Lumbar Medial Branch Neurotomy Using a Nimbus Multi-tined Expandable Electrode
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Background
Radiofrequency (RF) ablation has been effectively used to interrupt nociception arising from various spinal pain generators. Anatomic variation in the targeted neural pathways and suboptimal electrode placement may result in technical failure and poor patient outcomes. Intuitively, larger lesions mean a larger tolerance for both errors in electrode placement as well as the inevitable variation in the anatomic position of target nerves. A novel multitined expandable RF electrode was developed to create an elongated spheroid lesion offset from the central axis toward tines 8-10 mm in diameter. Initial case report with follow-up EMG of the multifidus is presented.

Methods
Following informed consent, a 47-year-old male with lumbar zygapophyseal joint pain (R L4/5) was treated. Using posterior oblique fluoroscopic guidance the RF electrode was advanced “down the beam” to the mid base of the right L4 superior articular pillar (SAP). The tines were then deployed medially toward the base of the SAP into the groove containing the L3 medial branch nerve. Placement was confirmed with multiplanar fluoroscopy, and neurostimulation at 2 Hz, and 50 Hz. A Radionics RFG 3C RF generator was ramped to 75° C for 80 seconds total lesion. Procedure was repeated at L5 (L4 MB). Impedances were < 250 ohms and power levels remained < 10 watts. EMG of the L3-L5 lumbar multifidi was obtained at 20 days post-procedure.

Results
30-day follow-up revealed an uncomplicated recovery and resolution of z-joint related pain. EMG demonstrated electrodiagnostic evidence of active and acute denervation of the right lumbar paraspinals at the L4, and L5 levels. Ipsilateral L3 and contralateral levels appeared normal. At 9 month follow-up pain had not returned.

Conclusion
A novel RF electrode using dual deployable tines for electrical field diffusion produces desired lumbar medial branch neurotomy via a simplified (down-the-beam) single lesion technique. This is the first description of a multitined expandable electrode designed for use in spinal RF procedures. We believe this device construct can be readily adapted to various ablation targets including; cervical, thoracic, and lumbar z-joints, the sacroiliac joint, and various targets along the sympathetically innervated chain. The unique design of the electrode and the resulting geometry of the tissue lesion are uniquely suited to technically simple, safe, consistent, effective and efficient interruption of nociceptive pathways.

Electrode Positioned for Lumbar Medial Branch Neurotomy

EMG of the Segmental Multifidus

**History:** s/p right lumbar radiofrequency rhizotomy approximately 20 days ago. Limited EMG exam completed today to evaluate for denervation.

**Paraspinal EMG**

<table>
<thead>
<tr>
<th>Side</th>
<th>Muscle</th>
<th>Nerve</th>
<th>Root</th>
<th>Ins Act</th>
<th>Fibs</th>
<th>PSW</th>
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<tbody>
<tr>
<td>Left</td>
<td>L3 Parasp</td>
<td>Rami</td>
<td>L3</td>
<td>Nml</td>
<td>Nml</td>
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<tr>
<td>Left</td>
<td>L4 Parasp</td>
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<td>Left</td>
<td>L5 Parasp</td>
<td>Rami</td>
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<td>Right</td>
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* Needle evaluation of the right L4 paraspinal and right L5 paraspinal muscles showed increased insertional activity and slightly increased spontaneous activity.
* All remaining muscles (as indicated in the preceding table) showed no evidence of electrical instability.

**Impression:** There is electrodiagnostic evidence of active and acute denervation of the right lumbar paraspinals at the L4 and L5 levels. The contralateral left-sided paraspinals appeared normal. These findings are consistent with the clinical history of recent right lumbar radiofrequency rhizotomy.

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Selected Bibliography


12. Rimantas Barauskas, Antanas Gulbinas1, Giedrius Barauskas Investigation of radiofrequency ablation process in liver tissue by finite element modeling and experiment Medicina (Kaunas) 2007; 43(4)