

SURGICAL AND RADIOGRAPHIC ANATOMY
of
LUMBAR RADIOFREQUENCY
MEDIAL BRANCH NEUROTOMY



SPINENET

Prepared for the

Spine Intervention Society

by

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The development of this presentation was prompted by discussions that arose between Dr Paul Dreyfuss and Professor Nikolai Bogduk during the production of the ISIS Guidelines for Spinal Injection Procedures in 2003. The discussions focused what the illustrations should depict as the correct placement of electrodes for lumbar radiofrequency medial branch neurotomy. It emerged that arguments for and against certain placements were based on no more than opinion or habit, i.e. the way individual practitioners had been accustomed to performing the procedure.

Consulting the literature revealed that whereas some authors depicted where to place electrodes, the basis for these instructions were, themselves, based on no more than “this is the way I do it”, or “this is the way I was taught to do it”. No objective origin for the recommendations for placements could be traced. Whereas most authors acknowledged that the target nerve ran across the root of the transverse process, no one had actually shown that where they placed electrodes actually coincided accurately with where the nerve ran. In effect, authorities had extrapolated the words, from written descriptions of the anatomy, onto radiographs; as if to say: “trust me; this is where the nerve is”.

Absent from the literature was any direct correlation between anatomy and electrode placement. Consequently, this presentation was generated. It is designed to provide operators with a formal foundation on which to base their technique; and to replace compliance with poorly founded and inaccurate hearsay from apparently learned authorities who, in fact, had no grounds for how they taught the procedure.

This presentation serves both

to illustrate and validate a particular technique for lumbar radiofrequency medial branch neurotomy

and

to instruct viewers how to execute that technique.

It consists of several sections. Each section is introduced by text and contains slides of dissections and radiographs. Radiographs are presented in pairs. The first of each pair is the raw radiograph. The second is labeled. The purpose of presenting pairs of radiographs is that viewers can flick between the two so that they can learn to recognize the labeled parts in the unlabelled slide. Sometimes a third slide is presented, in which the key elements have been colored in, in order to enhance perception.

In order, the sections are:

Section 1. Anatomy, no needles

which describes the radiographic anatomy of typical and the L5 lumbar levels.

Section 2. Understanding the mamillo-accessory ligament

which describes the significance of the MAL in the conduct of RF neurotomy.

Section 3. L4 RF medial branch neurotomy

which illustrates the electrode in exact position on the target nerve, and the corresponding radiographic views of that placement.

Section 4. Adjusting for lesion size

which describes the differences in tolerance when different electrodes are used.

Section 5. L5 RF dorsal ramus neurotomy

which illustrates the electrode in exact position on the target nerve, and the corresponding radiographic views of that placement.

Section 6. Adaptations

which describes how to achieve adequate lesions when the electrode cannot be placed exactly parallel to the target nerve.

Section 7. Lower Quality Fluoroscopy

which illustrates the surgical anatomy of lumbar medial branch neurotomy using fluoroscopic images of lesser quality.

The presentation closes with:

Section 8. Synopsis

which outlines, step by step, how the placements illustrated above should be achieved in practice.

Section 9. Actual procedure

which illustrates, step by step, an actual procedure in a patient.

SECTION 1: ANATOMY, NO NEEDLES

This section presents various radiographic views, first of the L4 level – as representative of typical lumbar levels, and secondly of the L5 level. The objective is have viewers be able to recognize the landmarks essential for the accurate conduct of medial branch neurotomy.

The radiographs used in this presentation may appear to be suboptimal to some readers. The definition of bony elements may not be as clear as some operators are accustomed to seeing in clinical practice. This arises, not so much because of the capabilities of the fluoroscope used to obtain the images, but because of the nature of cadavers. Embalmed cadavers, even ones in which one side has been dissected, tend to absorb X-rays more than living individuals. This hampers producing premier quality images. However, the images used in this presentation are not worse than those that would be obtained in some, large, patients, particularly the lateral views, which are often unclear in patients. Operators should, nevertheless, be able to read such images, and not demand perfect quality. Perfect quality will not always be available in practice. Competence is measured by the ability to discern accurately the relevant anatomy in less than optimal radiographs.

L4 AP view

In the AP view, practitioners should be able to locate and identify:

the superior articular process (sap)

the inferior articular process (iap)

the transverse process (TP)

and the mamillary process.

