

Indications for Spinal Injections in the Chronic Pain Patient

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ABSTRACT

The aim of this paper is to understand the complexity and variety of options available to the fully trained interventional pain physician in regards to spinal injection for chronic pain patients. This paper reviews and summarizes indications for some of the more common injection procedures in the cervical, thoracic, lumbar, and sacral regions. Therapeutic and diagnostic injections are discussed as well as selected interventional, nonsurgical, treatment options. Procedures and injections around and into spinal column structures are the mainstay of the medical specialty Interventional Pain Management. These precise and selective procedures require specific and intensive training over and above that afforded in the majority of the primary residencies and fellowship programs. Well-planned, physician expert instructed and proctored cadaver training along with physician review and procedure practice guidance are required for safe performance of the procedures.

Key Words. Spinal Injection; Epidural; Transforaminal; Sacroiliac; Discography; Radiofrequency; Neurotomy; Cervicogenic; Atlantoaxial; Occipital–Atlanto; Headache; Sympathetic

There is no more thrilling adventure than to alleviate pain, no greater pleasure than to restore health.

(Heschel, 1964) [1]

When discussing indications for any medical procedure, one must start with the patient, consider the objective, and define current appropriate medical practice. Interventional pain management, or more precisely, nonsurgical spine intervention, requires us to be physicians, not merely procedural technicians. Frequently, an inappropriate prescription for “epidural steroid injections $\times 3$ for low back pain” is given to a nonsurgical spine interventionalist. The injectionist may act as the managing physician, by directing the care related to the painful condition, or as a technical consultant from whom a specific procedure is requested. In either case, a careful, studied medical evaluation of the patient is mandatory. A referral for a diagnostic or therapeutic procedure

is just a request. Responsibility for, and the risks of, the injection rests upon the injectionist, not with the physician making the referral. Being consulted to perform an inappropriate procedure does not relieve the consulted physician of their duty to practice medicine within the current acceptable standards of this medical specialty.

Any new patient encounter must start with the medical history, including in depth questioning in regards to the chief pain complaint. This process allows one to start formulating a differential diagnosis and ruling in, or out, possible pathology. Contraindications to procedures in regards to medications such as anticoagulants and medical history need be ascertained to lessen the risk of complications. You will not find out about a urinary tract infection, or acute sinusitis that might increase the chance of an epidural abscess, if you do not routinely obtain a thorough history. While pursuing the medical history of a patient in pain, in addition to the general medical questions, it is important to ascertain information about the initiation, location, intensity, and quality of the pain as well as any aggravating or mediating factors.

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The physical examination should be focused on the specific pain complaint for which the initial consultation was made, but often a more all-inclusive examination may be indicated. This author has uncovered abdominal aneurisms, metastatic lesions, rectal, and axillary masses in patients who had been referred for "epidural injections." Examination of the cardiovascular, pulmonary, neurological, and musculoskeletal systems will aid in determining the appropriateness of the contemplated procedure and will provide some guide as to possible contraindications. Pain complaints of patients referred for spinal interventions are occasionally found, by musculoskeletal system examination, to be generated from more peripheral structures, hip, knee, or shoulder. History, physical examination, and evaluation of imaging studies are important and crucial steps in guiding interventional diagnostic and therapeutic procedures. However, taken alone they are unable to accurately discern the specific pain generator involved in regards to a spinal pain complaint, e.g., zygapophysial/facet joint, sacroiliac joint, and intervertebral disc pain. Imaging studies, such as plain X-ray, magnetic resonance imaging (MRI), computerized tomography (CT), or myelography often have minimal clinical significance and are not used as direct indicators in regards to a specific procedure. Therefore, as stated by the eminent interventional pain physician, Professor Charles Aprill, "Don't look at the image and decide what the patient has. Look at the patient and correlate with the image."

