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A Basic Approach to Lumbar Zygapophyseal Joint Disease: New Technology for Treatment, but does it Improve Outcomes?

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Low back pain (LBP) affects 80% of people at some point during their lifetime. LBP may be classified by the duration of symptoms [1], as acute (less than 4 weeks), sub acute (4-12 weeks), or chronic (more than 12 weeks). Chronic low back pain is the most common cause of job-related disability, a leading contributor to absenteeism in the workplace (2nd only to headaches) in the United States [2].

Many anatomic structures have been described as possible sources of chronic LBP, including the posterior longitudinal ligament, dorsal root ganglia, dura, annular fibers, muscles of the lumbar spine, and lumbar zygapophyseal (ZP) joint (facet joints). Of particular interest is the ZP joint. A ZP joint is a synovial joint between the superior articular process of one vertebra and the inferior articular process of the vertebra directly above it. There are two facet joints in each spinal motion segment.

The biomechanical function of each pair of ZP joints is to guide and limit movement of the spinal motion segment. In the lumbar spine, it functions to protect the motion segment from anterior shear forces, excessive rotation and flexion, and sustain minimal influence on the range of side bending.

The medial branch nerve branches from the dorsal primary ramus at the level of the intervertebral disc. It supplies innervations to the ZP joint. The proximal branch of the nerve ascends to innervate the joint from the caudal aspect. The medial descending branch continues distally to innervate the superior and medial aspects of the joint below. The functions of the ZP joint may be disrupted by degeneration, dislocation, fracture, injury, instability from trauma, osteoarthritis, and surgery.

Lumbar ZP joint disease, a source of LBP, dates back to 1911 [3], when it was first described by Goldwaith. In 1933, facet syndrome was described [4]. Based on pathomorphologic studies of the joint, facet joint disease as the cause of LBP was described in 1941. In 1974, the first technique for treatment was developed which theorized the denervation of the facet joint could alleviate the pain generated from this site.

Lumbar ZP joint disease is a challenging condition affecting up to 15% of patients with chronic LBP. The onset of lumbar facet joint pain is usually insidious, with predisposing factors including spondylolisthesis, degenerative disc pathology, and old age.

The diagnosis of lumbar ZP joint disease may be made noninvasively by physical examination; advanced imaging such as Magnetic resonance imaging (MRI) or computed tomography (CT) scan may be used for confirmation in an effort to rule out other conditions. There are various treatment modalities for ZP joint related pain. Conservative treatments include Nonsteroidal anti-inflammatory drugs (NSAIDS), and physical therapy with correction of posture and biomechanics. After conservative methods have been attempted for 4 to 6 weeks, an invasive technique may be performed. Some of these invasive techniques include ZP joint injections, lumbar medial branch nerve blocks, and radiofrequency (RF) neurotomy [5].

The most accepted invasive method for diagnosis is with low-volume intra-articular or medial nerve branch blocks. Standard treatments include intra-articular steroid injections and RF denervation of the medial branches innervating the joints.

RF ablation is designed to destroy the *medial branch nerve* that affects the nerves carrying pain from the facet joints. These nerves do not control any muscles or sensation in the legs so there is theoretically no danger of negatively affecting neurological function in the lower extremities. The medial branch nerves do control small muscles in the back, but loss of these nerves has not proven harmful.

A modern RF system consists of temperature display, impedance monitor, stimulator, and lesion generator. The generator is a source of voltage to the active (lesion) electrode. A reference electrode placed on the body completes a circuit. An electrical field is established within the body between the two electrodes [6]. RF voltage creates an electrical field around the tip of the lesion probe. Tissue around the tip is heated at low frequency; lesioning is a primarily ionic electrical field that oscillates with alternating RF current, causing movement of ions in the tissue. Heat is produced by friction due to the motion from the ionic current. Cell death occurs by thermal coagulation necrosis-a result of tissue heating. Cell homeostasis is maintained at 40°C; a temperature between 60 to 100°C causes near instantaneous induction of protein coagulation. Temperature is the fundamental determinant of lesion size and must be monitored. Success rates vary, but typically about 30% to 50% have pain relief. The nerves are usually blocked for 6 to 9 months, although relief may last as short as 3 months or 18 months or longer.