Viewers who are either not familiar with or not confident with recognizing the elements can follow the following guidelines.

The **transverse process** is evident as a rectangular shape projecting laterally from the vertebral column. No other structure overlies or obscures it.

Sometimes, however, because of over-penetration by the X-rays, the transverse process may be faint or not evident. In that event, an algorithm can be followed that will enable either the faint transverse process to be found, or its location to be plotted with reasonable confidence. The key is to find the **pedicle**, which should always be evident as an ovoid ring superimposed on the superior lateral quadrant of the vertebral body. From the pedicle, the transverse process will always project laterally, opposite the 3 o'clock position on the right, or the 9 o'clock position on the left.

The **superior articular process** will be evident as an ear-shaped projection just lateral to the upper pole of the pedicle. It presents a convex lateral margin that overlaps the root of the transverse process.

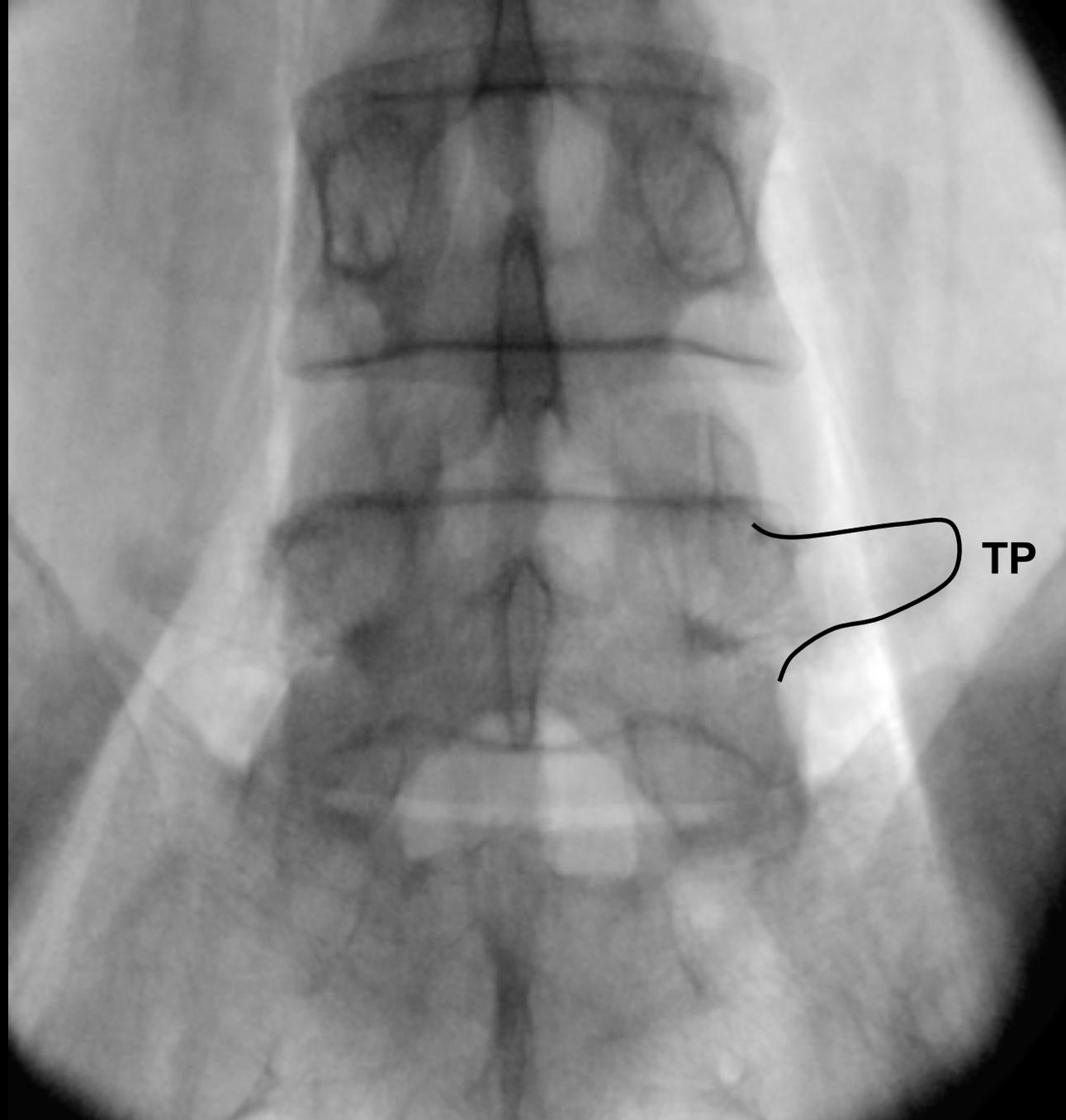
The **inferior articular process** descends from the vertebra above to meet the superior articular process. If unclear, the inferior articular process can be projected by tracing simultaneously the lateral margin and the inferior margin of the lamina of the vertebra above. Both these margins converge to the inferior articular process.

