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Efficacy of epidural injection of steroid in treatment of lumber disc prolapse: article review

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Abstract

Chronic low back and lower extremity pain is mainly caused by lumbar disc herniation (LDH) and radiculitis. Various surgery and nonsurgical modalities, including epidural injections, have been used to treat LDH or radiculitis. Caudal epidural injection of local anesthetics with or without steroids is one of the most commonly used interventions in managing chronic low back and lower extremity pain. To describe the indications, rationale, techniques, alternatives, contraindications, complications, and efficacy of lumbar and caudal epidural corticosteroid injections. Interventions: Three reviewers with formal training and certification in evidence-based medicine searched the literature on non–image guided lumbar interlaminar epidural steroid injections. A larger team of seven reviewers independently assessed the methodology of studies found and appraised the quality of the evidence presented. A systematic literature search was performed, in the Medline Case reports and retrospective and prospective studies were extensively reviewed to provide detailed descriptions of the clinical features of lumbar and caudal epidural corticosteroid injections. Data sources included relevant literature of the English language identified through searches of PubMed and EMBASE, and manual searches of bibliographies of known primary and review articles. Epidural corticosteroid injections are commonly requested treatments for patients with various low-back or lower-extremity pain syndromes (or both). Most of the reports on the use of this type of treatment are retrospective and noncontrolled. These studies indicate benefit; however, the prospective controlled studies provide varied results about the efficacy of lumbar and caudal epidural corticosteroid injections. In conclusions: In patients with lumbar radicular pain secondary to disc herniation or neurogenic claudication due to spinal stenosis, interlaminar epidural steroid injections appear to have clinical effectiveness limited to short-term pain relief. Therefore, in a contemporary medical practice, these procedures should be restricted to the rare settings where fluoroscopy is not available.

Keywords: Herniated disc, Steroids, Epidural injection, Low back pain

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Introduction

Lumbar disc herniation (LDH), which is the main cause for radicular pain, was first reported by Mixter and Barr in 1934 [1]. Since then, amounts of literature have been published to descript the epidemiology, diagnosis, pathophysiology and treatment for herniated disc pain. Among chronic pain disorders, low back pain arising from various structures of the spine constitutes the majority of problems It is a well-recognized fact that back pain in a disc disease is not only because of compression on neural elements, but may also be due to chemical inflammation [2].

The annual incidence of sciatica is 0.5% in the adult population in Western countries with an important impact on health resources Spinal disorders are considered as one of the most important causes of disability and work absenteeism and as one of the most expensive disease categories regarding hospital care [3].

Even though, the symptoms in 23% to 48% of patients would resolve spontaneously, and 5% to 15% of patients still need surgical treatment, which would lead to heavy economic burden and strain on health services. Various conservative, surgical or nonsurgical modalities have used in the treatment of LDH or radicular pain. However, surgery is not available for everyone who is symptomatic, and it may lead to failure in approximately 25% of patients in well-selected cases. In contrast, epidural injections are one of the most commonly performed nonsurgical treatments for LDH [4, 5, 6].

The most common cause of sciatica is an intervertebral disc herniation, which results in both nerve root compression and the release of pro-inflammatory molecules such as IL-1b, IL-6, TNF-a, nitric oxide and prostaglandin E2 Since the nucleus is an immune privileged site because it is both an avascular area that displays a biochemical phenotype with Fast causing infiltrating T-lymphocyte apoptosis, disc extrusion results in Th1 lymphocyte activation and macrophage infiltration via INF-g secretion. Recent studies also showed the importance of Th17 lymphocyte in this process [7, 8, 9, 10].

The underlying mechanism of action of epidural administered steroid and local anesthetic injections is still not well understood. It is believed that the achieved neural blockade alters or interrupts nociceptive input, reflex mechanism of the afferent fibers, self-sustaining activity of the neurons, and the pattern of central neuronal activities. Further, corticosteroids have been shown to reduce inflammation by inhibiting either the synthesis or release of a number of pro- inflammatory mediators and by causing a reversible local anesthetic effect [11, 12].

In addition, the underlying mechanism of epidural administered local anesthetic and steroid injections in the treatment of chronic low back pain still remains unknown [13, 14]. According to the current evidence, there is a trend suggesting that local anesthetics might have comparable effectiveness as steroids in the treatment of low back pain without LDH and also pain of facet joint origin [15,16,17].

Therefore, we performed a systematic literature review in order to obtain a numerical conclusion necessary for an objective evaluation of systemic steroid efficacy and tolerance in sciatica.

