Sacral Transforaminal Epidural Injection (Selective Nerve Root Block)

25

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Equipment and Monitoring

- Standard ASA monitoring
- Fluoroscopy
- Sterile prep, and drape
- Skin local anesthesia prior to any needle larger than 25G (unless sedation is used)
- Coaxial view is always used to advance needle, unless otherwise specified
- CPR equipment and medications available
- 20–25G, 3.5 inch (90 mm) – 5 inch (130 mm) needle (consider blunt tipped needle with introducer)
- Nonionic contrast
- Local anesthetic and steroid (Non-particulate)

Anatomy

- S1-S4 anterior rami form the sacral plexus
- S1 fibers contribute to the common peroneal, tibial, gluteal and obturator nerves
- S2 fibers contribute to the common peroneal, tibial, obturator, posterior femoral cutaneous and pudendal nerves
- S3 fibers contribute to the tibial, obturator, posterior femoral cutaneous and pudendal nerves
- S4 fibers contribute to the pudendal nerves
- Access the epidural space via S1, S2, or S3 posterior foramen of the sacrum (Fig. 25.1a, b)
- It may be difficult to distinguish posterior and anterior sacral foramina. The posterior foramina are small and round, while the anterior foramina are larger and semilunar shaped

Structures to Keep in Mind and Possible Complications

- Anterior nerve roots (to sacral plexus) → nerve damage
- Dura to S1, but occasionally to S3 → inadvertent intrathecal injection
- It is possible to access the pelvic organs through the posterior and then anterior foramina → rectum: retroperitoneal or epidural infection
- Periosteum → pain
- Infection
- Bleeding
- Postprocedure pain
- Vasovagal reaction
- Allergic reaction

Fluoroscopy Technique, Target Localization

- Patient in prone position
- Anteroposterior (AP) view
- Identify anterior and posterior foramina (Fig. 25.1a–e)
- Cranial (for S1) or caudal (S3) fluoroscopic tilt is occasionally needed to better visualize neuroforamina
- Occasionally the needle is directed to the foramen of interest based on the location of the contralateral foramen, if better visible

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Procedure Steps

- Advance needle through posterior foramen
- There is a "give" when passing through the posterior opening
- Check lateral view; needle tip should be just inside, but not through, the spinal canal
- Administer contrast medium using live fluoroscopy and extension tubing to exclude intravascular spread
- Inject 1–2 ml of contrast to confirm spread along the nerve root and into the sacral epidural space (Figs. 25.2a, b and 25.3a–c)

Clinical Pearls

- Good fluoroscopic view is critical. Rotate or tilt fluoroscopic unit until clear view of the "desired" neuroforamina is obtained
- Use gentle movement and, if need be, change fluoroscopic views often
- Best is to just enter the neuroforamina near bone edge (to avoid direct nerve infiltration). A bent needle tip can be walked off the neuroforaminal bony edge
- If foramen does not show well, visualizing the foramina on the contralateral side helps to understand the target on side of interest