Confidence in having recognized the articular processes is enhanced if the cavity of the zygapophysial joint that they form can be seen. Often, however, this cavity is not evident. Nevertheless, the two articular processes combined form a rounded mass that constitutes the zygapophysial joint.

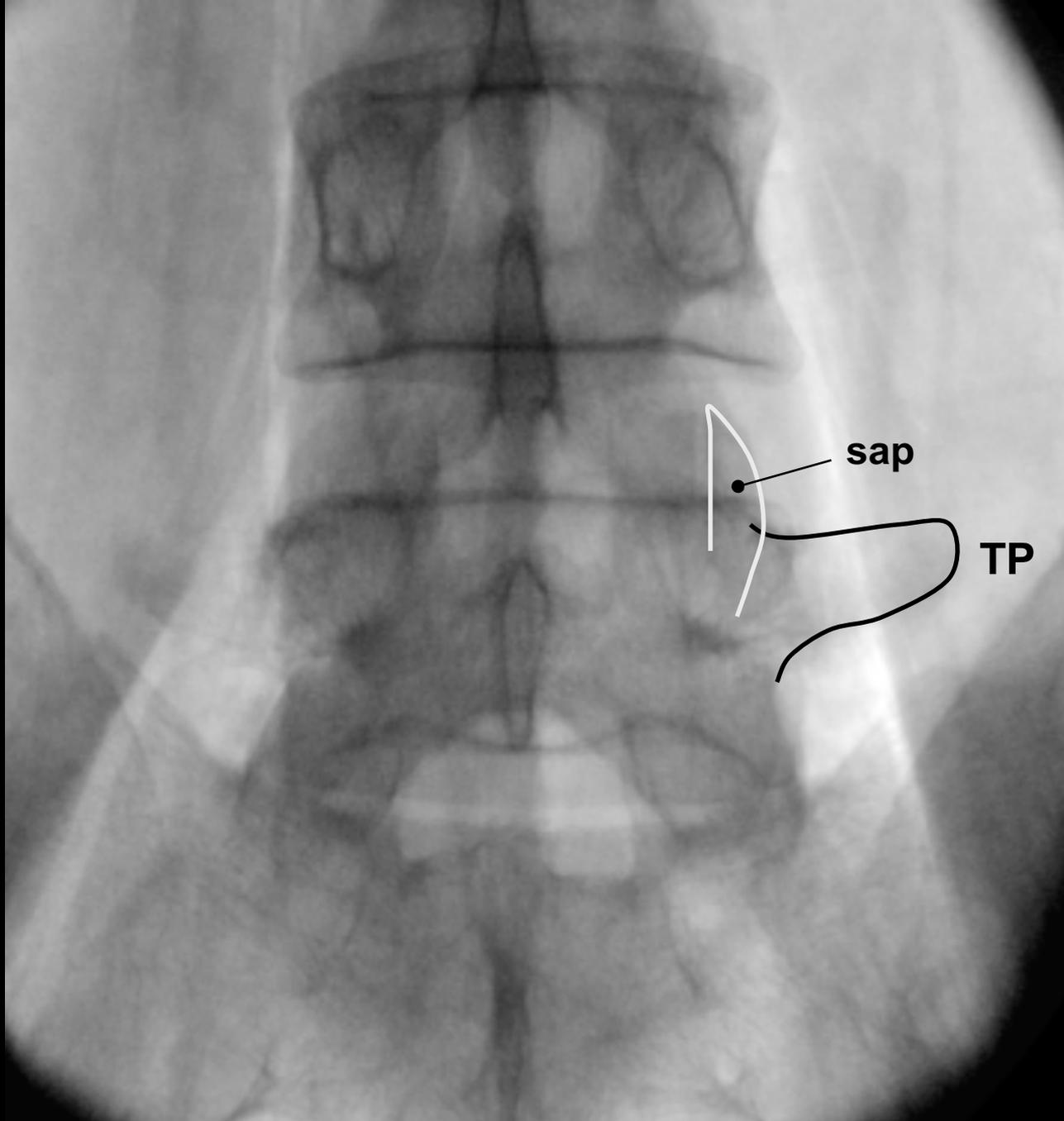
The **mamillary process** may not be evident. Even if and when evident, it is usually no more than an increased density, or an ovoid outline; but in either event it is located over the lower end of the superior articular process. Finding the mamillary process is not critical to the execution of medial branch neurotomy in a positive sense. However, it is important to appreciate where the mamillo-accessory ligament lies, for that is a site where electrodes should not go.