Methodologic Review

A randomized unblended study of 63 patients with sciatica by resultant data from published paper reported that 79% of patients in the treatment and 73% of the placebo group obtained pain relief. “Dry needling” into the lumbar interspinous ligament was performed in one third of controls and the others received epidural injections of normal saline or local anesthetic. In the double blind trial of 36 patients with lumbar radicular pain by Cuckler et al, 32% had pain relief at 24 hours and only 26% between 52-120 weeks. Placebo injections resulted in only 15% long term improvement. These authors concluded that “No statistically significant divergence was observed between the control and experimental patients [18, 19].

In a study of intraoperative epidural placement of aqueous MPA on an exposed nerve root and using retrospective “controls,” Davis and Emmons claimed a need for less postoperative analgesia as well as a 37%-40% decrease in postoperative stay. With the patients blinded, other results compared intraoperative MPA to saline irrigation. In another study, McNeill et al48 compared intraoperative MPA, placebo, morphine, and morphine-MPA mixture. Both groups concluded that this application of MPA was useless.

No comparable double blind prospective research has been published. Recently, [20, 21] 40 studied 99 patients with sciatica from disc disease, 71 of whom were assessed for pain control. Thirty-five received 80 mg epidural MPA in 10 ml normal saline and 36 had interspinous (not epidural) injection of 1 ml normal saline. An unspecified number received a repeat dose of steroid. The study design was flawed because both the site and content of inject ate di Veered for the two groups.

After 2 weeks, pain relief (defined subjectively and by consumption of opiates) was relieved in 46% of treated patients and 11% of controls. After 3 months, pain was “not severe or none” in 98% of treated and 82% of controls. No significant changes in neurological signs occurred in either group. The first well controlled double blind investigation of disc rupture by other researcher showed that “extradural injection of methyl prednisolone (80 mg) is no more evocative than a placebo injection in relieving chronic symptoms due to myelographically demonstrable lumbar disc herniation [22, 23].

While other, provided the most definitive well controlled study of epidural MPA therapy for disc related sciatica. Using careful follow up neurological examinations and exacting statistical methods, they concluded: “Thus, we found that epidural corticosteroid injections do not aboard long term advantages over placebo. (there was) no significant functional benefit, nor does it reduce the need for surgery.” Two studies of spinal stenosis treated with MPA demonstrated that pseudo claudication improved only slightly in both steroid and placebo groups.

Demonstrates that in uncontrolled reports, about 68% of patients with sciatica were improved by epidural steroid injection, but in controlled studies, the patients who received steroid infusions did not do significantly Better than the placebo and sham groups [24, 25].

Recently datat reported that intrathecal MPA reduced spinal fluid ã-globulin in multiple sclerosis, but they warned that “the effect on the clinical course remains to be established.” In a prospective study of intrathecal MPA in 20 patients, Van Buskirk et al reported no effect on the frequency of exacerbations; improvement in spasticity was “largely of a subjective nature.”

In 1970 Goldstein et al reported on 38 patients treated with 4–8 intrathecal MPA infusions and followed up for 2–8 years. Neurological examinations disclosed some initial improvement but this persisted in only 16. In a prospective study of 23 patients with multiple sclerosis given 83 intrathecal injections of MPA for 46 acute exacerbations (follow up averaged 22 months), Nelson et al reported only slight Kurtzke scale improvement in four patients. No patient improved directly after injection as had been previously reported. We have discovered no controlled studies of intrathecal steroid for multiple sclerosis [26-33].

Recently, small volume perineural epidural injection into the anterior epidural space has been advocated. Divergent techniques using various steroids, local anesthetic, epidurogram guidance, and hyaluronidase produced mixed results in uncontrolled studies of 169 patients. In a prospective double

blind trial of 49 subjects with lumbar sciatica, low volume injections of 10 mg triamcinolone were compared with isotonic saline.52 Both groups reported 80% “good” plus “fair” results. Marks et al53 evaluated lumbar facet joint injection of 20 mg MPA and local anesthetic. They concluded, “In the absence of a control group we cannot quantify the placebo effect and cannot, therefore, draw any conclusions regarding the validity of these procedures as diagnostic tests [34-40].

Five pragmatic RCTs compared the effectiveness of “non–image-guided” L-ILESI with other treatments in patients with lumbar radicular pain due to an intervertebral disc displacement. All the studies exhibited significant shortcomings. Three studies failed to include any validated outcome measures. One study used a 75% subjective improvement as the on outcome measure and observed no difference in this outcome between subjects treated with non–image- guided L-ILESI and those who received epidural local anesthetic.