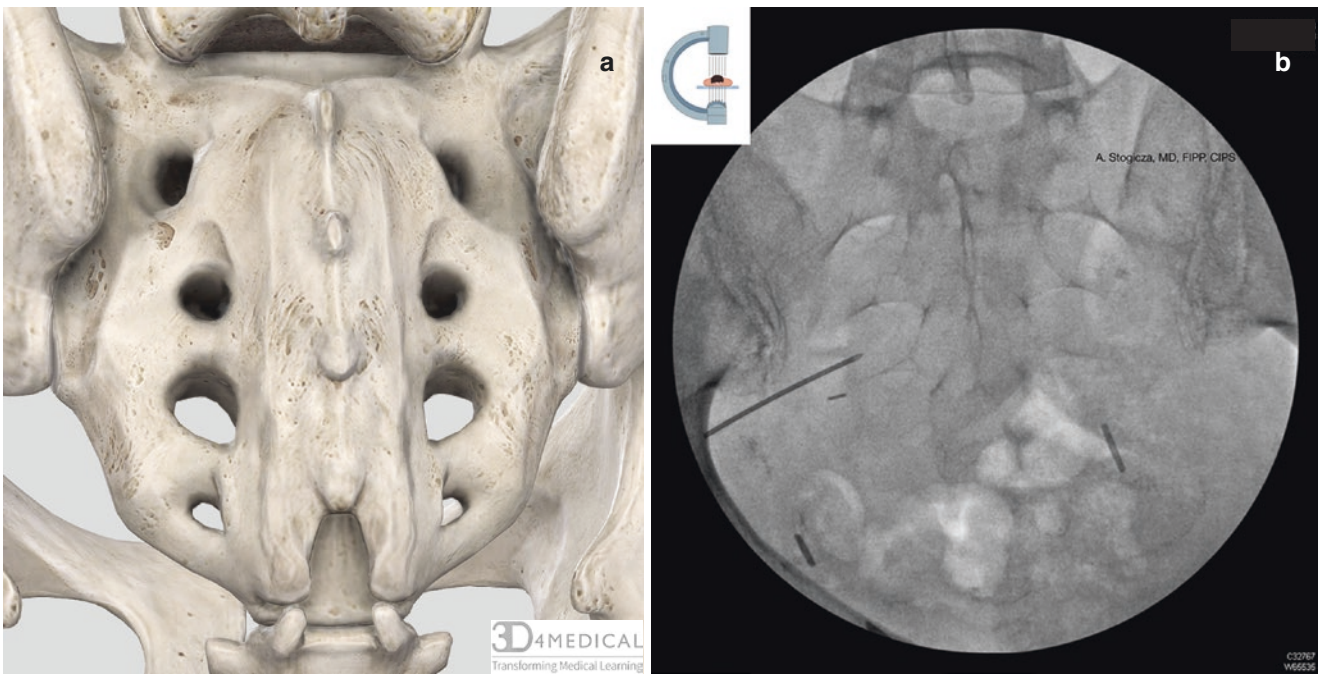

Fig. 25.1 Posterior view of the sacrum. Complete Anatomy image (**a**). Native (**b**) fluoroscopy image. Posterior, small, round foramina marked with purple. Needle is pointing at skin entry site (**c**). Anterior view of the sacrum. Complete Anatomy image (**d**), anterior, large, semilunar foramina marked with pink (**e**)

