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ORIGINAL RESEARCH

Comparing the effects of epidural methylprednisolone acetate injected in patients with pain due to lumbar spinal stenosis or herniated disks: a prospective study

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Objective: Satisfactory results have been seen with epidural steroid injections (ESI) in patients with herniated disks (HD), but the role in lumbar spinal stenosis (LSS) has been less investigated. We compared long-term effects of ESI in HD and LSS patients.

Methods: In a prospective, single-blind uncontrolled study, 60 patients with radicular pain due to HD (n = 32) or LSS (n = 28) were enrolled over a 9-month period. Methylprednisolone acetate 80 mg plus 0.5% bupivacaine 10 mg were diluted in normal saline up to a total volume of 10 mL, and injected into the epidural space. The amount of pain based on numeric pain score, level of activity, and subjective improvement were reported by patients after 2 and 6 months by telephone. Demographic data were analyzed with the chi-square test. The differences in numeric pain scale scores between the two groups at different times were analyzed with the *t*-test.

Results: There were no differences between HD and LSS patients regarding age, sex, and average duration of pain prior to ESI. The degree of pain was significantly higher in LSS patients in comparison with HD patients in the pre-injection period. The amount of pain was significantly reduced in both groups 2 months after injection. This pain reduction period lasted for 6 months in the HD group, but to a lesser extent in LSS patients ($P < 0.05$).

Discussion: Epidural methylprednisolone injection has less analgesic effect in LSS, with less permanent effect in comparison with HD.

Keywords: methylprednisolone acetate, lumbar spinal stenosis, herniated disk

Introduction

Low back pain (LBP) is one of the most commonly presented complaints in humans, and is reported by all age groups.[1] The causes of LBP may vary according to age. Mechanical LBP and herniated disk (HD) syndromes are the most common diagnoses in younger patients while lumbar spinal stenosis (LSS), which is a degenerative condition, primarily prevails in the older patient population.[2]

Treatment of LBP varies from conservative to operative modalities with different results.[1] Epidural corticosteroid injections (ESI) have been used frequently for patients with HD with satisfying results,[3] but the role of ESI in LSS is less often investigated.[1,3]

The aims of this study were to compare the response to ESI in patients with LSS and HD.

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Material and methods

In a prospective, single-blind uncontrolled study, patients with radicular pain due to HD were enrolled over a period of 9 months from November 2009 to July 2010.

Inclusion criteria included symptomatic HD or LSS, diagnosed with magnetic resonance imaging scan, LBP for more than 6 weeks, and age 18–60 years. Exclusion criteria included spondylolisthesis, cauda equina syndrome, progressive neurologic deficit, or other organic pathology requiring surgical intervention.

Before the procedure, the patients completed a consent form and were asked to rate their current pain on a 10 numeric pain scale (NPS) on the day of treatment. Then ESI was performed by a trained anesthetist with a midline approach and a 16-gauge Tuohy disposable needle inserted in the sitting position, and sterile operating room conditions. Entrance into the epidural space was determined using the loss of resistance method. Methylprednisolone acetate 80 mg plus 0.5% bupivacaine 10 mg was diluted in normal saline to a total volume of 10 mL, and injected into the epidural space, in the L3–L4 or L4–L5 space. The amount of pain, level of physical impairment index (using the Waddell et al method),[4] and subjective improvement were reported after 2 and 6 months by telephone.

Statistical analysis

The data were analyzed using SPSS for Windows, Version 12. Differences between LSS and HD patients in terms of demographics were analyzed with the chi-square test. The principal dependent variable was the difference in NPS score (at baseline, 2 months, and 6 months), and was analyzed with the *t*-test.

Results

Sixty patients (32 HD and 28 LSS) underwent ESI and were observed for 6 months. There were no differences between patients of the two groups regarding age, sex, mean duration of pain prior to ESI, body mass index (BMI), and pre-injection physical impairment index (Table 1). The degree of pain was significantly higher in LSS in comparison with HD patients in the pre-injection period (Table 2). Pain was reduced in both groups 2 months after injection. The degree of pain at 2 and 6 months was significantly lower in HD compared to LSS patients ($P = 0.007$ and $P = 0.04$, respectively) (Table 2). There was no correlation between age, sex, duration of pain, BMI, and pain intensity according to NPS with efficacy of ESI. Three LSS patients and one HD patient underwent surgery. There was one case of chest pain followed by hypotension about 10 minutes after ESI, which was treated with phenylephrine 100 μg and meperidine 30 mg.

