



Pearls

Pearls: Wrong-level Surgery Prevention

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The Sign Your Site initiative and the Pause Before Making Incision policies are great ways to prevent wrong-site surgery [2]. However, for spine surgeons, these

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efforts do little to prevent wrong-level spine surgery.

Several factors can contribute to wrong-level spine surgery, including morbid obesity, thoracic location, presence of multiple lesions, transitional anatomy, congenital anomaly, age, and diminished mineralization of bone [4]. While some of these factors can be overcome with careful preparation, in those patients where difficulty can be predicted, preoperative localization is vital. This can be done in the radiology interventional suite with accurate image guidance. These approaches can save considerable time, minimize uncertainty during surgery, and most importantly, help prevent wrong-level surgery.

Several localization techniques have been described and can be generally divided into those that place markers in the soft tissue, and those that place them in the bone itself [1, 3, 5–8]. In these challenging patients, I firmly believe that there is no role for soft-tissue markers. Fixed markers in bone are ideal, as they cannot be altered with initial exposure and remain visible during the critical parts of the procedure.

For difficult procedures, it is not uncommon to repeatedly check proper levels, and markers in bone offer a durable localizer. There are several options, including wires or screws that

can be deployed percutaneously and placed in a variety of structures. We prefer angiography coil at our institution. They are simple, fast, easily visible, and can be placed into the pedicle with a single-step deployment under image guidance. I prefer the pedicle for placement site. This provides a secure and reliable anchor site, and it is straightforward to interpret during the operative procedure as compared to a spinous process, which can have a variable relationship to the intended vertebral body or disc space.

The desired level is identified both by the reported level in the imaging report,



Fig. 1 An axial MR image shows a compressive lesion.

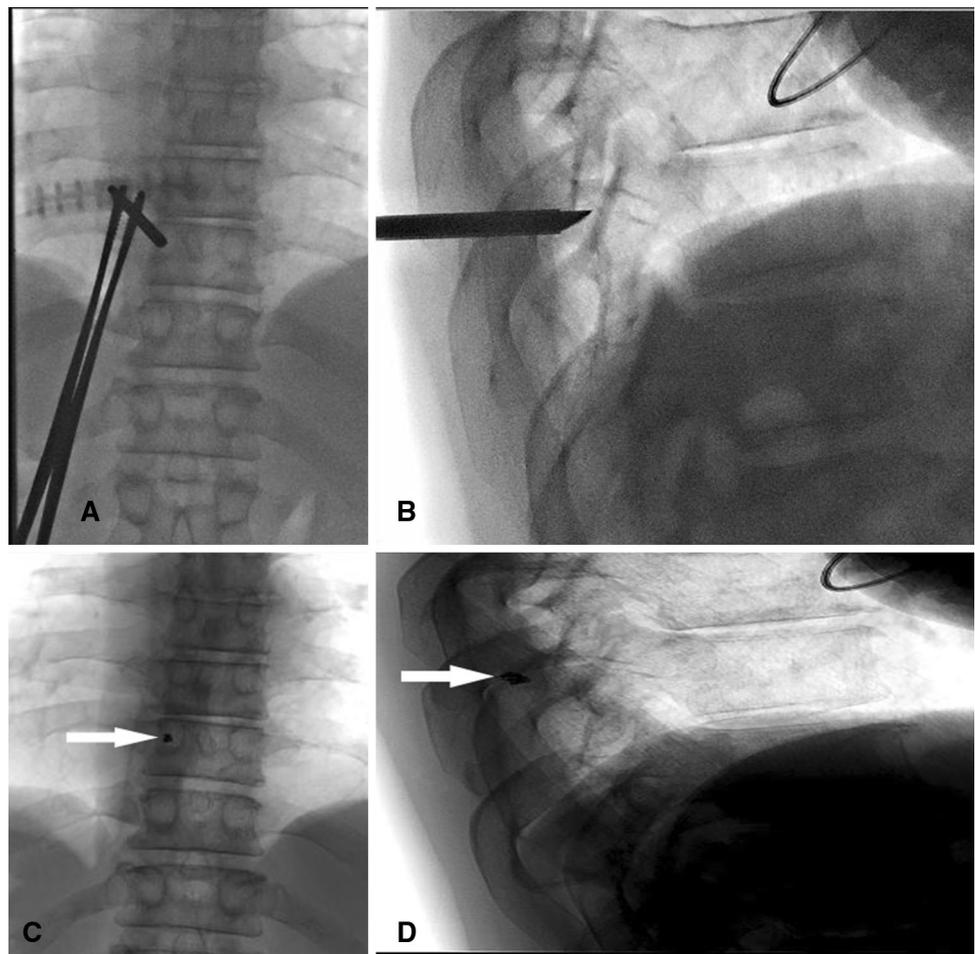
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and descriptively by the level of the lesion (Fig. 1). I make a point of communicating directly with the interventional radiologist, as well. The marker can be placed preoperatively

