CDI QUALITY INSTITUTE

CLINICAL GUIDELINES

Guidelines for the Performance of Epidural/Perineural Spinal Injections

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Introduction

This guideline outlines several best practices that ensure the accuracy and safety of image-guided spinal injection procedures.

When an order for an injection procedure is received, patients should be screened for bleeding disorders, for the use of anticoagulation or antiplatelet medications, and for allergies to contrast materials.

Patients should be screened for a history of bleeding disorders (e.g. hemophilia and von Willebrand disease) as the risk of bleeding complications is increased in these patients. Patients with severe bleeding disorders may require active hematologic support, often with direct replacement of blood products, while undergoing moderate or high risk procedures.

Patients should be screened for the use of anticoagulation or antiplatelet medications as the risk of bleeding complications is also increased in these patients. If an injection procedure is ordered on a patient taking anticoagulant or antiplatelet medications, the risks and benefits of the procedure and the risks and benefits of discontinuing their medications needs to be assessed.

Depending on the procedure and the indications for anticoagulation therapy, the patient may need to have his or her medications discontinued prior to the procedure or may need to undergo a bridging anticoagulation regimen. This process is detailed in the CDI Quality Institute's "Guidelines for the Management of Patients on Oral Anticoagulation and Antiplatelet Therapy Undergoing Percutaneous Image-Guided Needle Procedures: 2018 revision" (Quality Institute Anticoagulant Drug Guideline 2018).

This is a guideline, not a policy. It is a summary and distillation of the relevant clinical literature. The purpose of the CDI Quality Institute guidelines is to facilitate and accelerate the integration of medical evidence and best practices into daily clinical practices. Guidelines provide relevant medical evidence to support the development of policies in each individual practice. While individual practice policies may be based on recommendations in the CDI Quality Institute guidelines, they may also reflect local standards of care, associated hospital or network policies, the performance of procedures in hospital versus outpatient settings, different patient populations, differing levels of experience and different risk-tolerance profiles. Local practice policies should also be modified to account for new information or publications that become available between guideline revisions.

Patients should be screened for a history of previous adverse reactions to intravenous contrast. The history of a prior allergic-like reaction to intravenous contrast material is the most significant risk factor for a recurrent allergic-like reaction (ACR Manual on Contrast Media, Version 10.3, 2017). Patients with a history of multiple severe allergies (atopic individuals) and patients with asthma are also at increased risk for an allergic-like reaction. Premedication should be considered in patients at increased risk for an allergic-like reaction. Premedication decreases the incidence of a recurrent reaction, however does not eliminate it as recurrent allergic-like reactions have been estimated to occur in approximately 10% of premedicated patients (ACR Manual on Contrast Media, Version 10.3, 2017). If the previous reaction was moderate or severe, the injectionist may choose to perform the procedure with gadolinium-based contrast material, without contrast, or with air.

Previous imaging studies should be reviewed prior to the performance of the therapeutic and diagnostic spine injections in order to determine the best approach and to exclude contraindications to the injection.

Prior imaging should be reviewed prior to performing an injection procedure. The injectionist should correlate the patient's symptoms with the findings on the imaging study in order to identify the most likely pain generator. The injectionist should plan the approach and level of the injection in order to optimize the delivery of injectate to the pain generator. Finally, images should be reviewed to ensure that the procedure can be performed safely and to exclude contraindications.

If an interlaminar injection is planned, the previous images should be reviewed for the presence of adequate dorsal epidural space at the level of the injection and to ensure that the patient has not undergone previous dorsal decompression surgery at this level.

If a transforaminal injection is planned, the previous images should be reviewed to ensure that that there is adequate access to the foramen. Prominent transverse processes, accessory lumbosacral articulations, and prior fusion masses may restrict access to the subpedicular space. Injection directly into a severely stenotic foramen should be performed with care. In patients with severe foraminal stenosis, consideration might be given to a far lateral transforaminal injection (the needle being placed on the lateral margin of the subpedicular space), to an extraforaminal perineural injection, or to a paramidline translaminar injection, if feasible.

Prior imaging studies should be reviewed to exclude contraindications to an epidural injection such as an acute or subacute fracture, cauda equina, active infection or malignancy. The NASS Coverage Policy Recommendations for lumbar epidural steroid injections state that advanced imaging is required prior to the performance of the procedure in patients at risk for cancer or metastatic disease, infection or cauda equina (NASS Recommendations). Symptomatic cord or cauda equina compression (cauda equina syndrome), active spondylodiscitis, active osteomyelitis, and paraspinous abscesses are contraindications to a lumbar ESI. Cancer and acute fractures are relative contraindications to an ESI. An ESI should not be performed if it is felt that the fracture or neoplasm is causing the patient's pain. ESI injections can be considered in cancer or fracture patients, however, if the patient's pain is felt to be unrelated to the fracture or cancer.