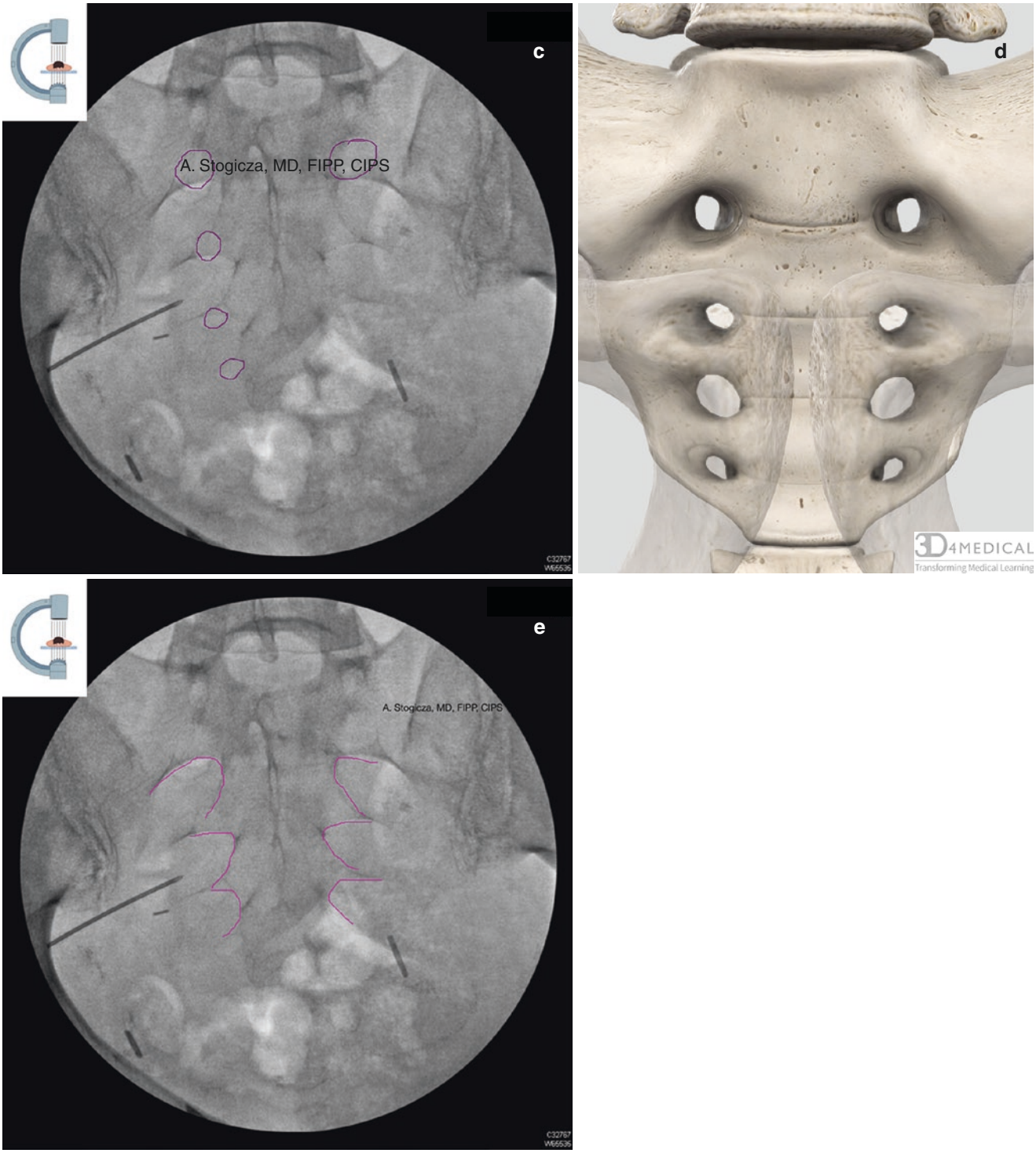

Fig. 25.1 (continued)

