still won't come out seek medical assistance immediately.

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## Références

1. Coselli et al CSF drainage reduces paraplegia after thoraco-abdominal aortic aneurysm repair: results of a randomised clinical trial. *J Vasc Surg* 2002;35:631-9
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