CMS Local Coverage Determinations (LCDs) require that plain films be reviewed to rule out "red flag" conditions if potential issues of trauma, osteomyelitis, or malignancy are a concern (L34982, L34980, L36920, L36521, L35148, L34807).

Needle placement should be performed with fluoroscopic or computed tomography (CT) guidance. If needle placement is performed under fluoroscopy, the procedure should be monitored in two or more planes to ensure safe and accurate needle placement.

Accurate needle placement is critical to the effective and safe performance of ESIs (Mayer & Zachary 2012). Image-guided techniques using fluoroscopy or CT are used to guide and confirm needle placement for these injections (Silbergleit et al. 2001; Johnson 2004). White et al. reported that in experienced hands, the epidural injection needle was incorrectly placed in 25% of caudal injections and in 30% of interlaminar injections when performed without imaging guidance (White et al. 1980). Renfrow et al. reported that incorrect needle placement occurs in up to 48% of caudal epidural injections performed without fluoroscopic guidance depending on the operator's experience (Renfrow et al. 1991). Stojanovic et al. reported that using the loss of resistance technique (without fluoroscopy) resulted in inaccurate needle placement 53% of the time with the initial attempt to enter the epidural space (Stojanovic et al. 2002).

When using fluoroscopy, needle placement is monitored and confirmation of needle placement should be made in two or more imaging planes (Kirschner et al. 2018; Mayer & Zachary 2012; Vo et al. 2018; Johnson 2004). Only by obtaining two or more views can the needle tip position be accurately triangulated (Kirschner et al. 2018).

If accurate needle placement is not achieved, the therapeutic substances may be delivered into the paraspinous soft tissues or vascular spaces, where they are ineffective. Even more important, the injection of therapeutic substance into the thecal sac or a blood vessel could result in untoward sequelae (Johnson 2004).

The NASS Coverage Policy Recommendations for lumbar epidural steroid injections require the use of real-time imaging guidance, fluoroscopy or computed tomography, with the use of injectable radio-opaque contrast material for all steroid injections and all transforaminal injections (NASS Recommendations).

CMS Local Coverage Determinations (LCDs) require that real-time imaging guidance, fluoroscopy or computed tomography, with the use of injectable radio-opaque contrast material is required for all steroid injections and all transforaminal injections (L34982, L34980, L36920, L36521, L35148, L34807).

Contrast material should be injected and the appropriate dispersion of contrast documented in two planes to ensure appropriate flow of contrast, to ensure the accurate delivery of the injectate, and to prevent an intrathecal, intravascular, or subdural injection.

After needle placement, contrast is injected under fluoroscopy to ensure the accurate delivery of the injectate, to assess for vascular filling, and to assess for inadvertent subdural or dural puncture (Schellhas et al. 2007). Injection of medications into the dural sac or subdural space can result in severe arachnoidal adhesions. Intravascular injection of particulate steroids has been

purported to result in cord infarction. Direct injection into the cervical cord or into nerve roots can result in long term neurological sequelae.

Postinjection films provide visual feedback regarding the distribution of the therapeutic agents and document the accurate delivery of therapeutic substances into the epidural space (Johnson 2004, Schellhas et al. 2007).

The NASS Coverage Policy Recommendations for lumbar epidural steroid injections state that for transforaminal ESIs, live contrast-enhanced fluoroscopy or digital subtraction angiography is preferred, though contrast-enhanced CT guidance may be performed with the understanding that … CT might not detect intravascular flow leading to potential complication, especially if particular steroids are used. Contrast may not be used in patients at a high risk for or with a history of an adverse risk with contrast usage (i.e. allergic reaction). If contrast is not used, however, consideration should be given to using non-particulate steroid solutions or to using a test dose of local anesthetic if a particulate steroid is to be used (NASS Recommendations).

CMS Local Coverage Determinations (LCDs) require that contrast medium should be injected during epidural injection procedures unless the patient has a contraindication to the injection (L34982, L34980, L36920, L36521, L35148, and L34807).

Films or digital images documenting appropriate needle placement and appropriate injectate flow should be retained and made a part of the patient's medical record.