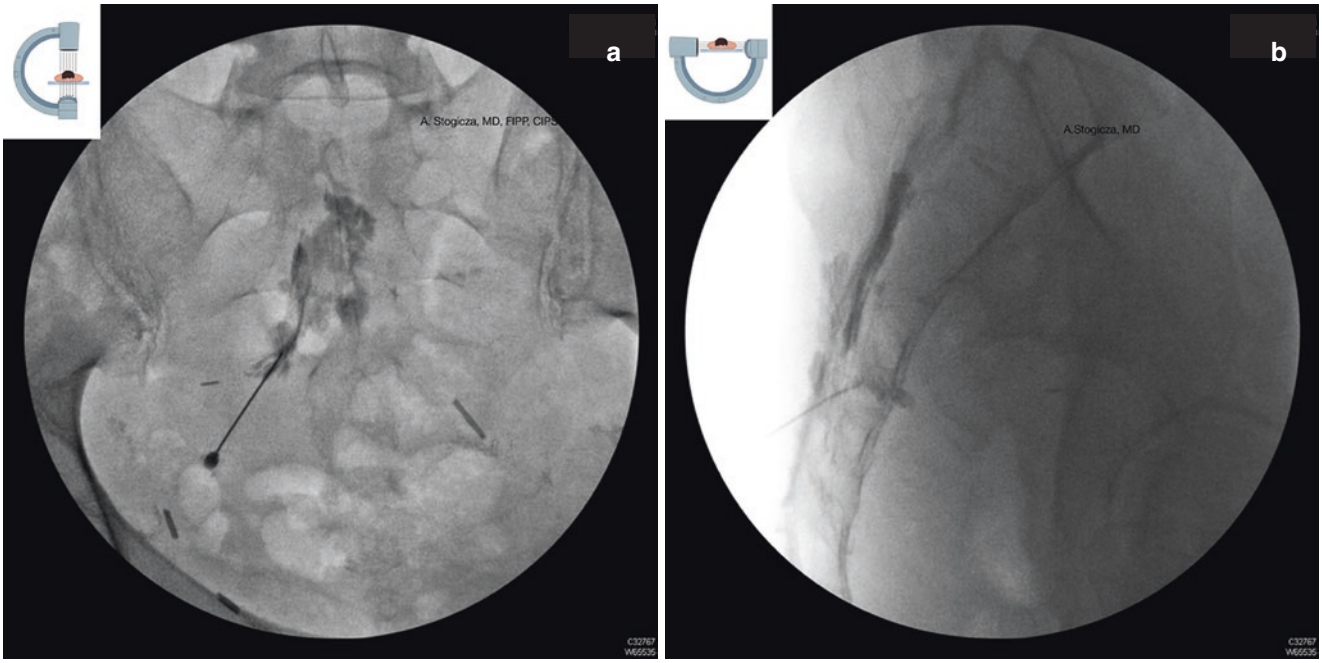

Fig. 25.2 AP (**a**) and lateral (**b**) image of the sacrum, needle in the S3 foramen, contrast in the epidural space and outlines S3 nerve root

- The foramen is always below the pedicle
- Procedure done correctly has few complications, but, if done haphazardly, will result in morbid complications (e.g., bowel perforation with fecal contamination and sepsis)
- Use only a tiny amount of contrast to check position (less than 0.5 ml at a time). If using too much contrast when needle placement is incorrect, it will obscure any chance of finding the correct neuroforamina again during subsequent attempt
- Contrast spread or lack thereof can indicate vascular uptake of the contrast (Fig. 25.4a, b)

Unacceptable, Potentially Harmful Needle Placement on Exam

- Rough needle manipulation
- Passing anterior to the sacrum via anterior foramen
- Not checking lateral view to assess depth of needle
- Any proof of lack of understanding of lumbosacral and pelvis anatomy, for example needle repeatedly forced through the iliac crest

Unacceptable, But Not Harmful Needle Placement on Exam

- Needle past midway between sacral line and anterior sacrum
- The examinee abandoned the procedure after unsuccessful attempts, but it was clear that the examinee was cognizant of the safety aspects of the procedure

