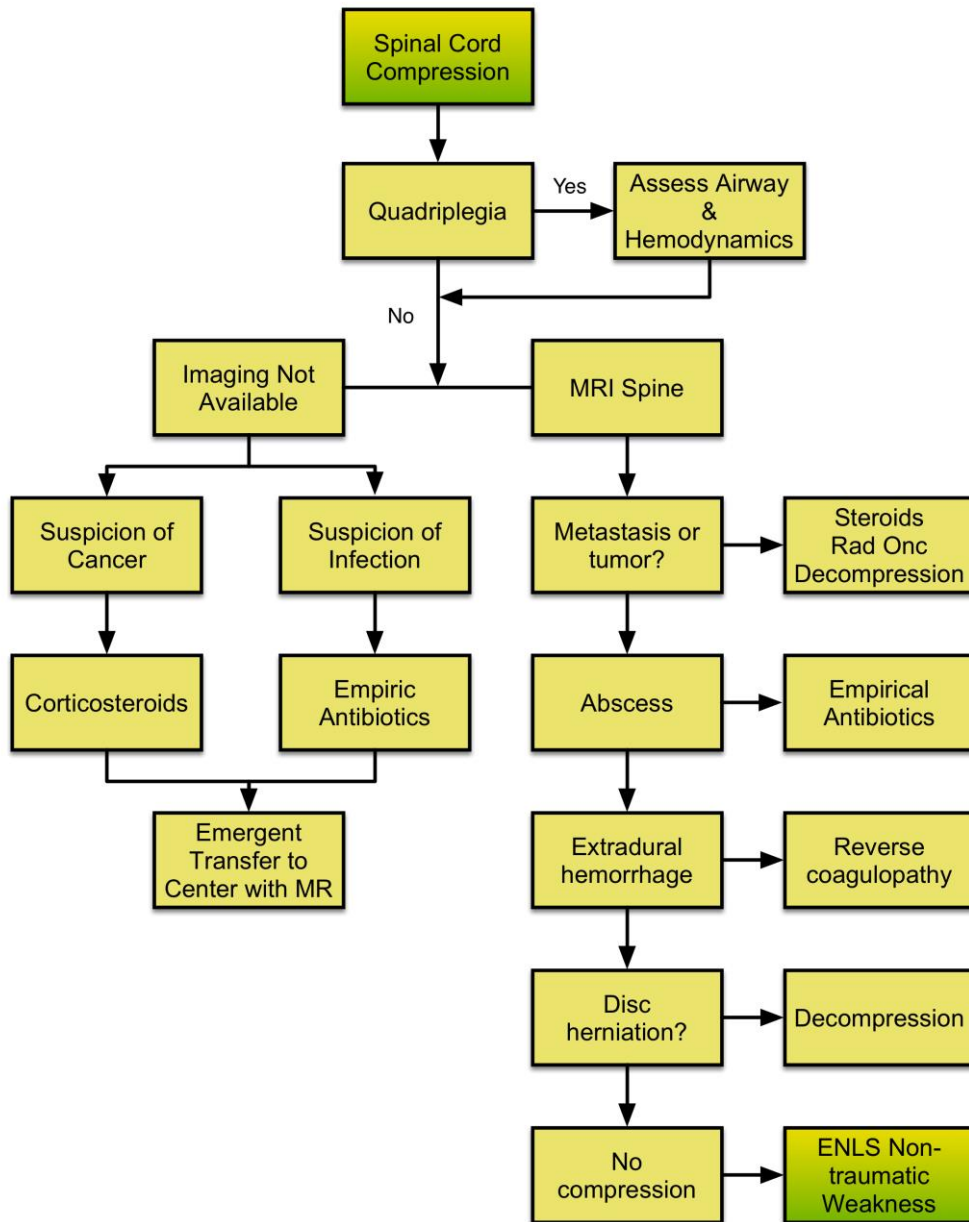


Emergency Neurological Life Support

Spinal Cord Compression

Version: 2.0
 Last Updated: 19-Mar-2016



[Checklist & Communication](#)

Spinal Cord Compression Table of Contents

Emergency Neurological Life Support	1
Spinal Cord Compression	1
Checklist	3
Communication	3
Abscess	4
Empirical antibiotics	4
Assess Airway and Hemodynamics	5
Cervical myelopathy may affect diaphragm	5
Corticosteroids	6
Empirical treatment if cancer is suspected	6
Disc Herniation	7
Decompression	7
Emergent Transfer	8
To a facility that has spine imaging available	8
Empiric Antibiotics	9
Empirical treatment for presumed infectious cause	9
Extradural Hemorrhage	10
Reverse coagulopathy	10
Imaging Not Available	11
No MRI or CT	11
Metastasis or Tumor	12
Steroids, radiation oncology, decompression	12
MRI Spine	13
Spine imaging is available	13
No Compression	14
ENLS weakness protocol	14
Quadriplegia	15
Special airway issues	15
Spinal Cord Compression	16
Suspected myelopathy	16
Suspicion of Cancer	17
Possible metastasis	17
Suspicion of Infection	18
Consider epidural abscess	18