Looking for contraindicating "red flag" conditions such as tumor, infection, or fractures prior to procedures is advisable in patients referred to the interventionalist physician. MRI, or possibly CT scan, prior to injection is the preferred practice. Performing an interlaminar epidural injection at a level of spinal stenosis can lead to an injection into the cord and marked morbidity. Personal review of images is always preferable, however if films or electronic images are not available, a report from a known, reliable physician might suffice. Personal review of images enables the injectionist to evaluate the adequacy, timeliness, and appropriateness of the studies from the interventionalists prospective, and may indicate the necessity for further studies. In order to adequately evaluate patients, all physicians practicing interventional pain must have extensive training in the interpretation of cervical, thoracic, and lumbar MRI and CT.

Once the history, physical, and review of pertinent imaging studies has been completed, deci-

sions as to level of the spine involved, axial (mechanical) pain with referral vs radicular (secondary to nerve root involvement) [2,3] pain, a differential diagnosis can be made and a diagnostic and treatment algorithm utilizing spinal interventions can be developed. In that interventional pain is a medical specialty, only fluoroscopically guided injections, performed by physicians [4,5] trained in this specialty, can be considered appropriate. All injectionists must be familiar with the concepts of placebo affect, false positive, and false negative outcomes.

With regard to cervical and lumbar radicular pain, correlation of symptoms with neurological findings involving sensory, motor and deep tendon reflex (DTR) function, and imaging studies will aid in determining the possible level of pathology. Pain secondary to stimulation of the thoracic spinal nerve and or dorsal root ganglion, thoracic radicular pain, is rarely associated with sensory dysfunction, although motor and DTR clinical tests are lacking. If a question exists due to multilevel pathology and indistinct symptoms a diagnostic selective spinal nerve block utilizing a low volume, high concentration local anesthetic can be helpful in delineating the correct level to be treated.

Corticosteroids placed into the epidural space have for many years been a relatively conservative treatment for lumbar, thoracic, or cervical radicular pain. In that by definition radicular pain is secondary to pathology of the segmental nerve or dorsal root ganglion, the more precise and concentrated the application of corticosteroid, the more efficacious should be the results. Well-designed randomized controlled trials (RCTs) of interlaminar epidural steroid injections employing precision X-ray guidance with confirmation of treated structures are not available. Some older or less rigorous studies have suggested no long term benefit, greater than a placebo, existing in patients receiving interlaminar epidural steroid injections. [6,7] However, many practitioners of interventional pain medicine continue to use interlaminar epidural steroid injections for the initial treatment of uncomplicated patients with radicular pain and a limited trial of this nonvalidated, frequently performed procedure may be appropriate in certain cases. Multilevel pathology, e.g., spondylolisthesis or spinal stenosis, with bilateral radicular pain may be a good indication for epidural placement of corticosteroids via the transflaval approach. In contrast to interlaminar epidural injections, observational and controlled trials have shown good

long term clinical outcomes using a transforaminal approach for intraspinal steroid therapy for lumbar radicular pain. [8–11] Many believe that an analogous situation may exist in the cervical and thoracic regions although validation by RCTs of thoracic and cervical transforaminal corticosteroid injection, have not yet been forthcoming.

Chronic axial low back pain, with or without referral, can usually be attributed to one of three structures; the intervertebral disc (~40%) [12,13]; sacroiliac joint (13–19%) [14,15]; or zygapophysial, facet, and joints (15–40%) [16,17]. History and physical combined with imaging studies cannot reliably differentiate between the specific structures with regard to pain generation in that all evidence a similar referral pattern. An investigative algorithm of the pain generators must proceed in a disciplined, efficient manner based on the probability of the various conditions producing the pain complaint as determined by MRI, age, symptomatology, and history. The MRI of the lumbar spine can be useful in that pristine intervertebral discs, as seen with this imaging modality, rarely prove to be symptomatic [10], and therefore discography can be deferred until other more likely sources of pain have been screened. In a recent algorithm for workup of low back pain [18] when disc pathology is noted on review of the MRI, provocation disc stimulation is considered a reasonable starting point. However, because workup of the synovial joints as a possible etiology of the pain is less invasive, thought should be given to these structures. This is especially true in the older patient population where zygapophysial pain is more common, degenerative disc changes ubiquitous, and the most commonly used treatment for discogenic pain, surgical fusion, questionably appropriate.

