# Lumbar Medial Branch Radiofrequency Ablation (RFA)

# 10

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**Abstract**

The lumbar vertebrae are connected by the zygapophysial or facet joints posteriorly. As each nerve root exits the vertebral foramen it divides into ventral and dorsal rami. The dorsal ramus is further divided in the lateral, intermediate, and medial branches. From L1 to L4, each medial branch travels between the superior articular process and transverse process of the level below. For example, the L1 medial branch crosses the L2 superior articular process. The L5 medial branch is variable and so the L5 dorsal ramus is targeted.

Each medial branch innervates two facet joints, so a single nerve block affects two facet joints. Additionally, each facet joint is dually innervated by the medial branch at its level and the medial branch of the above vertebra, so to fully block one facet joint it is necessary to block the medial branch above and below that joint (Bogduk, Spine (Phila Pa 1976) 8(3):286–293, 1983). For example, blocking the L4/5 facet joint requires blocking the L3 and L4 medial branches.

Treating low back pain caused by lumbar medial branch nerve usually requires two positive diagnostic nerve blocks prior to pursuing more definitive by lumbar medial branch radiofrequency ablation due to potential for false positive diagnostic blocks (Manchukonda et al., J Spinal Disord Tech 20(7):539–545, 2007).

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**Keys to Procedure**

- Understand relevant lumbar spine anatomy and zygapophyseal joint innervation.
- Understand basics of radiofrequency lesioning.

## Anatomy Pearls

See Images 10.1 and 10.2.

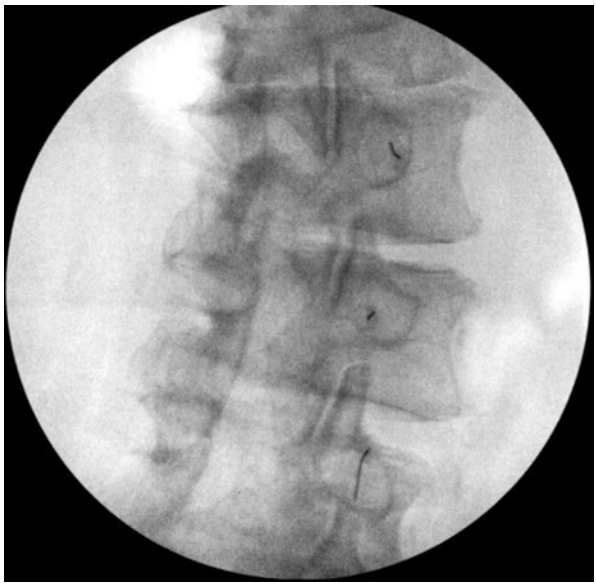

**Image 10.1** Oblique view: "Scotty Dog" with needles in position

**Image 10.2** Lateral view with RF needle cannulas in position

## What You Will Need

- Sterile towels.
- Half sheet drape.
- Chlorhexidine-based soap.
- RFA Generator that displays impedance, voltage, amperage, and temperature.
- Electrode grounding pad (connected to RFA Generator).
- RFA cannula with stylet × 3.
- Lidocaine 1% for skin—5–10 mL.
- Lidocaine 2%—2–3 mL.
- 25G 1.5″ needle for skin local.
- 18G 1.5″ needle to draw up medications.
- 5 mL syringe with 25G 1.5″ needle for skin local.
- 3 mL syringe for lidocaine 2%.
- Consider injecting bupivacaine 0.25% (1 mL) + methylprednisolone (40 mg) or dexamethasone (10 mg) split between three levels after RFA.
  - Will need 3 mL syringe.

## Patient Positioning

Prone with pillow under abdomen to flex thoracolumbar spine and minimize lumbar lordosis.

## How to Perform the Procedure

1. Sterilely prep over lumbar spine and drape with sterile towels and half sheet.
2. Obtain a true AP view of the lumbar spine and confirm the vertebral levels and side to be targeted.
3. Square off superior endplate corresponding to the vertebra at which the injection is being performed using caudad or cephalad tilt.
4. Oblique the C-arm intensifier 15–30° ipsilateral to the targeted side to form the "scotty dog" (Image 10.1) appearance to allow for proper visualization of the target point for L1–L4 medial branch nerves. For the L5 dorsal ramus keep the C-arm in AP position.

