EPIDURAL ACCESS/INJECTION

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These safety practices have been developed to highlight the important elements in the safe performance of interventional pain procedures. Adherence to these practices will help decrease the risk of preventable complications. For additional information about the indications and technical aspects that yield improved treatment outcomes, refer to the *IPSIS Technical Manual and Atlas of Interventional Pain and Spine Procedures*.

/// PERSONNEL AND EQUIPMENT/SUPPLIES

- Only physicians trained in the technique and interpretation of epidural access and injection should perform this procedure.
- Appropriately trained personnel are needed to operate the fluoroscopy unit or assist the physician.
- Resuscitation drugs, appropriate monitoring equipment, and oxygen must be available for every epidural intervention.

/// CONTRAINDICATIONS

ABSOLUTE

- An active systemic infection or a localized infection within the procedural field
- Uncooperative patient or inability to obtain informed consent
- Allergy to medication(s) that cannot safely be omitted or mitigated by pre-treatment
- Hypertensive emergency/urgency
- For interlaminar epidural access/injection, severe central spinal canal stenosis with obliteration of the posterior epidural space, or laminectomy at the level of access or along the course of an anticipated catheter placement
- Anatomical derangements that compromise the safe and successful conduct of the procedure

RELATIVE

- Pregnancy
- Asymptomatic blood pressure >180/110
- Uncorrected coagulopathy

/// ANTITHROMBOTICS AND BLEEDING DISORDERS

- The decision to continue or how to temporarily discontinue anticoagulation/antiplatelet (AC/AP) therapy must take into account potential complications in each scenario.
- There is a quantifiable risk of life-threatening thrombotic events associated with discontinuation of therapeutic AC/AP agents for spine interventions.
- The decision to temporarily discontinue AC/AP therapy and whether to employ a bridging strategy should include the patient and the physician prescribing the AC/AP therapy.
- Consistent with the IPSIS *Technical Manual and Atlas of Interventional Pain and Spine Procedures*, the bleeding risk is classified as intermediate to high for cervical, thoracic, lumbar, and caudal interlaminar injections; low to intermediate for cervical and thoracic transforaminal injections; and low for lumbosacral transforaminal injections.

/// PROCEDURAL SEDATION

- Sedation is not intrinsically necessary for epidural access/injection, but if employed in unique circumstances (*e.g.*, movement disorder, cases of extreme anxiety, previous vasovagal response), the patient should remain able to communicate pain or other adverse sensations or events. Deep sedation and general anesthesia are contraindicated.
- The decision to use sedation should be made on a case-by-case basis. Patients should be advised during informed consent that procedural sedation is not necessary but elective.
- If the physician performing the procedure decides that sedation is indicated, a separate healthcare provider must administer the medications and monitor the patient.
- Resuscitation drugs, appropriate monitoring equipment, and oxygen must be available if sedation is utilized.

/// SAFE, ASEPTIC PRACTICES

- Strict aseptic techniques should always be applied to the facility, patient, physician, assisting personnel, injectate/syringe, and other procedural materials. Examples include, but are not limited to:
  - Skin overlying the target region should be prepared for an aseptic procedure, preferably using chlorhexidine in alcohol. The area should then be draped to create a sterile field.
  - A face mask and sterile gloves must be worn during the procedure.
  - Sterile single-use syringes and needles are required, and single-dose vials should be utilized when available.
  - Acquisition, storage, and utilization of medications should adhere to relevant regulatory guidelines.

/// IMAGING

- Image guidance ensures appropriate needle placement and demonstrates injectate flow patterns. Image guidance reduces the risk of complications, allowing the physician to avoid vulnerable vascular or neural structures before any agent is injected or inserted and to ensure injectate is delivered to the target.

- The primary literature validates fluoroscopic imaging for safe and effective epidural access/injection, while the same rigor of investigation has not occurred for alternative image guidance. Therefore, fluoroscopy is the recommended image guidance modality for epidural access/injection.
- The fluoroscopic technique should follow the ALARA (As Low As Reasonably Achievable) principles to minimize X-ray exposure for the patient and the healthcare team.
- Contrast media is used for epidural injections to detect intravascular, intrathecal, subdural, and retrodural injections and predict the spread of an injectate before its administration.
- Non-ionic iodinated contrast media (ICM) are recommended.
- Specific ICM are approved for intrathecal use, while others are not. Careful selection is required for procedures with intended or potential inadvertent intrathecal delivery. When using ICM, concentrations should not exceed 300 mg/ml.
- The use of GBCM in the performance of spinal epidural injections using an interlaminar approach is not recommended.
- For transforaminal epidural injections, GBCM is also not recommended, although this recommendation is less strong given the current level of evidence. When the use of GBCM is necessary, physicians should limit the volume to the minimum required, ensuring it does not exceed 1 mL per session for injections involving the epidural space, where there is a risk of intrathecal entry. Additionally, it's crucial to engage the patient in a shared decision-making process to thoroughly discuss the risks and benefits associated with GBCM use.
- Obtain images documenting the final needle position and satisfactory contrast medium spread.

/// INJECTIONS

- The ultimate choice of approach or technique (interlaminar vs. transforaminal) should be made by the treating physician by balancing the potential risks and benefits of each technique for each patient.

