Review Article

Interventional pain management procedure for treating low back pain: anaesthesiologists should come forward

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Introduction

Although the variety of specialists caring for patients with chronic pain is broad, anesthesiology is the speciality that represents the majority of physicians who use interventional approaches in the treatment of low back pain. Anesthesiologists who consider themselves as interventional pain management specialists agree that the spectrum varies widely from those who use only epidural steroid injections in a recovery room setting to those who are fellowship-trained and exclusively provide image-guided spine intervention.

Training and skill level among such anesthesiologists vary widely, mainly because until recently, no common comprehensive standards or guidelines existed for interventional pain management physicians. This situation changed in 2001 as the result of the establishment of guidelines set forth by the American Society of Interventional Pain Physicians[1] and more comprehensive practice guidelines recently published by the International Spine Intervention Society (ISIS).[2] As these standards become more commonplace in this specialty, the gap of varied skill levels and training will narrow with the expectation of improved outcomes based on randomized control trials that are ongoing to further delineate more accurate guidelines for each specific procedure.

Image-guided spine intervention is used primarily for its precise diagnostic capabilities. This article reviews basic principles of the more common image-guided diagnostic techniques specifically as they relate to patients with low back pain. It also includes discussion of advanced modes of therapy, including spinal cord stimulation and intrathecal therapy, providing primary care physicians with an understanding of the primary indications for these therapeutic modalities.

Low Back Pain

Low back pain is a major health and socio-economic problem throughout the world. The lifetime prevalence has been estimated at anything between 59% to 90%[3]. In any one year, the incidence of back pain is reported to be ~5% of the population.[3] Though we have no definite data in Bangladesh but incidence is quite high. The symptomatology of LBP is nonspecific with many possible etiologies. The lumbar spine is a complex structure, and for many years, treatment of patients with LBP was based on speculation. Limited understanding of lumbar spine anatomy, specifically neuroanatomy, and a lack of knowledge of functional anatomy contributed to this approach to treatment. The concept of precisely diagnosing a potential anatomic structure responsible for generating LBP rests on the idea that for a structure to be a source of pain, it must have a nerve supply. Hence, a diagnostic nerve block can be administered to test this hypothesis.[4] Based on several studies by Schwarzer et al,[5-9] Bogduk[10] postulated that precision diagnostic injections can assist in formulating a specific diagnosis in 70% to 80% of those who suffer from LBP.

With respect to the relative contributions of various structures in chronic LBP, Manchikanti et al[11] evaluated 120 patients with a chief complaint of LBP by administering precision diagnostic

injections. These injections targeted facet joints via medial branch blocks, intervertebral discs via provocation discography, and sacroiliac joints (SIJs) via intra-articular injections. They concluded that the facet joint contributed to chronic LBP in 40% of the population, the intervertebral disc in 26%, and the SIJ in 27%. Anecdotal experience among physicians at Advanced Pain Consultants PA, in Voorhees, NJ, indicates that the intervertebral disc is the more frequent significant source of chronic LBP than are lumbar facet joints.

Facet Joint Pain

Osteoarthritis and trauma are among the most common conditions leading to pain emanating from facet joints. The primary symptom of pain emanating from this site is that of LBP. By injecting a solution of 10% hypertonic saline solution in the region of the facet joints, Hirsch and colleagues[12] demonstrated that pain can be created in the upper back and thigh regions. Pain frequently is also referred into the groin, buttocks, hip, or lateral and posterior thigh regions (or a combination of these sites). Pain is often described as a "deep, dull ache" and may be either unilateral or bilateral. On physical examination, there may frequently be increased pain with extension, tenderness to palpation over the affected joints, and normal findings on neurologic examination. Electrical stimulation of the medial branch nerves has also assisted in identifying referral pain patterns.[13]

Facet joint injections or medial branch nerve blocks are primarily diagnostic tools. An intra-articular facet injection usually includes use of a steroid such as methylprednisolone, which theoretically reduces inflammation within the joint, thereby potentially reducing pain. However, injecting steroid into the facet joint does not usually provide lasting relief. Dreyfuss et al[14] have demonstrated that clinically significant and prolonged relief from back pain can be achieved with radiofrequency neurotomy of the lumbar medial branches. Patients' pain must be carefully diagnosed with controlled diagnostic blocks of the lumbar medial branches.