Films documenting the final needle position and contrast flow should be documented in two planes and saved in the patient's record to verify that the procedure has been done appropriately (Petersohn 2017). This information is essential to assess the efficacy of previous injections and to plan repeat or second injections.

The NASS Coverage Policy Recommendations for lumbar epidural steroid injections require that films that adequately document final needle position and injectate flow must be retained and made available upon request (NASS Recommendations).

CMS Local Coverage Determinations (LCDs) require that films that adequately document final needle position and injectate flow must be retained and made available upon request (L34982, L34980, L36920, L36521, L35148, L34807).

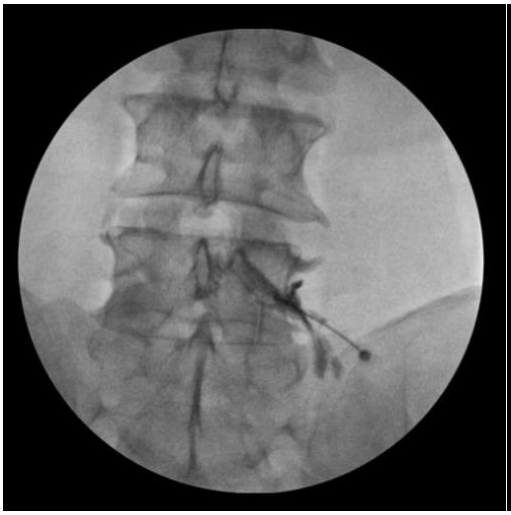
Notes concerning specific injection procedures:

Selective Perineural Injections (Cervical, Thoracic and Lumbar Nerve Root Blocks):

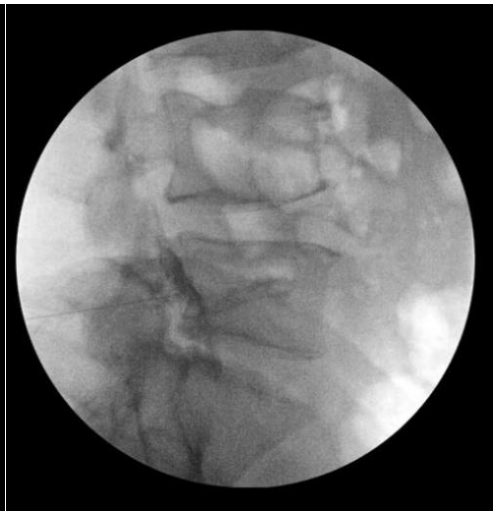
- Selective nerve root blocks are most often performed for surgical planning in patients with two or more lesions ipsilateral to the patient's symptoms and in patients with atypical clinical pictures. This can also be performed as a therapeutic procedure (Schellhas et al. 2007, Datta et al. 2013).
- The goal of a selective nerve root block is to deliver a small amount of local anesthetic to a specific nerve root. If the patient's pain is relieved following the injection, it reassures

the surgeon that decompression of that same nerve root would relieve the patient's symptoms.

- The needle may be placed into the subpedicular space, the retroneural space or the infraneural space using a posterior oblique approach under imaging (fluoroscopy or CT) guidance.
- After placement, the needle is aspirated for fluid or blood.
- A limited amount of contrast, 1 mL, is injected in order to document the distribution of the injectate.
- Contrast injection under live fluoroscopy is recommended to exclude vascular filling.
- If vascular filling is detected or an occult vascular injection is suspected, the needle should be withdrawn and redirected, or the injection rescheduled.
- Needle placement and contrast dispersion are typically monitored and documented in the AP and either oblique or lateral planes.
- The injection should be limited to the nerve root in question and immediate epidural space and should not disburse to adjacent nerve roots. If cross filling is documented, the volume of the final injectate can be decreased.
- Nonparticulate cortisone is often injected with the local anesthetic or prior to the local anesthetic.
- Images should be retained as part of the patient's medical record to document the level injected and contrast dispersion.