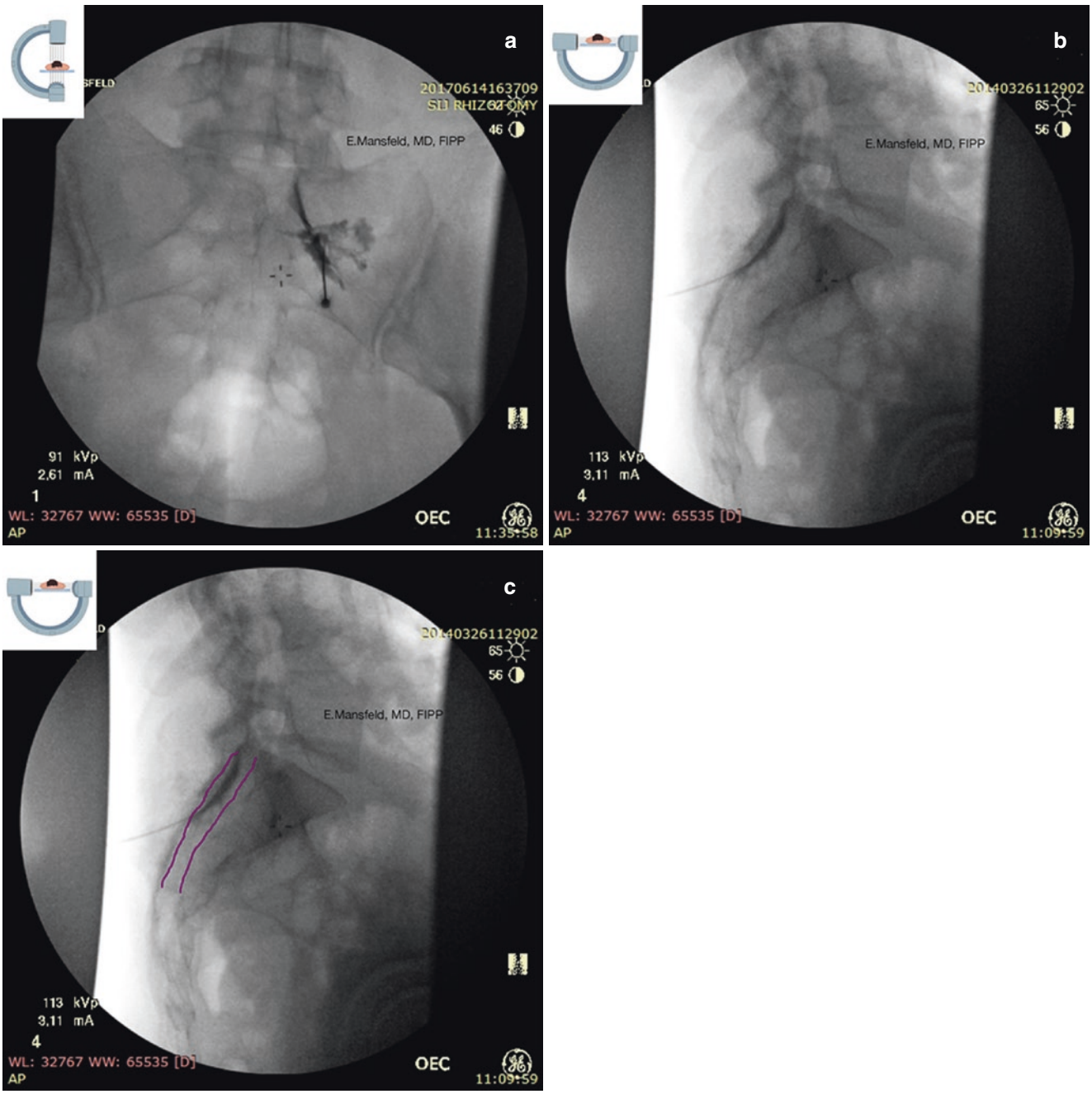

Fig. 25.3 AP and lateral image of the sacrum, needle in S1 foramen, contrast in epidural space. Epidural space is marked with pink. Native (**a**, **b**) and edited (**c**) fluoroscopy image

