Myelogram and Lumbar Puncture: Pre and Post Procedure Details

(Revised October 2011)

1) Patients should be well hydrated. No solid food after midnight but clear liquids in the a.m.

2) Patients who take neuroleptic medications (MAOIs, TCAs, phenothiazines, neurostimulants) must discontinue these medications for at least 48 hours prior to and 24 hours following myelography and/or lumbar puncture. Check the PDR if uncertain whether a certain drug lowers the seizure threshold.

3) Patients with a history of seizure disorder who are currently taking anti-seizure medications should continue taking their medications as usual.

4) Patients should continue taking all other prescribed medications (i.e. cardiac, blood pressure, diabetes medications, etc. – including Glucophag) as usual.

5) If patients are taking pain medication or muscle relaxants for their neck or back pain, they should take their usual dose 1-2 hours prior to the scheduled myelogram and/or lumbar puncture.

6) Contraindications to myelography and/or lumbar puncture:

   a. **INCREASED INTRACRANIAL PRESSURE:** (i.e., intracranial mass or hydrocephalus.) Patients should be screened for a history of systemic cancer, cerebral metastasis, primary brain tumor, hydrocephalus, subarachnoid hemorrhage, etc., or other cause of increased intracranial pressure. The patient’s imaging jacket should be reviewed for CT or MRI examinations of the brain. DO NOT forget to check for previous imaging on Amicas. If in doubt, a cranial CT should be performed prior to myelography and/or lumbar puncture.

   b. **HISTORY OF ALLERGY TO IODINE OR LOCAL ANESTHETICS:** Patients with an allergy to iodine should be pre-medicated with steroids and Benadryl in the usual fashion. Patients with a history of allergy to local anesthetics may need increased pain medication at the time of myelography and/or lumbar puncture. In this situation, mild intravenous sedation may be provided with nurse supervision from Vascular Interventional Radiology.

   c. **COAGULATION DISORDER:**

      i. Patients with a history of hemophilia, low platelets, liver disease or other etiology for coagulation disorder should have a PT, PTT, INR and blood count as indicated prior to myelography and/or lumbar puncture. The INR should be normal. A platelet count above 50,000 is considered acceptable/within normal limits. For patients with a platelet count less than 50,000 (i.e., chemotherapy patients, etc.), two platelet transfusions should be ordered stat, and the patient should be sent down to the Radiology department at the end of the second platelet transfusion, but while the platelets are still being actively transfused.
Residents should be made aware of the platelet transfusion process, and ensure that the patient is brought down to the department at the appropriate time point. A follow-up platelet count does NOT need to be checked/ordered for the procedure to proceed.

ii. Lab value parameters: PT (normal 10-12); <15 is acceptable. INR must be < 1.2. Platelets (normal 150,000-450,000); > 50,000 is acceptable. Transfuse platelets if < 50,000. Transfusions are especially common in patients receiving intrathecal chemotherapy.

iii. Patients taking anticoagulants such as Coumadin (warfarin), Lovenox, Pradaxa, heparin, etc. – These medications must be discontinued for an appropriate time relative to the half life of the drug and a PT, PTT and INR obtained prior to the procedure.

1. Depending on the patient’s INR, Coumadin (warfarin) should be discontinued for 4-5 days pre-procedure. Document a normal PT and INR. Heparin should be held for 4-6 hours. Document a normal PTT and INR. Heparin may be restarted 2 hours post-procedure. Lovenox should be held for 24 hours prior to procedure and can be restarted 24 hours after the procedure. **Pradaxa is a new direct thrombin inhibitor which does NOT require regular INR monitoring (unlike Coumadin).** Pradaxa should be held for 48 hours prior to the procedure, unless the patient has a creatinine clearance < 30, whereby Pradaxa should be held for five days. Pradaxa may be re-started 24-48 hours post-procedure.