Checklist

- Quadriplegia? Ensure proper ventilation
- Attain emergent spine imaging (MRI unless contraindicated)
- Alert spine surgeon if indicated
- Labs: CBC, platelets, PT,PTT
- NPO if expected to go to OR
- Suspected metastasis: contact radiation oncology; give steroids if spinal metastasis and cord compression confirmed
- Suspect epidural infections: ESR, send blood cultures, start antibiotics

Communication

- Airway status
- Abnormal vital signs
- Onset and duration of weakness or numbness, and last neurological exam
- Bowel or bladder involvement
- Suspected spinal level
- Results of spine imaging if available yet
- Systemic illness like malignancy or infection
- Any medications started
- Inquire what further therapy should be started immediately



Abscess

Empirical antibiotics

Imaging reveals a likely abscess. Epidural abscess (pus in the epidural space) likely causes myelopathy by venous infarction rather than actual cord compression, but the clinical signs and symptoms are identical.

- STAT Involve a spine surgeon emergently or facilitate transfer elsewhere if none is available.
- Draw blood cultures, urinalysis, urine cultures, ESR
- Look for signs of endocarditis
- Perform a 12-lead ECG (to look for PR prolongation)
- Consider starting empirical antibiotics in consultation with the surgeon and infectious disease consultant. Spinal cord decompression is possible but often not done emergently to give time to observe a response to antibiotics. Document the neurological exam (primarily strength testing) to establish a good baseline from which to make this decision.
 - Anti-microbial coverage should include staphylococcus, streptococcus, and methicillin resistant *staphylococcus aureus* (MRSA). If there is a history of a recent neurosurgical procedure, coverage for gram negative organisms should be added.
- Use of steroids is controversial; discuss with your consultant



Assess Airway and Hemodynamics

Cervical myelopathy may affect diaphragm

Assess ventilatory functions (ABG, simple inspection, EtCO₂) and consider airway protection and mechanical ventilation. A bedside Forced Vital Capacity (FVC) is helpful if available (consider intubation for FVC < 1 L); having the patient count out loud as fast as possible is also a good screen (normal is to exceed a 20-30 count).

- If there is any suspicion of trauma, do not extend the spine for intubation and refer to the ENLS Protocol [Traumatic Spine Injury](#).
- Spinal cord compression cannot account for a patient with a normal mental status (as judged by eye blinks) and having total body weakness (unable to move the face and arms and legs). They either have a generalized neuromuscular disorder, or perhaps a stroke of the brainstem (locked in), and by exclusion a psychiatric disorder. Secure the airway first then pursue the ENLS protocol [Acute Non-Traumatic Weakness](#), or ENLS protocol [Acute Ischemic Stroke](#). Once ventilation has been assessed, move on to acute imaging, but for those patients who are not intubated, anticipate progression of weakness and ensure continuous monitoring of ventilation as the work-up continues.



Corticosteroids

Empirical treatment if cancer is suspected

If you suspect epidural spinal cord compression from metastatic tumor, administration of steroids may rapidly shrink the tumor preventing spinal cord damage for several hours.

- Steroids are often given to rapidly reduce edema and decrease the chance of cord venous infarction. The use of steroids in patients with compression from epidural metastatic disease is considered to be part of standard medical therapy.
- The exact dose of steroids used in patients with epidural metastatic disease and spinal cord compression is controversial. Dexamethasone is typically used, high dose regimens for adults include 96 mg/day and lower dose regimens use 16 mg/day. Adverse events related to the steroid therapy are more common with the high dose regimen.



Disc Herniation

Decompression

If imaging reveals compression from disk herniation or from bone/vertebral body encroachment (spinal stenosis):

- disk herniation that compresses the spinal cord or the cauda equine may represent a neurosurgical emergency.
- disc herniation that does not compress the spinal cord or cauda equine is less urgent



Emergent Transfer

To a facility that has spine imaging available

Arrange expedited transfer to a facility with spine imaging to minimize delays in potential spinal decompression.

- Clearly communicate the urgency to the receiving physician
- Discuss with the receiving physician whether you should start steroids before transferring the patient
- Recommend that the receiving hospital should pre-arrange the imaging study so that valuable time is not lost



Empiric Antibiotics

Empirical treatment for presumed infectious cause

Patients with evidence of infection such as fever, leukocytosis, intravenous (IV) drug use, or a known infectious source should be started on empiric antibiotics after blood and urine cultures are drawn. Anti-microbial coverage should include staphylococcus, streptococcus, and methicillin resistant *staphylococcus aureus* (MRSA). If there is a history of a recent neurosurgical procedure, coverage for gram negative organisms should be added. These empiric therapies may be coordinated with the accepting facility's physicians.

Extradural Hemorrhage

Reverse coagulopathy

Bleeding in the epidural space may be spontaneous or from underlying coagulopathy.