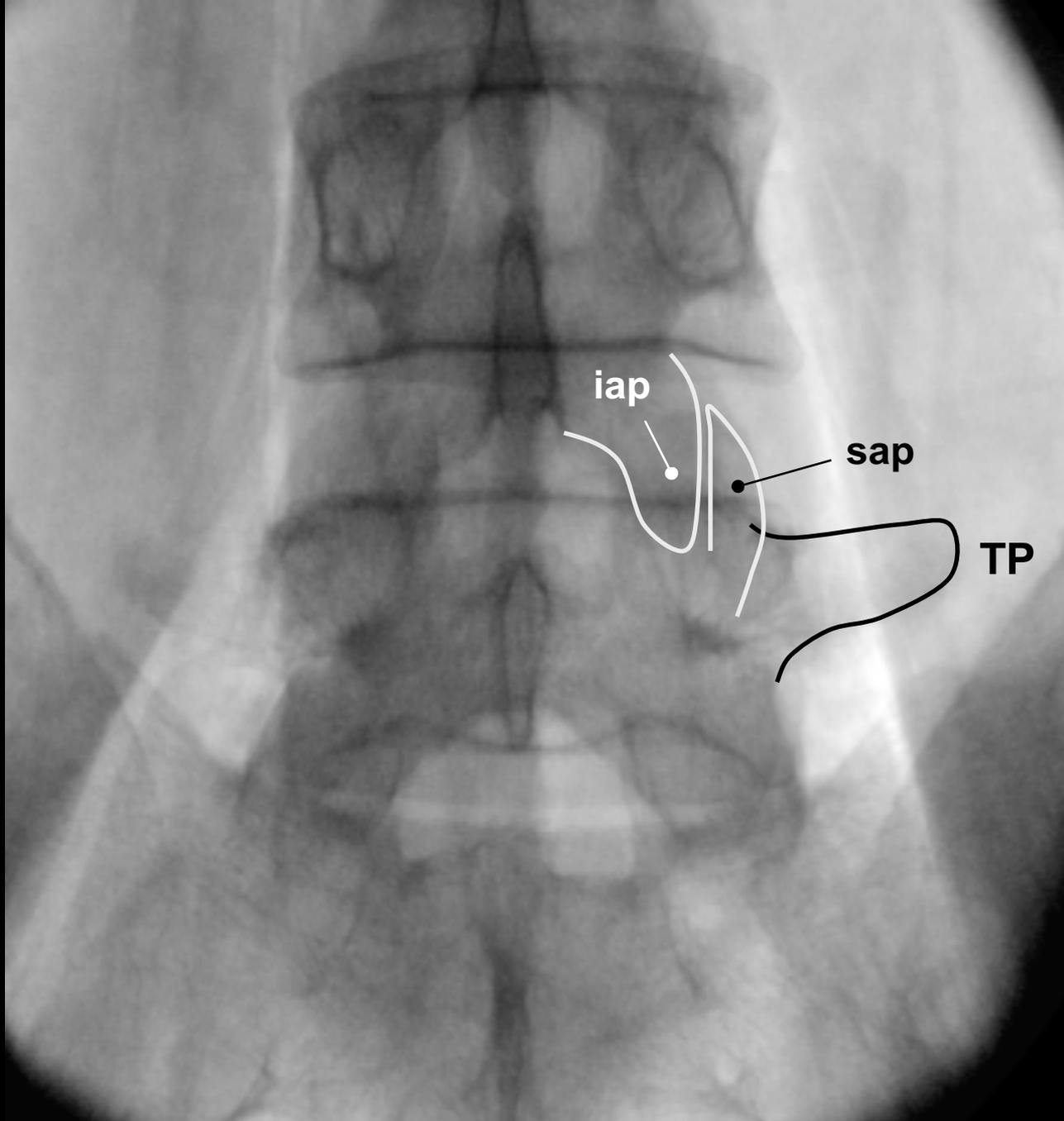
AP VIEW: L5 vertebra for L4 medial branch neurotomy