2. GP IIb/IIIa receptor antagonists require variable holding periods. Aggrastat (tirofiban) and Integillin (eptifibatide) require 12 hours and ReoPro (abciximab) requires 24-48 hours post cessation to achieve normal platelet aggregation. Concomitant use of aspirin with these agents may increase the risk of spinal hematoma.

3. Plavix (clopidogrel) and Ticlid (ticlopidine) should be discontinued for 7 days and 14 days, respectively.

4. Persantine (dipyridamole) and Aggrenox (aspirin and persantine) should be discontinued for 7 days.

5. The use of NSAIDs (Aspirin, Advil, etc.) alone does not appear to increase the risk of spinal hematoma and do not need to be discontinued.

d. **SEPTICEMIA, LOCAL INFECTION OR FEVER:**

i. Patients with generalized septicemia or fever should be postponed until the infection is controlled.
ii. Patients with a local cutaneous infection in the lumbar region within the vicinity of the lumbar puncture, (skin suppuration, recent spinal surgery with possible infection, or shingles) should also have the examination postponed until the infection is controlled. Needles should NOT be placed through epidural abscesses, as this could potentially result in meningitis.

e. **HISTORY OF SEIZURE DISORDER:** Patients with a history of seizure disorder should continue taking their usual dose of anti-epileptic medications prior to and following the myelogram and/or lumbar puncture. Patients with a history of prior seizure but who are currently not on medication require no specific treatment. In these patients, the examinations should be performed with 1/2 the usual intrathecal dose of contrast with special care to avoid “spilling” contrast into the intracranial subarachnoid space during myelograms.

f. **NEUROLEPTIC DRUGS** (i.e., drugs that are known to lower seizure threshold) **MUST BE HELD FOR 48 HOURS PRIOR TO AND 24 HOURS FOLLOWING MYELOGRAPHY.** The classes of drugs included are as follows: tricyclic antidepressants, MAO inhibitors, and phenothiazines. SSRIs are allowable.

g. **RECENT LUMBAR PUNCTURE:** Patients who have had a prior lumbar puncture, myelogram or lumbar epidural steroid injection within the past 7 days should have a myelogram procedure postponed for that time interval.

h. **TETHERED SPINAL CORD:** Patients with a history of spina bifida, Chiari I or II malformation, childhood spinal surgery, or a clinical suspicion of tethered spinal cord require special consideration. Non-invasive imaging should be performed prior to myelography and/or lumbar puncture to locate the position of the spinal cord.

i. **PREGNANCY:** All females of child bearing age should be carefully screened to assure that they are not currently pregnant. This is due to the significant amount of radiation that patients are exposed to while under fluoroscopy.

7) **COMPLICATIONS OF MYELOGRAPHY:**

a. *Post spinal headache* – This is the most common complication of myelography and/or lumbar puncture occurring in approximately 5-10% of patients undergoing this type of procedure. It occurs most frequently in younger patients (20-40 years of age) and more commonly in females. It can be distinguished from migraines and/or other types of headaches by the increased severity in the upright position and spontaneous improvement upon recumbency. It has its onset immediately after lumbar puncture or within a few hours. The incidence of post spinal headache is reduced by use of a smaller gauge needle (i.e., a 22 or 25 gauge needle) and with the use of non-cutting (Whitacre) needles. Multiple studies evaluating the risk of post spinal headache have found little correlation between patients who are kept at bed rest or allowed early ambulation and as such, there is no reason to confine patients to bedrest following myelography and/or lumbar puncture. Patients should limit their activities, excluding exercise or heavy lifting for 24
hours following myelography and/or lumbar puncture, and should be confined to a sedentary position: sitting in a chair, reclining or lying down with head elevated to keep the majority of the contrast in the lumbar region. They should avoid bending over. Patients should be instructed to drink a large quantity of fluid including water, soft drinks and juices following myelography and/or lumbar puncture. Drinks containing caffeine, which is thought to facilitate closure of the dural hole, may be helpful and as such, iced tea, coffee and colas are advisable. Patients should avoid alcohol for 24 hours. Those who develop a post spinal headache (which is classically most severe while standing and relieved by lying down) should be confined to bedrest for 6-8 hours before attempting ambulation. Fluids and analgesia are advised. In those patients whose headaches persist for more than 48 hours, an epidural blood patch may be required.

