Lumbar Radiofrequency Ablation

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Overview

- Evidence based indications
- Technique
- Contraindications
- Complications

Image: From Dr G Evans Teaching Files 2012
Indications

- 1- Pain relief after diagnostic medial branch blocks (best results if >80% relief with MBB vs studies that only used >50%)

- 2- May also be beneficial in patients that have had previous surgery, if the target sites remain accessible

- Anatomy Review: Each facet joint receives dual innervation from the medial branch at the same level and one level above the facet joint, so to denervate one joint you need to ablate 2 nerves

- Medial branches also innervate the multifidus muscle, the interspinous muscle and ligament, and the periosteum of the neural arch

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Technical Review of RFA

- High frequency alternating electric field (MHz)

- Objective is to deliver sufficient heating power to raise the temperature in neural tissue above the lethal range of 45-50°C

- Current concentrates in tissue around the exposed tip; vascularity, CSF, bone all work as heat sinks, with continuous RFA the generator varies output to maintain a set temperature

- Current density is less at the electrode tip than the sides; tissue heats up the electrode tip

- Lesion is therefore prolate spheroidal in shape and the exposed tip must be parallel to the nerve in order to get adequate coagulation

- Lesion size will not increase further after ~ 60 sec

- The lesion is directly proportional to the diameter of the electrode, lesions are generally 3-5 mm in diameter and the length of the exposed tip (20G = 0.9mm exposed tip at 85-90°C), lesions are generally ~ 2-3x the diameter of the electrode
• Target location is the lateral surface of the SAP just above its junction with the root of the TP

• This area may also be referred to as the “neck” of the SAP on lateral imaging

• The target nerve runs across this neck from the foramen, then hooks medially under the mamillo-accessory ligament
Technique

• Target area for RF lesions is the central 2/3rds, or 2/4ths of the neck

• Lesions that are made over the ventral 1/4 of the neck may coagulate the lateral or intermediate branches
Technique

- Lesions over the dorsal zone are likely to be ineffective as the nerve will likely be protected by the mamillo-accessory ligament.

- At the L5 dorsal ramus the mamillo-accessory ligament is vestigial, therefore is a longer target zone across the neck of the S1 SAP.
Technique

- It is essential that the electrode is placed parallel to the target nerve for an effective RFA.

- To do so, the needle should be inserted at 15-25 degrees oblique to the sagittal plane.

- This also allows the tip to reach around the neck of the SAP and is generally best accomplished by using a curved tip.
Technique

• A more sagittal approach may be used at L5

• In the average size patient a 100mm RFA needle with curved 10mm active tip will result in optimal RFA

• Insertion point should also be slightly caudal to the target point (~10-25 degrees) until the TP image narrows to become edge on and SAP well visualized arising from the TP

• This will ensure that the final position is optimally parallel to the target MB
Technique

• Once the x-ray is optimally positioned the needle should be inserted along the beam of the fluoroscope, to be seen edge on

• It is important to only freeze the skin and superficial tissues (not a tract of LA) so that sensory and motor testing will not be affected

• To avoid going to far the needle should be targeted to touch down at the junction of the SAP and TP, then walked off a few mm further to arrive at the appropriate depth
Technique

• An AP view should then be obtained to ensure the needle is directly abutting the lateral surface of the SAP

• Lateral imaging should then be done to assess depth along the neck of the SAP

• The uninsulated needle tip should never advanced to overlie any portion of the foramen, to avoid possible injury to the exiting spinal nerves
 Technique

• Sensory testing at 50Hz should illicit “buzzing or pressure sensation” in the appropriate MB distribution optimally at 0.3-0.5 V. (sensory alone is inadequate as it may be concordant if placed directly in the multifidus muscle)

• Motor testing at 5 Hz should not illicit any contraction of gluteus muscles or distal limb muscles at 3 times the sensory level.