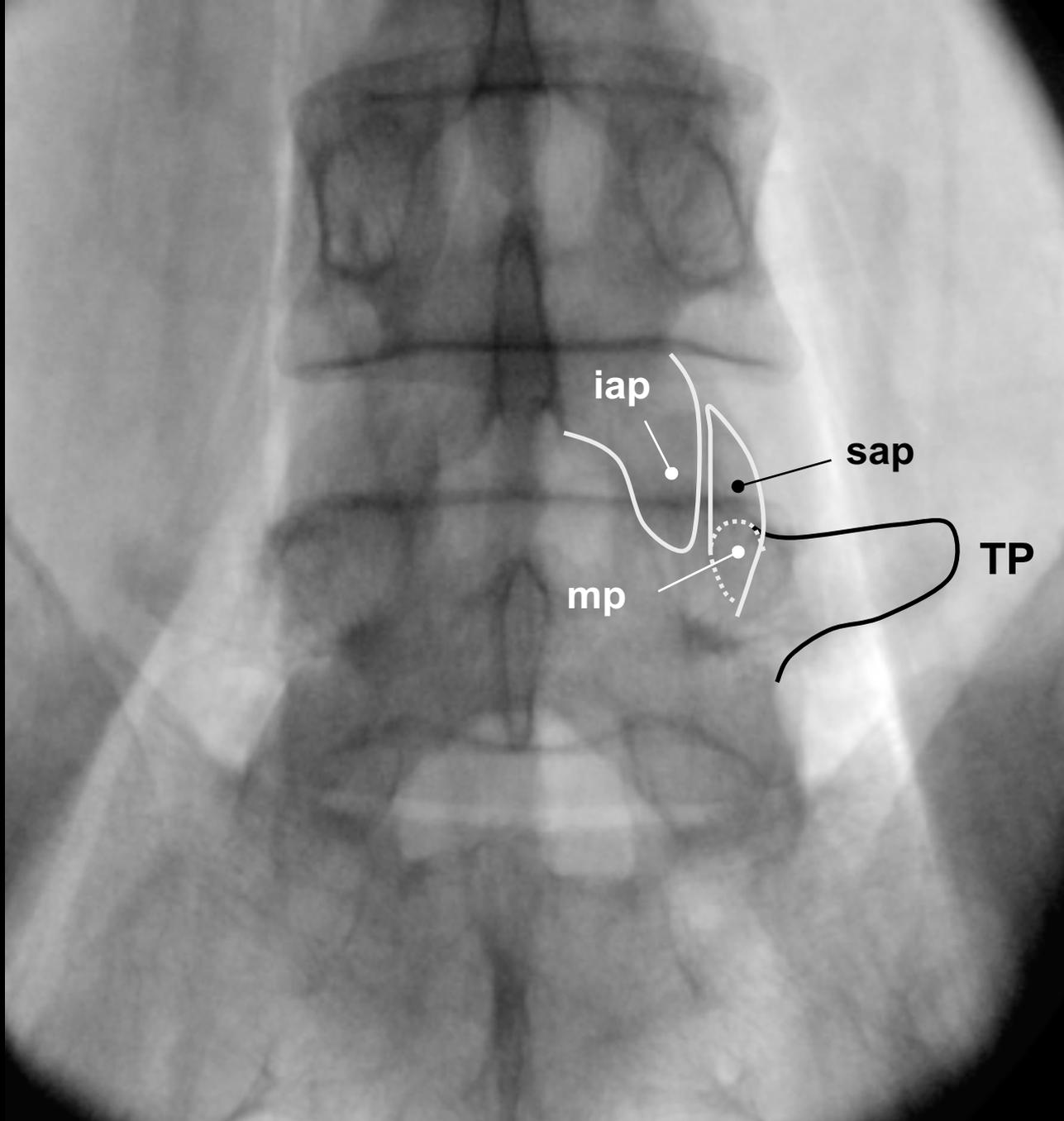
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