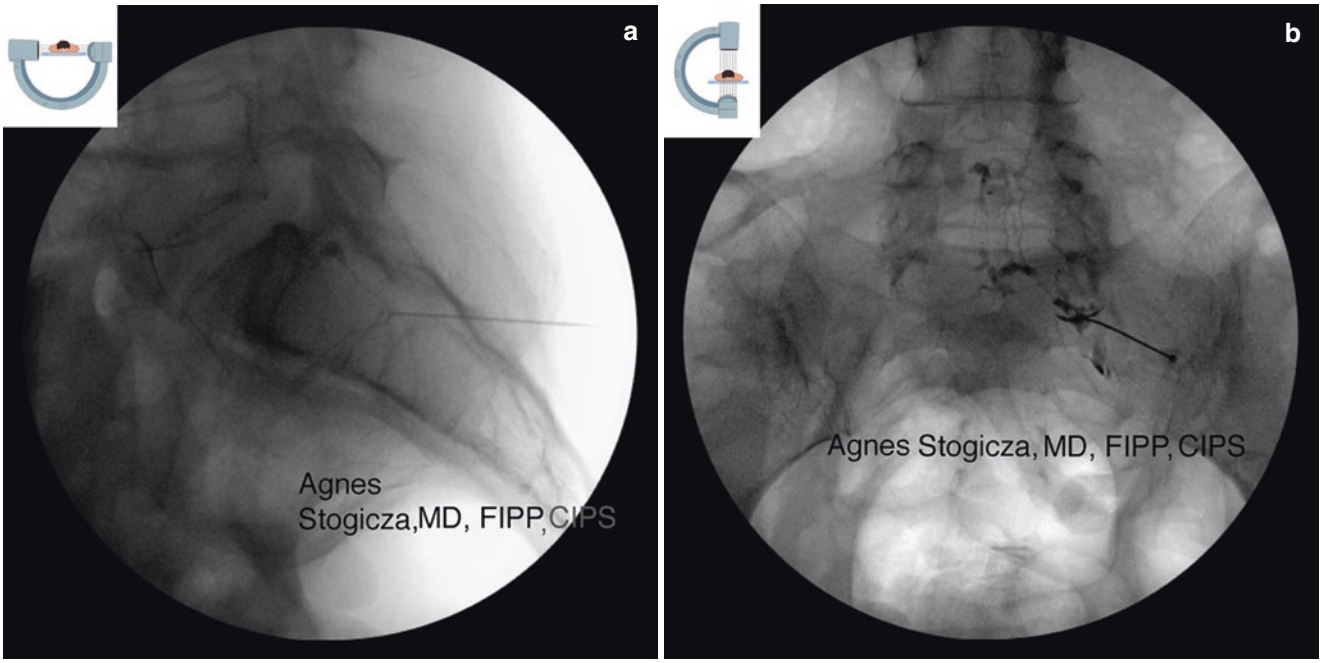

Fig. 25.4 Vascular uptake. Lateral view, 1 ml contrast injection (**a**), AP view, 3 ml contrast injection clearly shows the epidural venous plexus filled with contrast (**b**)

Evidence

Table 25.1 Level of evidence and recommendations by the Benelux section of the World Institute of Pain
These recommendations are based on both a review of the literature in 2015 by an independent third party (Kleijnen Systematic Reviews LTD) and the previous published guidelines published in Pain Practice. The recent literature, the potential risk for complications, and the grade of invasiveness were considered when deciding to upgrade or downgrade the recommendation.

Indication	Procedure	Recommendation 2009[1]	Grade 2015[2]	Recommendation 2018[3,4]
Lumbosacral radicular pain	Epidural corticosteroid administration	2B+/−	Moderate	Weak

[1]Van Boxem K, Cheng J, Patijn J, van Kleef M, Lataster A, Mekhail N, et al. 11. Lumbosacral radicular pain. Pain Pract. 2010;10:339–58
[2]Kleijnen Systematic Reviews Ltd.: Search and evaluation of the literature. 2015
[3]Huygen F, Kallewaard JW, van Tulder M, Van Boxem K, Vissers K, van Kleef M, et al. "Evidence-based interventional pain medicine according to clinical diagnoses": update 2018. Pain Pract. 2019;19:664–75
[4]https://www.anesthesiologie.nl/publicaties/praktische-richtlijnen-anesthesiologische-pijnbestrijding

Table 25.2 Level of evidence based on the American Society of Interventional Pain Physicians (ASIPP) review of the literature

Lumbar epidural injections[1]	Evidence
Disc herniation	Level I
Discogenic pain	Level III
Central spinal stenosis	Level III
Post-lumbar surgery syndrome	Level IV

[1]Manchikanti L, Schultz DM, Atluri SL, Glaser SE, Falco FJE. Lumbar epidural injections. In: Manchikanti L, Kaye AD, Falco FJE, Hirsch JA, editors. Essentials of interventional techniques in managing chronic pain. Springer International Publishing; 2018, p. 141–86

Suggested Reading

Burnett C, Anderson J. Sacral injections. In: Sackheim K, editor. Pain management and palliative care. New York/Heidelberg/Dordrecht/London: Springer; 2015. p. 315–23.

Huygen F, et al. "Evidence-based interventional pain medicine according to clinical diagnoses": update 2018. Pain Pract. papr.12786. 2019; https://doi.org/10.1111/papr.12786.

Racz GB, Noe C. Pelvic spinal neuroaxial procedures. In: Raj P, Erdine S, Staats PS, Waldman S, Gabor R, editors. Interventional pain management: image-guided procedures. Philadelphia: Saunders Elsevier; 2008. p. 420–3.

Rathmell JP, et al. Safeguards to prevent neurologic complications after epidural steroid injections. Anesthesiology. 2015;122:974–84.

The Sacral Nerve Root Block chapter was reviewed by Mert Akbas; Sudhir Diwan; Agnes Stogicza; Milan Stojanovic; Andrea Trescot; and Peter S Staats, Athmaja Thottungal, Einar Ottestad.