CERVICAL INTERLAMINAR EPIDURAL INJECTION PROCEDURES

- Pre-procedure review of advanced imaging is essential to ensure the presence of adequate dorsal epidural space for needle entry. Imaging may additionally reveal contraindications such as severe central stenosis or a disc herniation at the target level, which may increase the likelihood of accidental dural or spinal cord puncture. If imaging reveals significant central stenosis at the targeted C7-T1 level, a subjacent level (*e.g.*, T1-2) may be considered for epidural access.
- Cervical interlaminar ESIs should not be performed higher than C6-7, but preferably at C7-T1 or below.
- All cervical interlaminar ESIs should be performed using fluoroscopic guidance with appropriate AP, lateral, or contralateral oblique (CLO) views.
- Because the depth of epidural needle placement at the cervicothoracic levels may be poorly imaged using a true lateral fluoroscopic view, a CLO view may better visualize the relevant landmarks and help establish correct interlaminar epidural needle placement.
- Appropriate needle localization requires contrast medium injection in addition to a successful loss-of-resistance technique.
- Fluoroscopic imaging to confirm appropriate needle depth must be performed immediately before injecting any substance to prevent catastrophic complications related to inadvertent intramedullary injection.

- In general, it is unnecessary to inject local anesthetic, which introduces complication risk, especially respiratory depression/arrest from intrathecal injection. If local anesthetics are used, then small volumes of preferably short-acting agents should be administered. High-concentration, long-acting local anesthetics should be avoided.

CERVICAL TRANSFORAMINAL EPIDURAL INJECTION PROCEDURES

- Examination of pre-procedural imaging is recommended for all transforaminal access. In the cervical region, it is critical to understand the location of the vertebral artery, brachial (or cervical) plexus, and the exiting nerve relative to the anticipated location of the needle tip.
- Based upon the specific foraminal geometry of the ventral surface of the superior articular process, as well as the location of the neurovascular structures within the foramen, a safe needle trajectory and tip location should be planned before the procedure.
- Cervical transforaminal epidural access/injection should be performed by injecting contrast medium through microbore extension tubing using real-time fluoroscopy with or without digital subtraction imaging (DSI) and an AP view before injecting any substance that may be hazardous to the patient. Any detected vascular flow must be treated as potentially dangerous. If arterial flow is suspected, the procedure should be abandoned. Microbore extension tubing is recommended for all transforaminal ESIs to minimize movement of the needle tip once it has reached its appropriate target.
- Non-particulate steroid, such as dexamethasone, is the only acceptable steroid for a cervical transforaminal injection.
- Dexamethasone should not be mixed with ropivacaine because of the risk of precipitation and resultant particulate injection.

LUMBAR INTERLAMINAR EPIDURAL INJECTION PROCEDURES

- Pre-procedure imaging informs assessment before interlaminar access in the thoracic and lumbar spine. Access at a level of severe central canal compromise is contraindicated.
- All lumbar interlaminar ESIs should be performed using image guidance, with appropriate AP and lateral or CLO views and contrast medium.
- Fluoroscopic depth imaging (true lateral/CLO imaging) is essential during interlaminar epidural access procedures to prevent serious complications due to intrathecal or intramedullary injection. The CLO view is superior to the lateral view for needle tip visualization, projecting needle trajectory, and precision in predicting the dorsal margin of the epidural space.
- Using a high-concentration, long-acting local anesthetic introduces the risk of prolonged motor block from either epidural or inadvertent intrathecal administration and should be avoided.

LUMBAR TRANSFORAMINAL EPIDURAL INJECTION PROCEDURES

- Examination of pre-procedural imaging is recommended for all transforaminal epidural access procedures.
- Lumbar transforaminal epidural access/injection should be performed by injecting contrast medium through microbore extension tubing using real-time fluoroscopy with or without DSI and an AP view before injecting any substance that may be hazardous to the patient.
- Any detected vascular flow must be treated as potentially dangerous. If arterial flow is suspected, the procedure should be abandoned.
- A non-particulate steroid (*e.g.*, dexamethasone) should be used for the initial injection in lumbar transforaminal ESIs.

- Dexamethasone should not be mixed with ropivacaine because of the risk of precipitation and resultant particulate injection.
- Given the above risks, the non-particulate steroid, dexamethasone, is the initial steroid recommended. Particulate steroids may be used as a secondary agent if dexamethasone proves ineffective; an infraneural approach may then be considered an additional safety measure.
- High-concentration local anesthetics carry the risk of a prolonged motor block, which can extend the recovery period until the patient can be safely discharged. Consequently, the short-acting agent, lidocaine, may be the preferred agent.
- Microbore extension tubing is recommended for all transforaminal ESIs to minimize movement of the needle tip once it has reached its appropriate target.

/// POST-PROCEDURE MONITORING/FOLLOW-UP

- Patients should be monitored for an appropriate time following the procedure, depending upon the nature of the intervention and the agents utilized.
- Provide detailed oral and written discharge instructions to patients that outline the following:
  - restrictions and recommendations for the immediate post-injection period
  - potential common side effects that may occur immediately post-injection and in the days following the procedure (*e.g.*, pain at the injection site, increased blood glucose level)
  - symptoms that merit immediate medical attention
  - timing for resumption of usual medications and anticoagulants if discontinued for the procedure
  - instructions for diabetic patients to monitor blood glucose levels for 48 hours or until baseline levels have been achieved
- Ensure patients have a follow-up plan.

SOURCES

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DISCLOSURES

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