Lumbar perineural injection with AP view showing contrast flow limited to the L5 perineural space

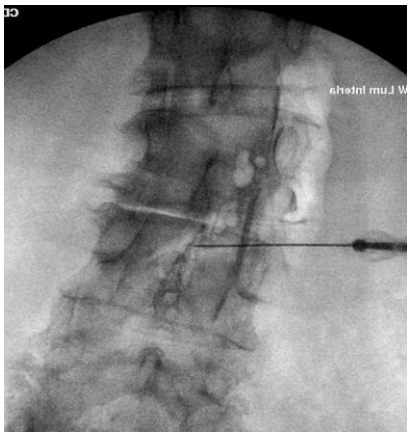


Lumbar perineural epidural injection with a lateral view showing contrast flow limited to the L5 perineural space and adjacent ventral epidural space

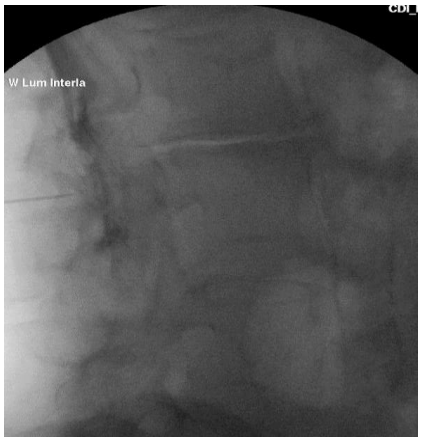
Interlaminar Lumbar Epidural Injections:

- Interlaminar lumbar epidural injections are typically performed for pain management.
- An interlaminar approach may be chosen in patients with midline or bilateral symptoms, in patients with neurogenic claudication secondary to central spinal stenosis, or in patients with radiculopathy if transforaminal approaches are limited because of difficult access or severe foraminal stenosis.

- The needle is placed into the dorsal lumbar epidural space using a posterior oblique interlaminar approach under fluoroscopic control.
- The depth of needle placement is controlled by hitting the superior margin of the inferior lamina or the inferior margin of the superior lamina and by monitoring the needle position under oblique and/or lateral fluoroscopy.
- The epidural space is localized using a loss of resistance technique.
- After placement, the needle is aspirated for fluid or blood.
- If negative, nonionic contrast is injected under direct fluoroscopic observation to confirm contrast flow within the epidural space.
- Nonionic contrast is injected to exclude vascular filling, subdural injection and intrathecal injection.
- On occasion, the amount of contrast detected under fluoroscopy will be understated, suggesting occult vascular filling. Imaging in the lateral plane is useful in these cases as ventral epidural filling can be difficult to detect on AP images.
- If vascular filling is detected or an occult vascular injection is suspected the needle should be withdrawn and the injection rescheduled or performed at another level.
- Imaging in the AP plane is useful to document a midline or paramidline position of the needle and to evaluate for lateralization of the injectate.
- Imaging in the oblique plane is useful to confirm posterolateral epidural filling and to differentiate this from paraspinous opacification.
- Imaging in the lateral plane is useful to exclude an intradural or subdural injection, and to document dispersion of the injectate into the ventral epidural space (Johnson 2004).
- Images with contrast should be retained as part of the patient's medical record to document the level injected and contrast dispersion.



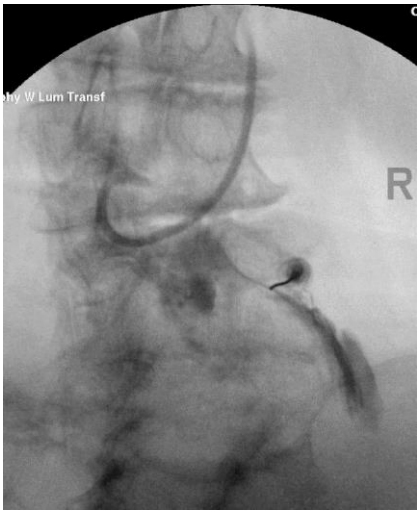
Lumbar interlaminar epidural injection: anteroposterior view showing the contrast flowing along the lateral epidural spaces



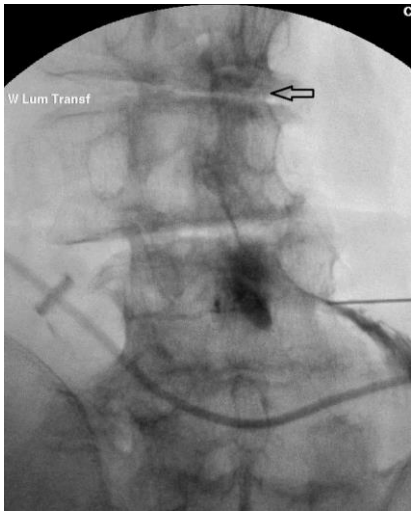
Lumbar interlaminar epidural injection: lateral view showing dorsal and ventral epidural filling.

