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Original Article

Comparative Effectiveness of Caudal Epidural Steroid Injection Versus Mesotherapy of Calcitonin on Pain Reduction and Improving Function in Patients with Lumbosacral Canal Stenosis: A Randomized Control Trial

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ABSTRACT

Background: The use of epidural steroid injection in spinal stenosis pain management has expanded greatly. Calcitonin is also effective in relieving neuropathic pain in spinal canal stenosis through the mechanisms of arterial dilation, anti-inflammation, anti-edema, and rises in beta endorphin levels. The current study was designed to evaluate the effect of mesotherapy with calcitonin compared with epidural steroid injection for pain relief and functional improvement in patients with lumbosacral canal stenosis.

Methods: A total of 39 patients comparable in age and gender with signs and symptoms of lumbosacral canal stenosis participated in this randomized control trial. Group A comprised patients receiving mesotherapy of 100 IU Calcitonin+Marcaine 0.5% (4 mL) in three repeated injections in the lumbosacral area; group B received a single caudal epidural injection of Marcaine 0.5% (4 mL)+80 mg methyl prednisolone (2 mL) under the guide of a fluoroscope. Patients were evaluated before and 4 and 8 weeks after intervention using the visual analog scale (VAS), Oswestry Disability Index (ODI), Quebec back pain disability scale (QBPD), and Ronald-Morris Disability Questionnaire (RMDQ).

Results: Based on the VAS, ODI, QBPD, and RMDQ scales, a significant improvement in pain and functional disability was observed in both groups 4 and 8 weeks after intervention ($P<0.05$), which was comparable between the two groups ($P>0.05$).

Conclusion: Mesotherapy with calcitonin Marcaine is just as effective as caudal epidural steroid injection; considering its advantages, mesotherapy can be a proper alternative method for managing pain and functional impairment in patients with lumbosacral canal stenosis.

Introduction

Low back pain (LBP), with a lifetime prevalence of 84%, is a widespread complaint of patients who refer to musculoskeletal clinics [1]. Lumbar spinal stenosis is among the most prevalent causes of LBP with an annual incidence rate of five cases per 100,000 individuals [2, 3]. Anatomical narrowing of the lumbar spinal canal gives rise to vascular and neural structure compression followed by a plethora of clinical signs and symptoms [4], such as more pain in the legs than the back, restless leg syndrome, neurogenic claudication, weakness, and,

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albeit rarely, cauda equina syndrome [5-9].

The diagnosis of spinal stenosis is based on a combination of history, physical examination, radiologic findings (magnetic resonance imaging), and electrodiagnosis. Spinal stenosis symptoms can be managed either surgically or with non-surgical modalities like lifestyle modification, exercise, physical therapy, hydrotherapy, acupuncture, or pharmacotherapy. Given the expense and risks of surgery in elderly patients, pain physicians have propounded increasing the use of fluoroscopic- and sonographic-guided interventional techniques for managing chronic spinal pain, although meritorious case selection and the true effect of these invasive and non-invasive techniques are controversial [10-12].

The use of epidural steroid injections with three different approaches (caudal, transforaminal, and interlaminar) has advanced in spinal stenosis pain management by reducing inflammatory mediators such as NO2 and TNF-α and diminishing mechanical compression. Caudal epidural injection is the safest and easiest approach with the least risk of inadvertent dural puncture, although it is less specific in targeting the site of pathology [13-17].

Calcitonin is a polypeptide hormone secreted by the thyroid gland that has anti-hyperalgesic effects in addition to calcium homeostasis in vertebrates. There is no evidence of calcitonin receptor expression on normal peripheral nerve tissue or dorsal root ganglion; however, it is effective in relieving neuropathic pain in spinal canal stenosis, although the mechanism remains unclear [14]. Arterial dilation, anti-inflammation, anti-edema, and increased beta endorphin levels are various beneficial effects of calcitonin in lumbar spinal stenosis [8].

Mesotherapy is the intradermal or subcutaneous fat injection of active substances with local therapeutic effects. Slow diffusion, higher local concentration of drug compared with intramuscular administration, longer lasting effects, fewer systemic complications, synergic effects, and systemic therapies are the advantages of this route of administration [18-20]. Mesotherapy gained popularity in cosmetic medicine, but its expanded therapeutic indications have recently attracted the attention of pain physicians for the management of painful musculoskeletal conditions [21].

Though there is little evidence on mesotherapy in lumbosacral spinal stenosis, this study was designed to evaluate the effect of mesotherapy with calcitonin comparing epidural steroid injection for pain relief and functional improvement in patients with lumbosacral canal stenosis.

Methods

Trial Design

This single-blinded, randomized clinical trial was performed in 2018 on lumbosacral canal stenosis (L4, L5, and S1 levels) patients, who were randomly divided into two groups, A and B, using the random block method. The study protocol was registered in the Iranian registry of clinical trials (IRCT) with code number IRCT20171201037696N1 and approved by the Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.MED.REC.1396.70). The consort flowchart is illustrated in Figure 1.