Recently, Baylis Medical developed LumbarCool™ Pain Management System for RF lesioning in lumbar medial branch neurotomy [7]. The LumbarCool™ Pain Management System uses the cooled-RF platform for lesioning lumbar medial branch nerves. It creates a large-volume, anatomy-specific lesion to encompass the groove at the base of the superior articular process [8]. The approach is similar and consistent with the medial branch block technique. It offers an alternative approach to placement with the active tip perpendicular to the target nerve.

The LumbarCool™ also has a unique probe that has internal cooling [9]. Internally, the water-cooled RF probe allows for the creation of large-volume, spherical lesions. Cooling maintains the desired temperature at all times, while eliminating tissue charring at the probe tip. A radiopaque marker is located at the proximal end of the active tip. This marker defines the lesion location under fluoroscopy,

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confirming position and enhancing visualization. The temperature sensor at the end of the probe tip ensures an appropriate thermal gradient in the target tissue.

The LumbarCool™ probe creates large volume, spherical lesions that effectively encompass the known running course of the medial branch nerve, and can increase the likelihood of causing destruction of these nerves. In our university hospital-based practice, this probe has been utilized, with good success and no complications thus far. The technical skills were not particularly challenging to learn, and the time to perform the procedure is less than that with the standard RF.

Our overall experience has been favorable with the LumbarCool™ technology for lumbar medial branch nerve neurotomy, but this device is not without concerns. Of these is the expense of the probes [10]. A disposable probe costs around $750 per probe. Another concern is the size of the lesion and the possibility of damage to the lumbar spinal nerves. This is particularly concerning because there have been no studies to determine the efficacy or safety. With all new technology there are potential benefits, but clinicians must be cautious of embracing new technology without strong scientific research and evidence based medicine.

References

1. Cypress BK (1991) Characteristics of physician visits for back symptoms: a national perspective. Am J Public Health 12: 141-156.
2. Ghormley RK (1933) Low back pain with special reference to the articular facets with presentation of an operative procedure. JAMA 101: 1773-1777.
3. Goldthwait JE (1911) The lumbosacral articulation: an explanation of many cases of lumbao, sciatica, and paraplegia. Boston Med Surg J 164: 365-372.
4. Clemans RR, Benzon HT (2005) Facet Syndrome: Facet Joint Injections and Facet Nerve Blocks. In Benzon HT et al: Essentials of Pain Medicine and Regional Anesthesia. 2edn, Elsevier, Philadelphia, 348-356.
5. Calodney AK (2008) Lumbar Facet Joint Blocks and Neurotomy. In Raj PP et al: Interventional Pain Management-Image Guided Procedures. (2nd edn), Saunders, Philadelphia.
6. Hammer M, Noe CE, Racz GB (2008) Joint Blocks of the Head and Neck. In Raj PP et al: Interventional Pain Management-Image Guided Procedures. (2nd edn), Saunders, Philadelphia.
7. Boswell MV, Colson JD, Spillane WF (2005) Therapeutic facet joint interventions in chronic spinal pain: a systematic review of effectiveness and complications. Pain Physician 8: 101-114.
8. Netter FH (1999) Atlas of Human Anatomy. (2nd edn), Novartis, East Hanover.
9. Lorentzen T (1996) A cooled needle electrode for radiofrequency tissue ablation thermodynamic aspects of improved performance compared with conventional needle design. Acad Radiol 3: 556-563.
10. Kaplan M, Dreyfuss P, Halbrook B, Bogduk N (1998) The ability of lumbar medial branch blocks to anesthetize the zygapophysialjoint. Spine 23: 1847-1852.