   If using conventional RF:
5. Introduce caudal tilt 20–25° (this is to assist with parallel placement of the RFA cannula to the medial branches).
   (a) Target for needle is the junction of the SAP and transverse process for L1–L4 medial branch nerves and sacral ala for the L5 medial branch nerve [1].

   *If using RF with cooled lesioning:*
6. Target for needle is the eye of the "scotty dog" (the pedicle) for L1–4 medial branch nerves and sacral ala for the L5 medial branch nerve.
7. Anesthetize the skin with Lidocaine 1%.
8. Insert the RFA cannula with stylet coaxial to the fluoroscopic beam and advance until bone/os is felt. Larger gauge RFA needles will produce a larger lesion size [2].
9. Repeat steps 3–6 for the subsequent lumbar medial branch nerves.
10. Obtain a lateral and AP fluoroscopic view to verify needle tips are in appropriate position.

    For Conventional RF:
    (a) AP view: The electrode tip should lay against the lateral surface of the SAP.
    (b) Lateral view: The electrode should cross the neck of the SAP and its active tip should be centered the middle two-quarters of the neck (Image 10.2).

    *For Cooled RF:*
    (a) *See chapter on lumbar medial branch block, the RF electrode position will be similar to the needle position used for lumbar MBB in AP and lateral views.*
11. After appropriate needle placement at the respective levels, remove the stylet and insert the thermal unit into the RFA cannula.

12. Assess impedance and perform sensory stimulation.
    (a) Patient should feel paresthesia only in their low back with 0.3–0.7 V at 50 Hz [3].
13. Perform motor stimulation.
    (a) Ensure no lower extremity muscle contractions elicited with 1.5–2 V at 2 Hz [3].
14. A multifidus muscle twitch can be expected as motor stimulation may stimulate the external motor branch of the lumbar medial branch nerve. Repeat sensory and motor stimulation for each subsequent level.
15. Administer 0.5 cc lidocaine 2% to anesthetize medial branch nerve prior to ablation.
    (a) Ensure no needle movement with needle manipulation for local anesthetic administration prior to proceeding with ablation.
    (b) Impedance levels will typically decrease following administration of local anesthetic (goal: less than 400–500 ohms) [3].

    If using Conventional RF:
16. Commence thermal ablation at 80 °C for 90 s at each level [1].

    *If using Cooled RF:*
17. Set following recommended parameters: Temperature: 60 °C and Time: 2 min and 30 s [2].
    (a) Initial 10–20 s typically most painful as probe heats up.
    (b) Pause ablation if pain not tolerable or radiating down leg and verify location of probes.
18. Remove needles, clean site, and place adhesive bandage.

**Pitt Pain Pearls and Pitfalls**

- The safest option is to provide local analgesia for procedure or mild sedation to allow for patient feedback during sensory and motor testing to ensure no injury to a spinal nerve or ventral ramus occurs.

## Check Points to Mastery

### Beginner

- Ability to obtain appropriate view for probe placement.
  - Square off endplates of target level.
  - Sufficient ipsilateral oblique tilt to obtain “scotty dog” view.
  - For conventional RF: (Obtain sufficient caudal tilt for parallel placement of probes to lumbar medial branch nerves).
- Identifying target for RF probe prior to placement (L1—L4: Conventional RF: the junction of the SAP and transverse process. Cooled RF: the eye of the “scotty dog” (the pedicle), L5: sacral ala).
- Ability to advance probe in a coaxial trajectory to the X-ray beam.

## Intermediate

- Determining which medial branches need to be targeted to denervate a specific zygapophyseal joint and identifying their anatomical location. For example, L3–L4 zygapophyseal joint is innervated by the L2 medial branch nerve (runs between the junction of the L3 SAP and TP) and L3 medial branch nerve (runs between the junction of the L4 SAP and TP) [4].
- Understanding the mamillo accessory ligament overlies a portion of the lumbar medial branches at the SAP and TP junction and may interfere with proper probe placement. Probe placement in an ipsilateral oblique view ("scotty dog" view) is thought to circumvent the ligament [1].

## Advanced

- Understanding RF lesion characteristics and how it is affected by parameters such as time, temperature, probe length [2].

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