Participants

Lumbosacral canal stenosis (L4, L5, and S1 levels) patients who sought pain management by referring to the physical medicine and rehabilitation clinics affiliated with Shiraz University of Medical Sciences in 2018 were invited to participate in this study. First, the objectives, protocol, medications, risks, and benefits of the research were explained to all patients, and then participants signed an informed written consent form.

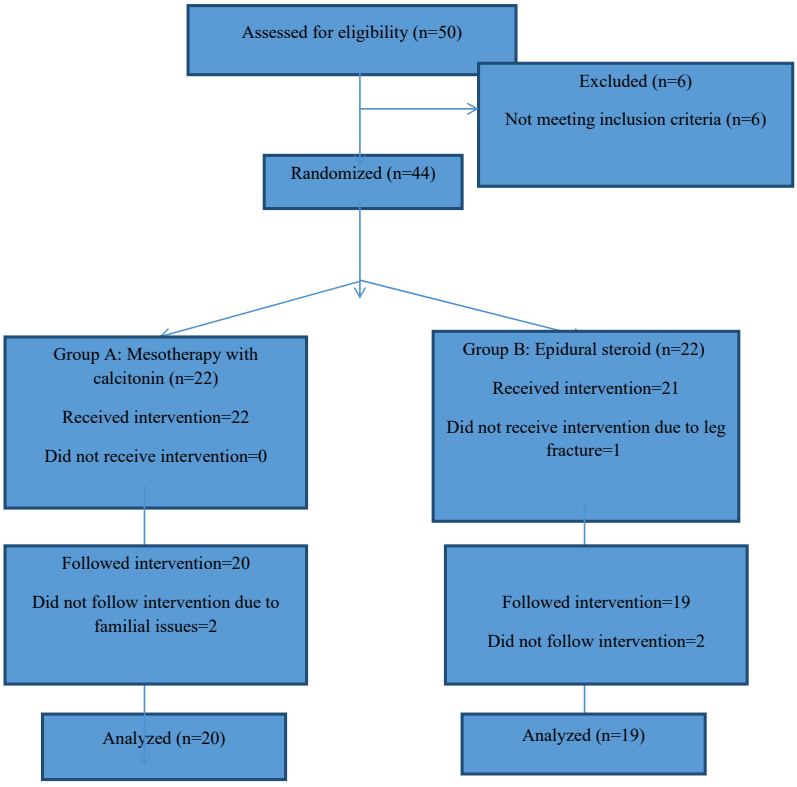

Figure 1: CONSORT flow diagram of the study.

B using the random block method (group A: mesotherapy with calcitonin; group B: caudal epidural steroid injection).

Using the quadruple random permutation block method and the table of random numbers, a random list was formed with six possible quadruple permutations (AABB, ABAB, ABBA, BAAB, BBAA, and BABA), so that A represented the person receiving mesotherapy with calcitonin, and B represented the person receiving the caudal epidural steroid injection.

This method was based on 11 blocks in 4 permutations and assigning zero to nine (according to the random number table) to each of these permutations (i.e. AABB Code 0, BABA Code 1, AABB Code 2, BBAA Code 3, BAAB Code 4, and ABBA Code 5 to 9), and all 44 patients were assigned to groups A and B. The statistician was blinded to the method of treatment (single-blind study).

Statistical Method

Descriptive data was evaluated by frequency, frequency percentage, mean, and SD. The mean changes in VAS, QBPD, ODI, and RMDQ before and after the intervention were assessed using the chi-square test (assessment of correlation of two categorical data) and the independent t-test (comparison of the means of a quantitative factor between the two groups). The homogeneity of the groups was assessed using the Kolmogorov-Smirnov test, and the trend of quantitative factor changes during the time was evaluated using the Friedman test.

A P value<0.05 was considered statistically significant.

Results

A total of 39 participants, twenty patients in group A (mesotherapy of calcitonin+local anesthetics) and nineteen in group B (epidural steroid+local anesthetics), were enrolled in the study. Statistical tests showed that there was no significant difference in age or gender distribution between the two study groups (P>0.05) (Table 1). Pain scores (VAS) and functional disability (ODI and QBPD) were not statistically different between the two groups (P>0.05).

Following the trend of all mentioned scores revealed a significant improvement in pain and functional disability in both groups 4 and 8 weeks post-intervention (Figures 2, 3, 4, 5), but there was no intergroup statistical difference among the VAS, ODI, QBPD, and RMDQ scales. The VAS score was also decreased 4 weeks post-intervention in both groups, but no statistically significant decline was seen 8 weeks compared to 4 weeks after injection (Table 2).

Discussion

Lumbosacral spinal stenosis is a disabling disorder that mostly affects the elderly over 65 years of age. Pain and walking limitations are the essential troublesome symptoms that limit the activity of daily living, so they should be considered in treatment strategies [3-5].