Diagnosis of lumbar zygapophysial joint pain mandates precise, selective, local anesthetic blockade of the innervation of these joints. As each articular structure receives a sensory contribution from the segmental and suprasegmental level, two injections are required to anesthetize each joint. For example, diagnosis of L5–S1 and L4–5 facet pain, injection of the dorsal ramus of L5 and the medial branches of the dorsal rami of L3 and L4 would be performed. If pain extends into the mid lumbar level, the L2 medial branch might be included to anesthetize the L3–4 joint. Bilateral zygapophysial joint pain is rare and routine three and four level, bilateral diagnostic injections not appropriate. Intraarticular injections with local anesthetic for diagnosis, or corticosteroids for

treatment of “Z” joint pain, have not been validated in the literature. Periarticular injections, whether done “blindly” or with the use of a fluoroscope, cannot provide diagnostic information; a therapeutic benefit has not been validated in the literature and should be considered as sham injections. Radiofrequency neurotomy of the lumbar medial branches and L5 dorsal ramus is the only validated lasting treatment for zygapophysial pain [19,20].

As with pain emanating from the intervertebral disc and “Z” joints, sacroiliac pain cannot be diagnosed by history, physical examination, or imaging studies [21]. Sacroiliac pain is always maximal below L5 [11,12,17,22], and significant pain above this is unlikely to be due to this synovial joint. Intraarticular injections can be utilized for diagnosis, remembering that the joint is often “leaky” and therefore the specificity of the injection may be compromised. Once sacroiliac joint pain, secondary to sacroiliitis with spondyloarthropathy, has been diagnosed, intraarticular corticosteroids have been shown to be efficacious as a therapeutic modality [23–25]. In that the sensory innervation of the of the sacroiliac joints appears to primarily involve branches from the dorsal ramus of L5 and the lateral branches of the S1–S3 dorsal rami [26,27], sacroiliac pain should be amenable to radiofrequency neurotomy. Creating a linear radiofrequency lesion of the area between the sacral foramina and sacroiliac joint capsule [28], hoping to disrupt the lateral branches, has been shown to be of little benefit [29]. Yin et al. [30], using a very precise, time intensive, stimulation-guided technique, has reported good relief, >60% relief, in 64% (9/14) of patients treated at 6 months, whereas Cohen and Abdi [31] noted 89% (8/9) with >50% relief at 9 months.

Thoracic pain is a rare entity in most practices and, with the exception of the sacroiliac joint, is diagnosed as for lumbar pathology. Techniques exist for the diagnosis of thoracic discogenic [32,33] and zygapophysial joint [34–36] pain; however, only one study indicates its prevalence [37]. Innervation of the thoracic zygapophysial joints [38,39], maps of their referred pain patterns [40,41], and techniques for evaluation of these structures are available to the clinician. Unfortunately, at this date, in that radiofrequency neurotomy is a nonvalidated but possibly reasonable option—and no other treatment has been shown to be effective in providing relief of pain secondary to thoracic zygapophysial pathology—the diagnostic utility of thoracic “Z” joints is limited.

Cervical pain and/or headache can stem from the intervertebral discs, zygapophysial joints, C1–2 (atlantoaxial) joint, or the occipital–atlanto (O–A) joint. An excellent algorithm with regard to working up these complaints—and indications for specific procedures [42]—exists as presented by Professor Nikolai Bogduk. In the cervical spine, degenerative changes of the zygapophysial joints and intervertebral discs are the norm in a mature population, and therefore MRI cannot be utilized for its diagnostic predictive potential. In the cervical spine, zygapophysial joint pain must always be ruled out as the pain generator prior to consideration of the intervertebral discs. False positive rates of up to 68% have been reported [43] when disc stimulation was performed prior to “Z” joint evaluation.

When approaching the patient with cervical pain, the first determination to be made is whether or not the headache or neck pain is dominant. Maps indicating the pain referral patterns from cervical zygapophysial joints and intervertebral discs are readily available [44], and should be utilized by those interventional pain physicians engaged in cervical work. If headache is the major complaint, the most common “Z” joints involved will be C2–3 followed by C3–4, and C1–2 [45,46]. Third occipital nerve, C3 medial branch and C4 medial branch blocks will be indicated for diagnosis. If the above were shown to be diagnostically negative and the treating physician’s skill and experience adequate, intra-articular injections of the C1–2 and possibly O–A joints might be considered, although proven nonsurgical treatments are lacking. When neck and shoulder pain predominate, the C5–6, C6–7, and C4–5 “Z” joints are often involved and local anesthetic at the medial branches of C5, C6, C7, and possibly C4 would be used to diagnose.

