443e Technique of Lumbar Puncture

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In experienced hands, lumbar puncture (LP) is usually a safe procedure. Major complications are extremely uncommon but can include cerebral herniation, injury to the spinal cord or nerve roots, hemorrhage (spinal hematoma), or infection. Minor complications occur with greater frequency and can include backache, post-LP headache, and radicular pain or numbness.

IMAGING AND LABORATORY STUDIES PRIOR TO LP

Patients with an altered level of consciousness, a focal neurologic deficit, new-onset seizure, papilledema, or an immunocompromised state are at increased risk for potentially fatal cerebellar or tentorial herniation following LP. Neuroimaging should be obtained in these patients prior to LP to exclude a focal mass lesion or diffuse swelling. Imaging studies should include the spine in patients with symptoms suggesting spinal cord compression, such as back pain, leg weakness, urinary retention, or incontinence. In patients with suspected meningitis who require neuroimaging prior to diagnostic LP, administration of antibiotics, preferably following blood culture, should precede the neuroimaging study.

LP should not be performed through infected skin, as organisms can be introduced into the subarachnoid space (SAS).

Patients with coagulation defects including thrombocytopenia are at increased risk of post-LP spinal subdural or epidural hematomas, either of which can produce permanent nerve injury and/or paralysis. If a bleeding disorder is suspected, the platelet count, international normalized ratio (INR), and partial thromboplastin time should be checked prior to LP. There are no data available to assess the safety of LP in patients with low platelet counts; a count of <20,000/μL is considered to be a contraindication to LP. Bleeding complications rarely occur in patients with platelet counts ≥50,000/μL and an INR ≤1.5. Some institutions recommend that the platelet count be >40,000 prior to LP.

GUIDELINES FOR PATIENTS RECEIVING ANTICOAGULANT OR ANTIPLATELT MEDICATIONS

There is an increased risk of bleeding complications if an LP is performed in a patient receiving antiplatelet or anticoagulant medications. The risk is further increased when multiple anticoagulant medications are used or when the level of anticoagulation is high. The most common site of bleeding is the epidural space. Symptoms of bleeding following an LP can include a sensory or motor deficit and/or bowel/bladder dysfunction; back pain occurs less commonly. For serious deficits such as paraparesis, immediate surgical intervention, ideally within 8 h of onset of weakness, is important to minimize permanent disability; surgical intervention after 24 h is associated with a poor outcome.

Only limited data are available to guide decisions about performing LPs in patients receiving anticoagulant drugs. Information about managing antiplatelet and anticoagulation drugs during invasive surgical procedures is often available from the prescribing information provided by the drug manufacturer. Evidence-based guidelines for management of regional anesthetic procedures including spinal and epidural blocks in patients receiving anticoagulation have been developed by the American Society of Regional Anesthesia and Pain (ASRA); these guidelines can help guide decisions by physicians considering LP in patients receiving anticoagulation. Management of these patients can be complex and needs to consider both the risk of LP-related hemorrhage as well as the risk of reversing therapeutic anticoagulation prior to LP. Guidelines for some commonly used anticoagulants are summarized below.

Unfractionated Heparin, Therapeutic Dosing The ASRA 2010 Practice Advisory recommends discontinuing unfractionated heparin (UFH) 2–4 h prior to removal of spinal or epidural catheters to minimize risk of hematoma. Similar guidelines are reasonable for patients undergoing LP: discontinue UFH 2–4 h prior to LP; document normal partial thromboplastin time (PTT) prior to the procedure; and document a normal platelet count in patients who have received heparin for 4 days or longer because of the risk of heparin-induced thrombocytopenia (HIT). The half-life of heparin is 60–90 min.

Unfractionated Heparin, Prophylactic Dosing There are only a few case reports of spinal hematoma resulting from spinal or epidural anesthetic procedures in patients receiving low-dose subcutaneous UFH; ASRA guidelines state that there is no contraindication to the use of these techniques for anesthesia in patients receiving prophylactic UFH at a dose of 5000 U subcutaneously twice daily. Similarly, LP in patients receiving 5000 U of UFH subcutaneously twice daily is unlikely to cause spinal hematoma. Precautions to minimize risk include the following: document a normal PTT prior to the LP; document a normal platelet count in patients who have received heparin for 4 days or longer; and perform the LP 1–2 h prior to the next heparin dose, when the heparin effect should be minimal.

Low-Molecular-Weight Heparin, Therapeutic Dose (e.g., Enoxaparin 1 mg/kg Subcutaneously q12h) Patients receiving low-molecular-weight heparin (LMWH) are at increased risk of post-LP spinal or epidural hematoma. LMWH dose should be held for at least 24 h before the procedure.

Low-Molecular-Weight Heparin, Prophylactic Dose (e.g., Enoxaparin 0.5 mg/kg Subcutaneously q12h) Patients receiving prophylactic-dose LMWH have altered coagulation. ASRA guidelines recommend waiting at least 10–12 h after a prophylactic dose of LMWH before inserting a spinal or epidural catheter to minimize the risk of spinal or epidural hematoma. Similar guidelines are reasonable for patients undergoing LP.

Warfarin Spinal puncture is contraindicated during warfarin therapy.

Aspirin and Nonsteroidal Anti-inflammatory Drugs (NSAIDs) ASRA guidelines conclude that use of these drugs does not appear to be associated with an added significant risk of spinal bleeding in patients having spinal or epidural anesthesia. Similarly, LP in patients receiving one of these drugs is unlikely to cause bleeding. Reversal of drug effect on platelet function requires stopping the drug for approximately 10 days for aspirin and for 48 h for NSAIDs.

Ticlopidine/Clopidogrel The actual risk of spinal hematoma with these drugs is unknown. Based on drug prescribing information and surgical reviews, ASRA guidelines suggest discontinuing ticlopidine 14 days prior to a spinal or epidural procedure and discontinuing clopidogrel 7 days prior to the procedure. Similar guidelines are reasonable for performing LP.

Abciximab, Eptifibatide, and Other Platelet Glycoprotein IIb/IIIa Inhibitors The actual risk of spinal hematoma with these drugs is unknown. Platelet aggregation remains abnormal for 24–48 h following discontinuation of abciximab and 4–8 h following discontinuation of eptifibatide. ASRA guidelines recommend avoiding spinal or epidural procedures until platelet function is normal. Similar guidelines are reasonable for performing LP.

Direct Thrombin Inhibitors (e.g., Argatroban, Bivalirudin) ASRA guidelines recommend against performing spinal or epidural anesthesia in patients receiving thrombin inhibitors.

Oral Factor Xa Inhibitor (e.g., Rivaroxaban) Rivaroxaban prescribing information includes a black box warning that epidural or spinal hematomas have occurred in patients treated with rivaroxaban who are receiving spinal or epidural anesthesia or undergoing LP. LP should be avoided in patients receiving this drug.

ANALGESIA

Anxiety and pain can be minimized prior to beginning the procedure. Anxiety can be allayed by the use of lorazepam, 1–2 mg given PO 30 min prior to the procedure or IV 5 min prior to the procedure.