LUMBAR SPINAL DRAINAGE

RATIONALE

One of the anesthetic challenges for thoracic aortic surgery is to decrease the risk of perioperative spinal cord ischemia. The anterior spinal artery originates from the vertebral arteries high in the cervical spine. Although they run the entire length of the spinal cord, their blood supply is segmental in nature and major supplying arteries include the ascending cervical artery, the inferior thyroid artery, a major thoracic aortic feeding artery, intercostals arteries, artery of Adamkiewicz, and iliac artery branches.

Spinal drainage is used to improve forward flow through the spinal arteries in an analogous fashion to controlling cerebral perfusion pressure: spinal artery perfusion pressure = MAP – CSF pressure or CVP (whichever is greater). By utilizing CSF drainage perfusion may be improved and neurological deficit may be reversed or avoided. There is a paucity of randomized clinical trial data and use of drainage is center dependent.

PLACEMENT OF THE CATHETER

Equipment

A special lumbar drainage kit is used; along with additional supplies including sterile saline; a 10 ml syringe; a 22-ga. spinal needle (some attendings use this as a finder); prep tray; long fenestrated drape; gown and gloves; Tegaderm; 4 x 4 gauze, and in some cases suture, needle holder and scissors. There are several kits supplied by various companies.

The spinal drain catheter kit used at HUP is provided by Medtronic. The catheter is made from “kink resistant, translucent silicone elastomer tubing”. The catheter is approximately 16 gauge (large enough to allow spontaneous CSF drainage) and is placed through a 14 gauge Touhy needle that has been inserted percutaneously into the subarachnoid space. The catheter resembles those used for CSF shunts. The catheter is very flexible and requires a guide wire placed into the catheter lumen to provide adequate stiffness for placement. The catheter is very “stretchy” and if tugged hard it may stretch and snap in two.

Technique

The approach is essentially the same as for a lumbar puncture. After induction of anesthesia and intubation, turn the patient to the lateral decubitus position (please watch carefully for increased BP with light anesthesia). Next comes a meticulous prep, gown and glove, and drape. Some attendings also prefer a surgical scrub before gowns. An assistant can open the catheter kit. The catheter requires lubrication with a saline flush and placement of a stylet. Once the catheter is ready, the large introducer needle can be placed in the subarachnoid space (again watching for BP changes). The usual approach is midline but some prefer a paramedian approach. Even in patients with normal ICP, it is very important to minimize CSF leakage after needle placement. The catheter should be ready in one hand before the needle stylet is removed with the other. Keep careful track of insertion depth as the catheter is threaded into the subarachnoid space. Once the catheter is placed remove the needle. Removing the stylet from the catheter usually requires a second pair of hands. After the catheter is taped in place, the patient can be turned supine, at which point the CSF drainage kit can be assembled. Please be very sure you understand the stopcock function on this apparatus to avoid any unplanned CSF drainage. As
a last step, some attendings like to drain a very small amount of CSF before surgical draping to confirm proper catheter function.

**MANAGEMENT OF THE SPINAL DRAIN**

It is the responsibility of the anesthesiologist to keep track of the volume of CSF drained and record it on the anesthesia record. Need for drainage will usually be determined by consultation with neuromonitoring. Often hemodynamic management in terms of increasing MAP or utilizing LA-FA bypass may be instituted. Some centers prefer to drain small volumes (5-10ml) at regular intervals. Do not forget to close the drain after the desired amount is removed. Be careful about disconnection where the catheter is joined to the drainage tubing. This junction should be supported, kept in sight and maintained free of tension. Pressure can be monitored via the catheter, but it is unclear if drainage should be done to a set pressure (i.e. to maintain CSF pressure = 10 cm H2O) or if drainage should be done in response to changes in SSEPs or MEPs.

The spinal drain is maintained for the first 24 to 48 hours as cases of delayed paraplegia have been successfully treated with CSF drainage and hemodynamic management.

**Complications**

Excessive CSF loss at the time of subarachnoid puncture might decrease ICP enough to cause CNS complications. A combination of high blood pressure and CSF loss (cerebral perfusion pressure) might act similarly. Infection can occur. Post dural puncture headache may occur as chronic herniation. Blood patch may be therapeutic.

**References**

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