• In Cohen’s 2007 study, optimal results were obtained when good multifidus muscle contractions were observed. (supported by other positive studies ie Dryfuss, Manejias)
Lesion

- Before RFA the target nerve should be blocked with ~0.5-1.0 cc of LA (ex 2-4% Lidocaine)

- RFA settings: 80-90C for 90 seconds

- After injection of LA, before RFA lesion needle position should be re-checked on lateral radiographs to ensure that the tip did not migrate toward the neural foramen
Lesion

- If more than one lesion is performed at a given level the needle tip must only be withdrawn from the position above (2-3 mm to provide overlapping lesions)

- If the lateral image is not clear, an oblique view may be used to further confirm that placement is optimal
Evidence

- Study by van Kleef et al (1999)
- RDB, 31 pts, LBP >12 mths, confirmed with diagnostic control blocks prior to RFA
- RF 80C for 60 sec, F/U 2,3,6 and 12 mths
- Success was >2 pt dec in VAS or >50% Global and Oswestry
- Higher improvement in RFA vs control short and long-term
- Negatives: used 0.75cc for MBB, did not check sensory

Evidence continued

- 15 pts with facet pain diagnosed by comparative LA blocks
- RFA and EMG of the multifidus muscle to determine accuracy
- 60% obtained at least 90% relief of pain at 12 mths and 87% at least 60% relief at 12 mths

Evidence continued

- Retrospective study, 20 pts, MBB used for initial diagnosis, RFA repeated as indicated
- Mean duration of relief was 10.5 mths, 2nd treatment effective in 85%
- Mean duration of relief of 11.6 mths

Evidence Continued

- Study by Manejias et al (2008)

- Patients with at least 50% pain reduction based on NRS scores

- Exclusion criteria: included pts with < 2 yrs follow-up time, radicular pain, radiologic evidence of a moderate to severe disc protrusion, and a positive discogram

- Positive multifidus contraction prior to RFA

- Of the subjects, 52% reported a NASS (North American Spine Society) four-point satisfaction index of 1 or 2 and demonstrated a 30% decrease in the RMDQ (Roland–Morris Disability Questionnaire)
Evidence Continued

- Gofeld et al. (2007) conducted a prospective audit of 174 patients with complaints of LBP for more than 6 mths

- Patients were asked to estimate total perceived pain reduction (on a scale from 0% to 100%) at 6 weeks and at 6, 12, and 24 mths

- Fifty-five reported no benefit from the procedure and 119 reported good (>50%) to excellent (> 80%) pain relief lasting from 6 - 24 months.

- This study is limited by use of subjective outcome measurements

Negative Studies

- King and Lagger (1976), no diagnostic blocks done prior to RFA, also likely included pts with sciatica, no sensory stimulation, RFA not parallel to the nerve...

- Leclaire et al (2001), main inclusion criteria inappropriate: “significant pain relief lasting 24 h” after an intra-articular injection of lidocaine and steroid, RFA not parallel

- Gallagher et al (1994), did not define “good” or “equivocal” response to diagnostic injections, electrode not placed parallel to nerve

- Sanders and Zuurmond (1999), used 1 cc for diagnostic MBB
Contraindications

• Evidence of an untreated infection (systemic or at injection site)
• Bleeding diathesis
• Indeterminate diagnostic MBB
• Pregnancy
• Anti-coagulated patients
• Patient psychologically or medically unstable
Relative Contraindications

- Patients with Pacemakers or ICD’s (Consult EP for reprogramming/use of magnet)
- Significant respiratory or cardiovascular disease that will ability to tolerate the procedure or light sedation
- Immunosuppression
- Unrealistic expectations, poor relief < 3 mths with previous RFA
- Uncooperative patients that are not able to tolerate the procedure or increased pain in the initial post-op period
Complications

• Numbness and/or dysesthesias have been reported after RFA but tend to be transient and self-limiting.

• Burns are rare and may result from electrical faults, insulation breaks in the electrodes, and generator malfunction.

• The most common complication after facet joint RFA is neuritis, with a reported incidence of < 5%.
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