with sedation, but more commonly, this procedure is coordinated so that the patient is anesthetized in radiology, the marker is placed under general anesthesia, and then the patient is taken

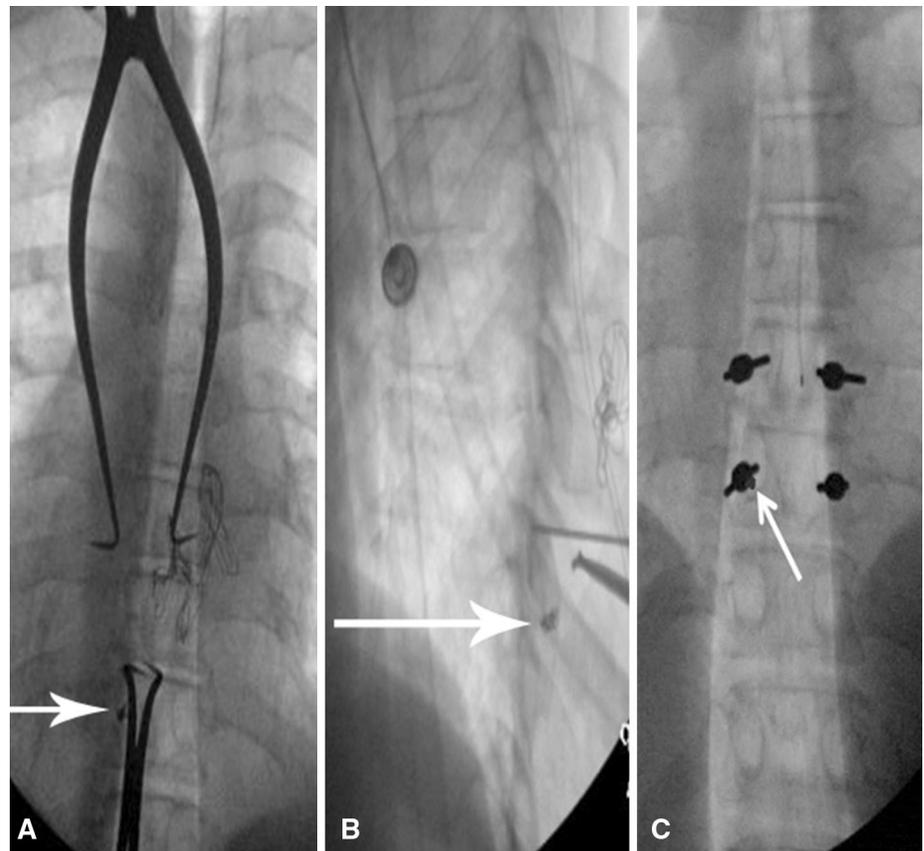
directly to surgery (Fig. 2). The marker is easy to see on both AP (Fig. 3A) and lateral images (Fig. 3B), and it remains visible during decompression and/or instrumentation if needed (Fig. 3C).

Fig. 2A–D (A) AP and (B) lateral radiographs with trochars placed prior to deployment of coil are shown. (C) AP and (D) lateral radiographs with coil positioned in the pedicle are shown.



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Fig. 3A–C (A) AP and (B) lateral intraoperative marker films are shown. (C) The AP radiograph shows intraoperative placement of pedicle markers.



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