Sacroiliac Joint Pain

There is no scientific evidence that history or physical examination can accurately identify the SIJ as a source of pain, controlled intra-articular injections are the only available means of identifying this site as causing such discomfort.[15,16] Because innervation of the SIJ is poorly defined and most likely complex, pain emanating from here cannot be diagnosed using nerve blocks. Intra-articular injection of a local anesthetic (e.g. lidocaine or bupivacaine hydrochloride) into the SIJ is the technique of choice used to prove or disprove that it is the etiologic factor.

Discogenic Pain

Provocation discography involves injection of contrast medium into the disc nucleus to define its morphology; this increase in intradiscal pressure allows simultaneous evaluation of the patient's response to pain reproduction. Therefore, provocation discography can determine if this anatomic location is a pain source. It is based on the concept that if a particular disc is the source of pain, stressing it should result in reproduction of that pain. Furthermore, if the disc is not the source of pain, then when stressed, it should either not cause pain or it may produce pain that is atypical (disconcordant) of the underlying pain. Immediately following provocation discography, computed tomography (CT) scanning is done to obtain a static axial view of the intervertebral disc to evaluate the degree of annular disruption. Sachs et al[17] developed the Dallas discogram scale, which grades disruption of the annulus on a four-point scale. A normal nucleogram, one in which contrast is entirely contained within the nucleus, is considered a grade 0 disc. Grades 1 to 3 describe extension of the contrast medium to the inner third, middle third, and outer third of the annulus fibrosis, respectively. Examples include a posterior radial fissure at L4–5 with contrast extravasating into the anterior epidural space and a grade 3 posterolateral annular disruption on the postdiscography CT scan.

Ozone disc nucleolysis and epidural steroid

Outcome studies of lumber disc surgeries document a success rate between 49% to 95%.[18] Reasons for this failure are: 1) dural fibrosis, 2) arachnoidal adhesions, 3)muscle & fascial fibrosis 4) mechanical instability resulting from the partial removal of bony and ligamentous structures required for surgical exposure and decompression leading to facet & sacro-iliac joint dysfunctions, 5)

radiculopathy, 6)recurrent disc herniation.[19-21] There has been surge of interest in search of safer alternative method of decompressing the nerve roots maintaining the structural stability. Undoubtedly, the epidural steroid injection [ESI] is the precursor of the more specific spinal injection procedures done today and the most familiar to primary care physicians. Epidural steroid injection, transforaminal epidural procedures has a high success rate (up to 84%) but chances of recurrences are also high.[22-24] Chemonucleolysis using chymopapain has moderate success rate (approximately 66% at one year).[25, 26] It has also the chances of anaphylaxis following intradiscal chymopapain injection. Injection of ozone for discogenic radiculopathy (low back pain with radiation to legs) has developed as an alternative to chemonucleolysis and disc surgery popularly called ozone therapy for slip disc. Owing to its high success rate, less invasiveness, fewer chances of recurrences and remarkably fewer side effects ozone therapy for slip disc is becoming very popular.[27-29]

How does ozone therapy work? The action of ozone therapy is due to the active oxygen atom liberated from breaking down of ozone molecule. When ozone is injected into the disc the active oxygen atom called the singlet oxygen or the free radicle attaches with the proteo-glycan bridges in the jelly-like material or nucleus pulposus. They are broken down and they no longer capable of holding water. As a result disc shrinks and mummified and there is decompression of nerve roots.

Radio frequency procedures

Different radio frequency procedures are essential in pain management. It is the best form of treatment for trigeminal neuralgia, different types of cancer pain and spinal pain including low back and neck pain.

There are two types of Radio Frequency pain management procedures. The older one is Conventional Radio Frequency where heat is generated which is producing the lesion and stopping the pain signal. The newer one is Pulsed Radio Frequency where a strong electro-magnetic field is produced around the nerve which is stopping the pain signal. Here the normal function of nerve is maintained and only abnormal pain is stopped.