- Contact a spine surgeon immediately and share the vital information included in the communication list
- Labs: PT/PTT, platelets, consider DIC screen and blood smear for red cell analysis
- Reverse warfarin associated coagulopathy (see ENLS protocol [Intracerebral Hemorrhage](#) discussion on reversal of coagulopathy)
- Intramedullary bleeding (bleeding into the spinal cord) may be due to an underlying vascular malformation and will likely require additional imaging studies (repeat MRI, spinal angiography) if the etiology is not otherwise apparent



Imaging Not Available

No MRI or CT

Without imaging, one needs to consider treatments that can be put in place presumptively until imaging can be completed.

- If there is a history suggesting infection and epidural abscess is a possibility, then one should consider empiric antibiotics
- If there is a history of cancer and spinal metastasis and cord compression is a possibility, one should consider empirical steroids
- If neither is present, an expedited transfer to a facility with imaging capability is warranted.



Metastasis or Tumor

Steroids, radiation oncology, decompression

If the MRI or CT imaging shows cord compression from tumor or mass:

- Emergent decompression may be helpful for this patient so rapid involvement of specialists is key
- Contact a spine surgeon immediately and present the key features listed in communication
- Consult radiation oncology to consider emergent spinal irradiation
- Consider glucocorticoids clear this with your consultant first
- Pain management: short acting narcotics, consider airway issues if the process is cervical
- DVT prophylaxis: no heparin yet until surgical decision is complete; pneumatic compression stockings are appropriate
- If the neoplastic process is leptomeningeal (i.e. not directly compressing the cord but encasing the cord), decompression is likely not beneficial but spinal fluid assessment is the next step. Consult oncology and consider LP.



MRI Spine

Spine imaging is available

Emergent MRI with gadolinium is preferred in most cases.

- CT with contrast and or CT myelogram is an alternative if MRI is contraindicated or not available.

Imaging is used to rule out any compressive etiology of the spinal cord like tumor, infection, or intervertebral disc herniation. It is important to communicate the neurological findings to your radiologist so that the proper location(s) of relevance are imaged.

- Quadriplegic patients should have at least the C-Spine imaged. Entire spine imaging (including the conus) may also be appropriate especially if the patient has known cancer.
- Paraplegic patients (if there are no symptoms in the arms) should have both the T-spine and LS spine imaged. Reflexes are likely unreliable in this context in guiding whether to include T-spine imaging; i.e. rapid compression of the T-spine can cause hyporeflexia in the lower extremities acutely, so areflexic paraplegia is not necessarily a cauda equina syndrome (which localizes to the LS spine on imaging). A discussion with the radiologist is important to image the proper level, and to expedite the imaging so that treatments can be provided efficiently and quickly.
- It is also important to notify a spine surgeon that your patient may have a myelopathy that will need surgical decompression, and when their spine imaging will be completed.



No Compression

ENLS weakness protocol

Imaging may reveal no evidence of cord compression. If so, other causes of myelopathy need to be considered including transverse myelitis, spinal cord infarction (from aortic dissection), viral myelitis (West Nile, CMV, HIV, HTLV-1), dural AV fistula, and others. Refer to the ENLS protocol [Acute Non-Traumatic Weakness](#) for a discussion of these entities, and especially consider aortic dissection.

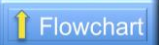


Quadriplegia

Special airway issues

In the event of sudden or progressive quadriparesis or quadriplegia, the cause may be a cervical cord pathology. This may lead to hypoventilation because of both chest wall and diaphragmatic weakness.

If the patient has paraplegia/paraparesis ventilatory issues are uncommon, so move on to imaging.



Spinal Cord Compression

Suspected myelopathy

Acute signs and symptoms of myelopathy (spinal cord dysfunction) include

- Bilateral numbness or weakness that is present at a specific dermatomal level and continues caudally
- Weakness is of upper motor neuron variety (spastic, extensors effected more than flexors, up-going toes)
- Urine retention or spastic bladder
- May have focal back pain identified via percussion of the spine
- Acute spinal cord compression is an emergency; work-up and intervention should begin immediately

If there is severe back pain and leg weakness consider aortic dissection as a cause; typically such patients will have intact joint position sense in the toes but loss of temperature sensation along with marked weakness (anterior spinal artery syndrome).

If the patient is taking anticoagulants, consideration of coagulopathic complications is warranted. See ENLS reference [Pharmacotherapy](#) on reversal of coagulopathy. See ENLS protocol [Acute Non-Traumatic Weakness](#) for a more formal evaluation of the cause of weakness.

Topic Co-Chairs:

Kristine O'Phelan, MD

E. Bradshaw Bunney, MD

John W. Kuluz, MD



Suspicion of Cancer

Possible metastasis

Consider spinal metastasis with spinal cord compression if there is a history of cancer, or new suspicion of cancer.



Suspicion of Infection

Consider epidural abscess

Suspicion for an infectious cause (epidural abscess) rises if the following are present:

- Fever
- Elevated WBC count
- History of intravenous drug use
- Known infectious source- current or past endocarditis, sepsis, chronic infection like osteomyelitis
- Any of the above with focal spine tenderness elicited by percussion (reflex hammer striking your finger placed over the vertebral spinous process)