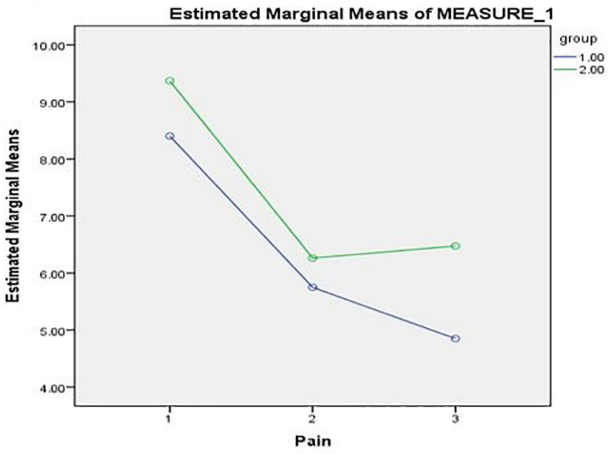

Figure 2: The trend of Visual Analog Scale score among groups A (mesotherapy, blue graph) and B (epidural steroid, green graph) in 8 weeks follow-up.

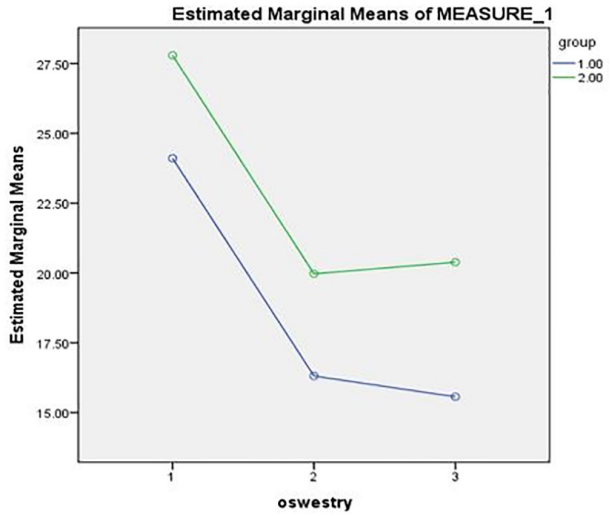

Figure 3: The trend of Oswestry Disability Index (ODI) score between the groups A (mesotherapy, blue graph) and B (epidural steroid, green graph) in 8 weeks follow-up.

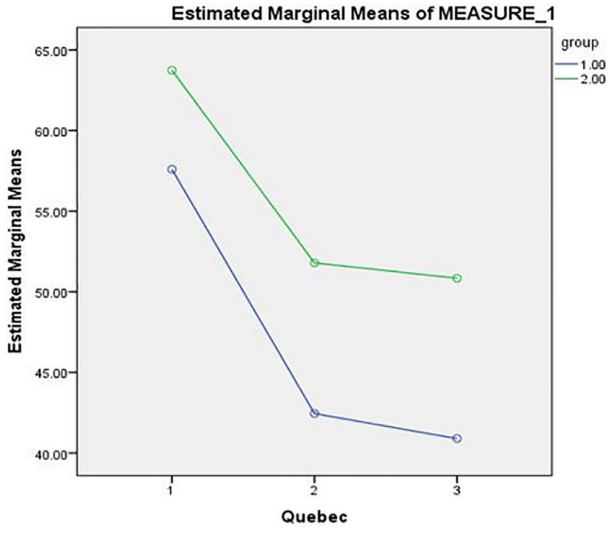

Figure 4: The trend of Quebec back pain disability scale (QBPD) score between groups A (mesotherapy, blue graph) and B (epidural steroid, green graph) in 8 weeks follow-up.

Table 1: Baseline characteristics of patients

	Group A (n=20)	Group B (n=19)	P value
Mean age (years)±SD	57.0±8.4	56.2±6.9	0.486
Sex (male/female)/%	2/18 (10/90%)	5/14(26.3/73.7%)	0.693

session, the patients and medical team are exposed to X-rays, and an operating room and high level of dexterity are required. Mesotherapy of calcitonin has a similar level of pain relief and functional improvement and can be well performed in an outpatient clinic with no need of an operating room or X-ray exposure, though it requires several sessions. Therefore, mesotherapy can be an alternative method of pain management in patients with lumbosacral spinal stenosis, if a good patient selection has been done.

Generally, all pain interventions are employed to attain the active rehabilitation phase so as to promote the activity of daily living, functional independence, and quality of life. Thus, none of them is the final goal; they are ways to a better rehabilitation program. The short-term follow-up and subjective patient assessment through the course of the study using the questionnaire rather than objective lab marker or radiologic evaluation were the important limitations of this study.

It is recommended that long-term studies with more objective assessment strategies be conducted to compare the efficacy of mesotherapy with calcitonin and epidural steroid injection in patients with lumbosacral canal stenosis.

Conclusion

Mesotherapy with calcitonin+Marcaine is as effective as caudal epidural steroid injection. Thus, considering the advantages, mesotherapy can be a proper alternative method for managing pain and functional impairment in patients with lumbosacral canal stenosis.

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Conflict of Interest: None declared.

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