Transforaminal Lumbar Epidural Injections:

- Transforaminal lumbar epidural injections are typically performed for pain management.
- A transforaminal approach is typically chosen to address unilateral back and or radicular pain secondary to a disc herniation, foraminal stenosis or subarticular recess stenosis. Bilateral symptoms may require an interlaminar or bilateral transforaminal injections.
- The needle may be placed into the subpedicular space, the retroneural space or the infraneural space using a posterior oblique approach.
- After placement, the needle is aspirated for fluid or blood.
- Nonionic contrast is injected to document perineural filling and to document rostral flow of contrast and opacification of the epidural space.
- Contrast injection under live fluoroscopy is recommended to exclude vascular filling.
- On occasion, the amount of contrast detected under fluoroscopy will be understated suggesting occult vascular filling. Imaging in the lateral plane is useful in these cases as ventral epidural filling can be difficult to detect on AP images.
- If vascular filling is detected or an occult vascular injection is suspected the needle should be withdrawn and redirected, performed at another level or the injection should be reattempted at a later date.
- Needle placement and contrast dispersion are typically monitored and documented in the AP and either oblique or lateral planes.
- Nonparticulate cortisone is recommended for the initial injection to minimize complications associated with inadvertent intravascular injection or filling. If particulate contrast is requested or indicated, consideration might be given to a test dose of lidocaine.
- Images with contrast should be retained as part of the patient's medical record to document the level injected and contrast dispersion.



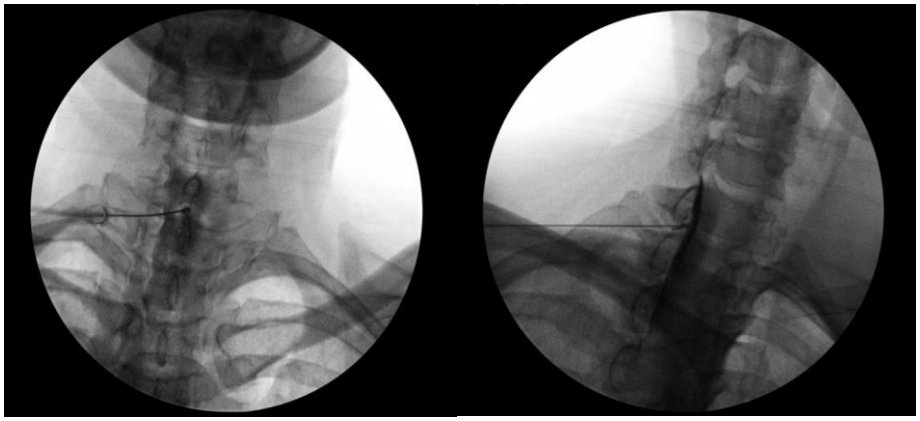
Lumbar transforaminal epidural injection: oblique view showing the contrast flowing within the perineural and adjacent epidural spaces



Lumbar transforaminal epidural injection: AP view showing the contrast flowing within the perineural and adjacent epidural spaces cephalad to L34 (open arrow)

Imaging of Cervical Epidural Injections:

- Cervical interlaminar epidural injections are typically performed for pain management.
- The interlaminar approach is often the initial procedure of choice for either axial or radicular pain.
- A blunt tip needle (Whitacre or Tuohy) is typically used in order to minimize the chance of an inadvertent dural puncture.
- The needle is typically placed into the dorsal cervical epidural space using a posterior oblique C7-T1 interlaminar approach under fluoroscopic control.
- The depth of needle placement is controlled by hitting the superior margin of the inferior lamina, the inferior margin of the superior lamina and by monitoring the needle position under oblique and/or lateral fluoroscopy.
- The epidural space is localized using a loss of resistance technique.
- After placement, the needle is aspirated for fluid or blood.
- If negative, nonionic contrast is injected under direct fluoroscopic observation to confirm contrast flow within the epidural space. Loss of resistance can occur in the epidural space or in the posterior paraspinous space and epidural cannulation needs to be confirmed with contrast.
- If there is blood return, if vascular filling is seen or if there is an inadvertent dural puncture the needle should be withdrawn. The injection can be attempted at another level if feasible or the injection should be rescheduled.
- Imaging in the AP plane is useful to document a midline or paramidline position of the needle and to evaluate for lateralization of the injectate.
- Imaging in the contralateral oblique plane is useful to confirm needle placement relative to the lamina, to confirm posterolateral epidural filling and to differentiate this from paraspinous opacification.
- Images with contrast should be retained as part of the patient's medical record to document the level injected and contrast dispersion.



Cervical epidural injection: anteroposterior view showing contrast flowing into epidural space bilaterally

Cervical epidural injection: oblique view shows contrast is injected in the epidural space – anteroposterior view cannot show if contrast is anterior or posterior

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