If assessment of the cervical “Z” joints is negative, cervical disc stimulation might be entertained. Cervical discography is “demanding, technically intensive, and unforgiving,” [47] and should only be performed by physicians who have undergone the required rigorous training, and are well versed in advanced interventional pain techniques. The pain referral diagrams should focus

the operator as to the correct levels, and multilevel pathology is common.

The sympathetic nervous system appears to mediate a multitude of pain syndromes. This sympathetic mediated pain or sympathetically maintained pain (SMP) includes circulatory insufficiency (e.g., Raynaud’s and Buerger’s diseases); acute herpes zoster; postherpetic neuralgia; central pain; perineal or pelvic pain; chronic regional pain syndrome; phantom limb pain; and trench foot. Blockade of the cervical, thoracic, lumbar sympathetic chain, or ganglion impar can be trialed for diagnostic and perhaps therapeutic utility [48–50]. Spinal cord stimulation may be effective in the treatment of SMP.

The specialty of interventional pain offers powerful tools that can be utilized for the benefit of patients in pain. However, any instrument for good can be co-opted by “the dark side.” Non-fluoroscopically guided, “blind” injections in today’s environment are not appropriate. Known diagnostic injections, with dubious therapeutic value—which are fostered on an unaware public—and referring sources as efficacious and therapeutic procedures, often repeated without benefit in a series of three, constitute at best questionable medical practice. Evaluation of our patients at each visit prior to injection and following diagnostic procedures is essential. Evaluation is an ongoing process, which does not end after the initial consultation, and often necessitates deviation in our initial treatment algorithm.

Spinal injections are an invaluable modality for the diagnosis and treatment for chronic pain of spinal origin. Precise, selective, fluoroscopically guided procedures performed by well-trained physicians can be of great benefit to those suffering from chronic pain. Although in the hands of a well-trained, experienced interventional pain physician these procedures appear simple, they can be fraught with danger in the hands of the novice or poorly trained injectionist. In regards to spinal injections, one does well to remember the words of Herman Melville: “. . . one forgets the tiger heart that pants beneath it; and would not willingly remember, that this velvet paw but conceals a remorseless fang [51].”

Procedure examples with the Current Procedural Terminology and possible International Classification of Diseases (ICD)-9 codes*

Procedure	Current Procedural Terminology Code	ICD 9
Interlaminar epidural-cervical	62310	723.4/722.0
Interlaminar epidural-thoracic	62310	724.4/722.11
Interlaminar epidural-lumbar	62311	724.4/722.10
Caudal	62311	724.4/722.10
Transforaminal/SSNB-cervical	64479/64480	723.4/722.0
Transforaminal/SSNB-thoracic	64479/64480	723.4/722.0
Transforaminal/SSNB-lumbar-sacral	64483/64484	724.4/722.10
Inject disc-cervical	62291	722.4
Inject disc-thoracic	62291	722.4
Inject disc-lumbar	62290	722.52
Discography S&I-cervical	72285	
Discography S&I-thoracic	72285	
Discography S&I-lumbar	72290	
Facet jt/MBB-cervical	64470/64472	716.9/721.0
Facet jt/MBB-thoracic	64470/64472	716.9/721.2
Facet jt/MBB-lumbar	64475/64476	716.9/721.3
Sacroiliac	27096	739.4
Sympathetic-cervical	64510	337.21/354.4/053.21
Sympathetic-thoracic	64520	337.21/354.4
Sympathetic-lumbar	64520	724.4/355.71
Sedation >30 minutes	99141	
Fluoroscopy for needle guidance	76005	

MBB = medial branch block; S&I = supervision and interpretation; SSNB = selective spinal nerve block.
 * Current Procedural Terminology (CPT), American Medical Association, Chicago, Illinois, 2007.

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