Advanced Therapies

Spinal cord stimulation and intrathecal therapy are advanced therapeutic modalities used for treating patients with chronic intractable pain. They are essentially reserved for patients in whom continuing pain is not the symptom, but rather the disease. Together, these modalities consist of technology that is considered "neuromodulatory."

Vertebroplasty may be used for patients with vertebral compression fractures due to osteoporosis, metastatic tumors, or benign tumors such as vertebral heamangiomas. Patients with metastasis and myeloma usually experience severe pain and disability.

Vertebroplasty is performed to provide pain relief and to produce bone strengthening and vertebral stabilization when the lesion threatens the stability of the spine.

Conclusion

Low back pain usually is self-limiting, but when it persists and is unresponsive to rehabilitation and analgesics, precise determination of the source of pain becomes key to planning proper treatment. Patients with LBP may demonstrate varied clinical scenarios, none of which, unfortunately, helps in determining the exact source of the pain. A precise spinal diagnostic evaluation can identify the correct anatomic site of such discomfort in most patients. Different interventional pain management procedure is to be applied to treat this group of patients. Definitely success depends on skill of interventionist. Though blind epidural steroid injection is practiced for LBP by our interventionist as common therapeutic procedure but use of image-guided procedures would be practiced for better outcome. Anaesthesiologists should come forward to take proper role in managing such type of patients after taking proper knowledge on anatomical, pathological and image tecqnique.

References

1. Manchikanti L, Singh V, Pampati V, Damron KS, Barnhill RC, Beyer C, et al. Interventional techniques in the management of chronic pain: part 2.0. *Pain Physician.*2001; 4:24 -96
2. Bogduk N, ed. *Practice Guidelines for Spinal Diagnostic and Treatment Procedures.* San Francisco, Calif: International Spine Intervention Society; 2004

3. Lawrence RC, Helmick CG, Arnett FC, Deyo RA, Felson DT, Giannini EH, et al. Estimates of the prevalence of arthritis and selected musculoskeletal disorders in the United States. *Arthritis Rheum*. 1998;41:778 -799

4. Schwarzer AC, Aprill CN, Derby R, Fortin J, Kine G, Bogduk N. The prevalence and clinical features of internal disc disruption in patients with chronic low back pain. *Spine*.1995; 20:1878 -1883

5. Schwarzer AC, Aprill CN, Derby R, Fortin J, Kine G, Boduk N. The relative contributions of the disc and zygapophyseal joints in chronic low back pain. *Spine*.1994; 19:801 -806

6. Schwarzer AC, Aprill CN, Derby R, Fortin J, Kine G, Boduk N. Clinical features of patients with pain stemming from the lumbar zygapophyseal joints. Is the lumbar facet syndrome a clinical entity? *Spine*. 1994;19:1132 -1137

7. Schwarzer AC, Derby R, Aprill CN, Fortin J, Kine G, Boduk N. The value of provocation response in lumbar zygapophyseal joint injections. *Clin J Pain*.1994; 10:309 -313

8. Schwarzer AC, Wang SC, Bogduk N, McNaught PJ, Laurent R. Prevalence and clinical features of lumbar zygapophyseal joint pain: a study in an Australian population with chronic low back pain. *Am Rheum Dis*. 1995;54:100 -106

9. Schwarzer AC, Aprill CN, Bogduk N. The sacroiliac joint in chronic low back pain. *Spine*.1995; 20:31 -37

10. Bogduk N. Musculoskeletal pain: toward precision diagnosis. Progress in pain research and management. In: Jensen TS, Turner JA, Wiesenfeld-Hallin Z, eds. *Proceedings of the 8th World Congress on Pain*. Seattle, Wash: IASP Press; 1997:507 -525.