Table 1 Differences in demographic data, symptoms, and physical findings between LSS and HD patients

Variables	LSS (n = 28)	HD (n = 32)	*P* value
Age (year) (mean ± SD)	46.7 ± 12.1	42.6 ± 10.9	0.17
Sex (male/female)	12/16	17/15	>0.05
Pain duration (months) (mean ± SD)	25.3 ± 25.2	21.8 ± 19.6	0.5
Body mass index (mean ± SD)	25.7 ± 2.8	25.5 ± 3.5	0.5
Pre-injection physical impairment index (number percent)			
Active	4 (14.3%)	5 (15.6%)	
Reduced productivity	14 (50%)	18 (56.3%)	0.6
Not active	10 (35.7%)	9 (28.1%)	

Abbreviations: LSS, lumbar spinal stenosis; HD, herniated disk.

Discussion

The pathophysiology of LBP is multifactorial, and the proinflammatory chemicals such as phospholipase A2,[5,6] interleukin-6, interleukin-8, prostaglandin E2, leukotriene B4, and thromboxane B2 may play major roles.[7,8]

The methods of treatment also vary from noninvasive modalities to surgical treatment. One of the safest and relatively noninvasive methods of treatment is ESI. More effective results have been shown with methylprednisolone, and in longstanding back pain.[1] Failed back surgery syndrome, HD, and symptomatic LSS are among specific diagnoses which might be treated by ESI.[9,10] Corticosteroids supposedly inhibit the neuropeptide synthesis and transmission in unmyelinated C fibers, suppress inflammation, stabilize the membrane, and have some anesthetic action which reduces sensory symptoms.[10–12]

Generally, the overall success rate of ESI ranges from 63% to 80%.[11,12] In our study, the average success rate was 73.7% and 26.3% in HD and LSS patients, respectively. Patient selection, technique of injection, dosage of corticosteroid, follow-up, the route of administration, injected drugs, and utilization of fluoroscopy are among factors that may influence results.[13]

Runu et al reported poor responses to ESI in obese, multilevel, and large disk prolapse patients.[1] There was no correlation between ESI and BMI, sex, and duration of pain in our study.

Table 2 Degree of pain in patients of two groups during different times

Variables	LSS (n = 28) (mean ± SD)	HD (n = 32) (mean ± SD)	*P* value
Pre-injection pain	7.0 ± 1.3	6.3 ± 1.1	0.02
Pain 2 months after injection	4.8 ± 2.3	3.1 ± 2.0	0.007
Pain 6 months after injection	4.4 ± 2.8	2.9 ± 2.5	0.04

Abbreviations: LSS, lumbar spinal stenosis; HD, herniated disk.

We decided to evaluate the efficacy of ESI after 2 months because therapeutic decay phenomenon has been observed with ESI, and early response could be due to the local effect of corticosteroids which have been shown to last at least 3 weeks at the therapeutic site. White et al prospectively studied 300 patients and reported good results in the early period.[14] The effect of ESI was found to decrease with time. They reported 82% pain relief at day 1, 50% at 2 weeks, and 16% at 2 months. Buttermann reported the effectiveness of ESI for up to 3 years by nearly 50% of patients with HD who had not had improvement with more than 6 weeks of noninvasive care.[3] Another study showed significant pain relief in 86% of patients with HD who underwent injection of local anesthetic mixed with nonparticulate betamethasone.[15] In our 6-month follow-up of patients, the results were poorer than the aforementioned three studies in both HD and LSS patients. However, pain relief lasted longer in HD patients than in LSS patients.

Schoenfeld and Weiner suggested a 3–4-week course of conservative management before epidural corticosteroid injection.[16] We extended this time to 6 weeks, and only included the patients with poor response to conservative methods for 6 weeks. Our results showed that more patients with HD responded to ESI in comparison to LSS. Theoretically, LSS is the result of destruction of the posterior joints which cause synovial reaction, cartilage destruction, osteophyte formation, and intervertebral disk disruption. These changes can lead to loss of disk height and facet instability. Subsequently, the neural foramina and spinal canal are narrowed, impinging upon the structures within them, including the spinal cord, nerve roots, and cauda equina.[17]

For the analgesic effectiveness of epidural corticosteroid, the volume and route of injection would have a considerable influence on the distribution of solutions and clinical benefits but it is restricted to 10 mL.[18] Kim et al documented epidurographically that a 10-mL solution bolus reaches far enough to mid and lower lumbar area, and extra volumes or repeated injections could not significantly change the blocked level.[19] We used a 10-mL corticosteroid bolus for injection of the interlaminar epidural space. However, some authors suggest that transforaminal epidural corticosteroid injection provides a lower volume of concentrated medication to a selected nerve root compared to interlaminar epidural corticosteroid.[20]

Limitations

The strength of our results is limited by a lack of placebo group. Thus, we are not able to attribute pain relief to drug effects entirely. In addition, we used only 10 NPS for assessment of pain which may limit the strength of our results.

Conclusion

Epidural methylprednisolone injection has less analgesic effect in patients with LSS compared to HD, with less permanent effect.

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Disclosure

The authors report no conflicts of interest in this work.

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