Both patients with lumbar radicular pain due to disc herniation and those with neurogenic claudication were included in the study. The subgroup analysis did not demonstrate any dissimilarity in the outcome based on the diagnosis. Another RCT used a change in patients’ conditions (“improved, no change, worse”) as the outcome measure and reported that lumbar epidural injection of steroid together with local anesthetic produced significantly better results than lumbar epidural injection of local anesthetic alone when assessed at 1 month but not thereafter. Finally, a small trial of 20 patients found equal effectiveness of epidural and intrathecal steroid injections in providing subjective pain relief, measured as “complete relief, improvement, or no benefit” in patients with clinically diagnosed lumbar radicular pain [41-43].

In 1978, Yates" described a prospective, randomized, crossover study of patients with low-back pain and sciatica and no specific diagnostic criteria. In this study, four types of injections were used in the caudal epidural space: 50 mL of isotonic saline, 50 mL of 0.5% lidocaine, 47 mL of isotonic saline with 3 mL of triamcinolone hexacetonide, and 47 mL of 0.5% lidocaine with 3 mL of triamcinolone hexacetonide. One of each type of injection was given in a random sequence until symptoms were relieved; thus, the patients served as their own control subjects. A total of 49 injections were given to 20 patients. Improvement in lumbar spinal mobility and straight-leg raising was noted after the corticosteroid injections but not after the injections without corticosteroids. Subjective improvement correlated with these objective criteria. The study was limited by short-term follow-up, which was only 1 week after the final injection [44-48].

In addition, In 1984, Klenerman and associates'? Performed a prospective, randomized, blinded study of 63 patients with unilateral, acute sciatica of less than 6 months' duration. The treatment group received lumbar epidural injections of 80 mg of MPA and isotonic saline (total volume, 20 mL). Management of the three other groups was as follows: 20 mL of epidural administered saline, 20 mL of 0.25% epidural administered bupivacaine, and simple needling (with a Touhy needle) into the interspinous ligament without injection [49-54]. Follow-up was at 2 weeks and 2 months.

The criteria for improvement were visual analogue scales and patients' descriptions of pain. Overall, the condition of 75% of the patients was improved or cured, but no distinction was noted in results after the various types of injections. Of note, no injections were repeated. Findings were limited because the patients had a wide range of pretreatment symptoms and signs of unspecified duration [55-59].

Of the 6 randomized trials, 5 studies were judged to be positive for short-term relief. Only 4 trials reported positive results with long-term follow-up of more than 6 months. Surprisingly, other data showed negative short-term relief, however, positive long-term relief. The results in 2 studies utilizing fluoroscopy were superior to blind epidural injections [60].

Risk

During pressure therapy with high volume epidural saline and procaine, some of Evans' patients complained of abnormal sensations or paranesthesia, such as formication (and) found it difficult to control a desire to shout or scream." 5 In one experiment, when 30 ml saline was injected epidural, the subarachnoid pressure at L4-L5 rose to 320 mm H2O, cyanosis, opisthotonos, unconsciousness, and incontinence of urine and faces followed the injection of 120 cc of 2percent solution of novocain; consciousness returned within half hour and recovery was complete." Lievre et al described a "pain reaction crisis" in a patient treated with epidural hydrocortisone for arachnoiditis. During pressure injections of isotonic saline and lidocaine hydrochloride, four of Brown's patients had "a mild tetanic episode." Possible explanations include spinal cord compression or injection into the epidural venous plexus [61].

Adverse reactions from epidural steroids: 1989–94 Beginning in 1989 in Australia, there were numerous claims of adverse reactions to epidural steroid therapy.69 Case histories suggested diagnoses of encephalopathy (three), myelopathy (three), cauda equina syndrome (two), sciatica (one), chemical meningitis (one), and cerebrovascular accident (one). In 1991, The Health Care Committee of the National Health and Medical Research Council was appointed to investigate complications of epidural steroid therapy. The panel concluded that "In view of the absence of definitive evidence for or against the efficacy of epidurals administered corticosteroid preparations (the Council) can neither endorse nor proscribe the epidural use . . . In view of the potential hazards (epidural therapy should be administered) only with fully informed consent... only with the approval of a hospital ethics, accreditation or credentialing committee . . .only for radicular pain as part of a properly constituted research protocol aimed at determining the e efficacy of the epidural injection of steroids [62].

