



TECHNICAL NOTE / *Neuroradiology*

The oblique interlaminar approach for fluoroscopy-guided lumbar puncture: Keep the eye opened!



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KEYWORDS

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A lumbar puncture (LP) is a common procedure, carried out for diagnostic or therapeutic purposes; the technique for a seated patient, with the trunk in full flexion, is well known [1]. However, the morphology of the patient and/or any degenerative changes (Table 1) can make the procedure very painful for the patient and technically difficult (or even impossible) for the practitioner, who is then left with the option of carrying out the procedure under radiological guidance.

The purpose of this article is to present a lumbar puncture technique that uses the oblique interlaminar (OIL) approach under fluoroscopic guidance, which allows the LP to be performed with ease in spite of unfavourable anatomical conditions. This technique is also suitable for carrying out myelography or lumbar radiculography.

A fluoroscopically-guided LP is usually performed using the median interspinous approach; there are two standard puncture techniques:

- the patient is seated or lying down and a lateral view is used, fluoroscopy only being used to choose the widest interspinous space and to check that the final position of the needle tip projects into the centre of the lumbar spinal canal as it should. In this position, fluoroscopy does not offer any guidance in the horizontal plane, especially if there is axial rotation of the vertebrae or narrowing of the spinal canal due to facet joint arthritis;
- alternatively, the patient is in the prone position; in this case, the intervertebral space is positioned for puncture using a true PA view of the lumbar spine, if necessary by slightly rotating the patient from one side to the other. However, interspinous osteoarthritis, which can still be underestimated on fluoroscopy, can interrupt or even block the puncture.

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Table 1 Pathological conditions obstructing lumbar puncture.

Anatomical condition	Consequence(s)
Scoliosis	Vertebral rotation around the longitudinal axis of the patient: if the needle follows the beam axis it is directed towards the lateral part of the lumbar canal
Interspinous osteoarthritis (Baastrup's syndrome)	Narrowed or obliterated interspinous space
Facet joint hypertrophy	Posteroanterior compression of the anterolateral regions of the thecal sac
Disc and vertebral body osteoarthritis	Reduced intervertebral height leading to a narrowed interlaminar space

The oblique interlaminar approach is an alternative route that works around these difficulties.

Description of the technique¹

The patient is initially placed in the prone position, possibly with a foam cushion placed under the abdomen in order to reduce lumbar lordosis. Between L2-L3 and L4-L5, the level and the side where the interlaminar space (ILS) appears widest is marked; if there is significant lordosis, the x-ray tube can be tilted if necessary to maximise the ILS vertically. The ILS looks like a narrow oval or triangular space on both sides of the spinous process (Fig. 1a).

The patient is then rotated slightly by 20 to 30°, and the side to be entered is raised in order to widen the chosen ILS transversely; in this position, the laminae bordering the ILS are perpendicular to the beam axis. Then the needle is directed beneath the arch formed by the inferior edge of the lamina of the overlying vertebra (Fig. 1b) parallel to the beam axis, advancing into the subarachnoid space

(Fig. 1c); if CSF is present in the stylet of the needle, then this demonstrates correct needle positioning.

It is possible to either take a sample of CSF and/or perform an intrathecal injection either in the prone position after attaching a tubing system to the needle, or directly after having relocated the patient to a true lateral position.

Discussion

The OIL approach offers a number of advantages over the standard interspinous approach. Firstly, it allows the interspinous space (ISS) to be bypassed [2]. This is useful because any osteoarthritis that has developed at the superior or inferior borders of the spinous processes causes narrowing of the ISS, the extent of which is difficult to assess using fluoroscopy and underestimated for all cases. This narrowing makes it difficult to advance the needle; therefore guiding the needle may be problematic, especially if a small calibre needle (23G or thinner) is used: the drawbacks of the interspinous route mean that the interlaminar approach should be preferred.

However, when a true posteroanterior view is used for the interlaminar approach, this does present two disadvantages:

- firstly, because the laminae are oblique to the coronal plane, the ILS appears as a narrow oval space with a long vertical axis ("closed eye"). If there is facet joint hypertrophy, the width of this space is reduced, which makes the puncture difficult; if there is scoliosis, the ILS can even be totally obliterated due to axial rotation of the vertebrae, which makes the interlaminar approach impossible (Fig. 2). By contrast, the oblique view presents the interlaminar space posteroanteriorly, transversely widening the space available for needle entry ("open eye") (Figs. 1 and 2);
- secondly, with a true posteroanterior view, use of the paramedian point of entry conducts the needle tip towards the lateral part of the dural sac, where its anteroposterior diameter is reduced (Fig. 3a), especially if there is arthritic hypertrophy of the posterior articular processes compressing the edges of the dural sac. The main advantage of the OIL route is that the needle is directed towards the midline, even though the skin entry site is lateral (Fig. 3b); in this way, the needle tip meets the

¹ Settling the patient and preparation for the procedure (disinfection of the skin, setting up a sterile field, etc.) will not be detailed here.

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