11. Manchikanti L, Singh V, Pampati V, Damron KS, Barnhill RC, Beyer C, et al. Evaluation of the relative contributions of various structures in chronic low back pain. *Pain Physician*.2001; 4:308 -316

12. Hirsch D, Inglemark B, Miller M. The anatomical basis for low back pain. Studies on the presence of sensory nerve endings in ligamentous, capsular and intervertebral disc structures in the human lumbar spine. *Acta Orthop Scand*.1963; 33:1 -17

13. Windsor RE, King FJ, Roman SJ, Tata NS, Cone-Sullivan A, Thampi S, et al. Electrical stimulation induced lumbar medial branch referral patterns. *Pain Physician*.2002; 5:347 -354

14. Dreyfuss P, Halbrook B, Pauza K, Joshi A, McLarty J, Bogduk N. Efficacy and validity of radiofrequency neurotomy for chronic lumbar zygapophysial joint pain. *Spine*.2000; 25:1270 -1277

15. Bogduk N, ed. Sacroiliac joint blocks. In: *Practice Guidelines for Spinal Diagnostic and Treatment Procedures*. San Francisco, Calif: International Spine Intervention Society; 2004:66 -85

16. Slipman CW, Whyte WS, Chow DW, Chou L, Lenrow D, Ellen M. Sacroiliac joint syndrome. *Pain Physician*.2001; 4(2):143 -152

17. Sachs BL, Vanharanta H, Spivey MA, Guyer RD, Videman T, Rashbaum RF, et al. Dallas discogram description: a new classification of CT/discography in low-back disorders. *Spine*.1987; 12:287 -294

18. Vijay S. Kumar: Total clinical and radiological resolution of acute, massive lumber disc prolapse by ozonucleolysis. Rivista Italiana di Ossigeno-ozonoterapia 4: 2005

19. Shah RV, Everett CR, McKenzie-Brown AM, Sehgal N. Discography as a diagnostic test for spinal pain: A systematic and narrative review. Pain Physician 2005; 8:187-209

20. Schofferman J, Reynolds J, Herzog R, Covington E, Dreyfuss P, O'Neill C. Failed back surgery: etiology and diagnostic evaluation. Spine J 2003; 3:400-403. 5. Slipman CW, Shin CH, Patel RK, Isaac Z, Huston CW, Lipetz JS, Lenrow DA, Braverman DL, Vresilovic EJ Jr. Etiologies of failed back surgery syndrome. Pain Med 2002; 3:200-214

21. Vad VB, Bhat AL, Lutz GE, Cammisa F. Transforaminal epidural steroid injections in lumbosacral radiculopathy; A prospective randomized study. Spine

22. Riew KD, Park JB, Cho YS, Gilula L, Patel A, Lenke LG, Bridwell KH. Nerve root blocks in the treatment of lumbar radicular pain. A minimum five-year followup. J Bone Joint Surg Am 2006; 88:1722-1725

23. Ng LC, Sell P. Outcomes of a prospective cohort study on peri-radicular infiltration for radicular pain in patients with lumbar disc herniation and spinal stenosis. Eur Spine J 2004; 13:325-329

24. Krugluger J, Knahr K. Chemonucleolysis and automated percutaneous discectomy–a prospective randomized comparison. Int Orthop 2000; 24:167-169.

25. Revel M, Payan C, Vallee C, Laredo JD, Lassale B, Roux C, Carter H, Salomon C, Delmas E, Roucoules J. Automated percutaneous lumbar discectomy versus chemonucleolysis in the treatment of sciatica. A randomized multicenter trial. Spine 1993; 18:1-7

26. Muto M, Andreula C, Leonardi M Treatment of herniated lumbar disc by intradiscal and intraforaminal oxygen-ozone (O2-O3) injection. J Neuroradiol. 2004; 31: 183-9

27. Lehnert T, Mundackatharappel S, Schwarz W, Bisdas S, Wetter A, Herzog C, Balzer JO, Mack MG, Vogl TJ. Nucleolysis in the herniated disk. Radiologe. 2006 May 13

28. Buric J, Molino Lova R. Ozone chemo-nucleolysis in non-contained lumbar disc herniations: a pilot study with 12 months follow-up. Acta Neurochir Suppl. 2005;92: 93-7

29. Andreula CF, Simonetti L, De Santis Fet al: Minimally invasive oxygen ozone therapy for lumber disc herniation. American Journal of Neuroradiology 2003; 24: 996-1000