Complications

A few case reports have described major complications from epidural corticosteroid injections. The actual incidence of these problems is, of course, unknown. Infectious complications have occurred. Elliott and Collett" reported a case of septicemia delayed by 9 days after a lumbar epidural corticosteroid injection; however, a direct causal relationship may not have existed." The two reported cases of bacterial meningitis were described in 1978 by Dougherty and Fraser." One case occurred after three epidural injections of hydrocortisone, and one occurred after three epidural injections of MPA. The latter case occurred in association with formation of a dural- cutaneous fistula after an unintentional dural puncture. Four cases of epidural abscess have been reported after epidural corticosteroid injections [63].

The incubation period was between 7 and 31 days. In the three cases that resulted in permanent neurologic damage, the diagnoses were delayed, and the laminectomies were performed after the onset of paralysis. These cases illustrate the vital importance of vigilance in detecting such complications. Bromage'" discussed a proposal in which all patients who have undergone invasive spinal procedures be given a type of "Medic-Alert" bracelet, although conceding that this may be neither feasible nor cost-effective. No published reports have described epidural hematomas after lumbar or caudal epidural corticosteroid injections. Only one case report described a hematoma in a patient taking indomethacin who had received six cervical epidural corticosteroid injections." Allegations have been made of a link between epidural [64].

Accidental subarachnoid injections Inaccurate placement of epidural needles into veins, ligaments, and the subarachnoid space occurs in 25%-52% of epidural procedures by the caudal approach and in 30% by the lumbar approach. Accidental intrathecal injection occurs during epidural therapy in about 5%-6% of procedures; it is now generally agreed that accidental intrathecal injections are dangerous Intravascular Complications The arterial supply of the spinal cord and roots below T2 is from aortic segmental vessels that enter through spinal foramina.

These arteries are vulnerable to laceration or intravascular injection during epidural therapy, foraminal injection, and nerve block. Radicular or spinal cord damage may be permanent sequellae. In cervical epidural procedures and trigger point blocks, the vertebral artery can be accidently punctured leading to medullary infarct. Retinal damage from MPA arterial microemboli has followed accidental injection of MPA into arteries or collaterals supplying tonsillar fossa, sphenopalatine ganglion, ethmoid sinus and nasal septum.

The emboli evidently travel ante grade or retrograde into retinal arteries; a similar mechanism may explain acute myelopathy after epidural injection into the segmental vessels on nerve roots [61].

Botwin et al reported complications of fluoroscopically guided caudal epidural injections in 139 patients, who received 257 injections. Complications per injection included insomnia the night of the injection (4.7%), transient non-positional headaches (3.5%), increased back pain (3.1%), facial flushing (2.3%), vasovagal reactions (0.8%), nausea (0.8%), and increased leg pain (0.4%). The incidence of minor complications was 15.6% per injection [54].

Manchikanti et al reported complications with pain during the injection with back pain in 43% of the patients and leg pain in 22% of the patients. They also noted postoperative complications in 34% of the patients with soreness at the injection site in 18%, increased pain in 5%, muscle spasms in 4%, swelling in 4%, headache in 3%, minor bleeding in 2%, dizziness in 1%, nausea and vomiting in 1%, fever in 1%, numbness in 1%, and voiding difficulty in 1%. Manchikanti et al reported with fluoroscopically guided caudal epidural injections intravascular placement in 14% of the patients. They also reported complications in 7% of the patients with soreness at the injection site in 6%, increased pain in 1%, muscle spasms in 1%headache in 1%, and nausea and vomiting in 1%. Other much less common complications include transient blindness, retinal necrosis, serous chorioretinopathy, retinal hemorrhage, chemical meningitis, nerve damage, discitis [65].

Conclusion

The results of this systematic review evaluating the effect of caudal epidural injections with steroids in managing various types of low back pain and lower extremity pain emanating as a result of disc herniation. Epidural steroid injection probably accelerates pain relief in patients who eventually have natural resolution of radicular pain in a gradual delayed fashion. The results of this systematic review are provided utilizing contemporary systematic review methodology utilizing randomized trials and observational studies, even though most of the evidence was derived from randomized trials. These epidural corticosteroid benefits, even if only for short- and intermediate-term periods, validate such treatment because it has the potential to decrease the duration of pain, disability, and loss of productivity from weeks or months to days. Most patients, when offered the choice, would undoubtedly prefer to receive a treatment that relieves their pain faster than the time needed for natural resolution of the problem, which could be much longer.

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