b. **Spinal cord damage from neck hyperextension** – This typically occurs in elderly patients undergoing cervical myelography with an underlying cervical spinal stenosis. Marked hyperextension of the neck in an attempt to pool contrast material may result in ischemic damage to the spinal cord. This can result in paraplegia and represents 2/3 of the major complications reported following myelography. Patients suspected of having cervical spinal stenosis should be positioned with only limited hyperextension and should not be sedated during myelography to prevent this complication.

c. **Vasovagal reactions** – These are usually self limited and can be treated with Trendelenberg positioning and patient reassurance. Rarely, atropine and fluids are required. Special care should be taken with the elderly.

d. **Meningitis** – Both aseptic (chemical) and septic meningitis have been described following myelography and lumbar punctures. Meticulous attention to sterile technique should avoid infectious complications. Care should be taken to NOT touch the stylet of the spinal needle except at its hub.

e. **Nerve damage, persistent pain and arachnoiditis** – Nerve damage can potentially occur with lateral lumbar puncture, damaging an exiting nerve in the lateral recess. This complication rate is very low. Careful attention to performing midline puncture should eliminate this complication. Arachnoiditis occurred following the use of Pantopaque and is now rarely seen.

f. **Seizure** – Seizures have been reported in patients with a history of seizure disorder, patients taking neuroleptic drugs, and in patients with no such history. When performing cervical myelography, care should be taken to avoid “spilling” contrast into the intracranial subarachnoid space. Residents should ensure that patients have held any drugs that may lower their seizure threshold (MAOIs, TCAs, phenothiazines).

g. **Brain herniation** – This has been described following lumbar puncture in patients with a brain mass or hydrocephalus.

h. **Spinal or epidural anesthesia** – This may result from attempts to produce “deep” anesthesia utilizing the 1 ½ inch 25 gauge needle in thin patients or using a myelogram
needle in heavier patients. This practice should be strongly discouraged as this may represent a serious complication. Anesthesia should be performed only at the skin and immediate subcutaneous levels. Additionally, it should only be performed with 1% lidocaine containing no preservatives. The single use lidocaine vials that are provided on the myelography tray are safe to use. Lidocaine that comes in re-usable bottles contains a preservative which is neurotoxic and should never be used for myelography and/or lumbar puncture.

i. **Epidural or subdural hemorrhage** – This most commonly occurs in patients who are taking anticoagulants or who have a bleeding disorder. However, it has been described in patients with no such history. Residents should ensure that all anticoagulants are held for the correct number of days (see above) before proceeding. Also, laboratory values such as PT, APTT, INR and platelets must be within normal limits before proceeding.

j. **Iatrogenic Intraspinal Epidermoid** – This can occur if lumbar puncture is performed without the stylet. A core of dermis can be injected into the subarachnoid space resulting in delayed development of an epidermoid mass.

k. **Intrathecal injection of ionic contrast** – This is a dreaded complication that usually results in death or permanent neurologic disorder. Emergency treatment includes life support, total spinal drainage, and replacement with normal saline and intravenous steroids. Extreme care should be taken when drawing up contrast to assure that it is NON-IONIC contrast that is clear and free of particulate matter and has not passed its expiration date

l. **Additional extremely rare complications** – including subarachnoid hemorrhage, subdural hematoma, hearing loss, cranial nerve palsy, dural venous thrombosis and osteomyelitis have been described. These complications rates are very low.
3D Diagram for Lumbar Puncture/Myelogram Approach
Fluoroscopy Picture – Needle Localization
Lumbar Puncture Oblique Picture
Split Subdural – Subarachnoid Injection on a Myelogram (Incorrect)
Lumbar Myelogram Picture (Correct – Completely Subarachnoid)