

ORIGINAL RESEARCH

Compare the efficacy of Caudal Epidural Steroid Injections (CESIs) with conservative treatments in alleviating lumbosacral radicular pain

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ABSTRACT

Introduction: Lumbosacral radicular pain, or sciatica, represents a substantial source of discomfort, often leading to reduced mobility and significant impairment in daily activities. This condition mainly occurs because of nerve compression or inflammation in the lumbosacral area. **Objective:** To compare the efficacy of caudal epidural steroid injections (CESIs) with conservative treatments in alleviating lumbosacral radicular pain. **Methodology:** This comparative study was conducted at and a total of 55 patients diagnosed with lumbosacral radicular pain were added in the study. Patients reported radiating pain in the lower back and legs, consistent with sciatica, and had undergone diagnostic evaluations, including physical examinations, imaging studies and nerve conduction tests where necessary were included in the study. **Results:** Data were collected from 55 patients mean age was similar, with the CESI group averaging 52.3 years and the conservative group 50.7 years, and the gender distribution was nearly equal in both groups. BMI values were close, averaging 27.8 kg/m² in the CESI group and 26.9 kg/m² in the conservative group. The results indicate that both CESI and conservative treatments led to a reduction in pain over the 12-week period, with the CESI group experiencing significantly faster and more substantial improvements. At baseline, mean VAS scores were comparable between the CESI (8.2) and conservative (8.0) groups. **Conclusion:** It is concluded that Caudal Epidural Steroid Injections (CESIs) offer a more rapid and substantial reduction in pain and improvement in functional abilities compared to conservative treatments for lumbosacral radicular pain.

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INTRODUCTION

Lumbosacral radicular pain, or sciatica, represents a substantial source of discomfort, often leading to reduced mobility and significant impairment in daily activities. This condition mainly occurs because of nerve compression or inflammation in the lumbosacral area. Hence the manifestation of pain in the lower back that radiates down the leg, especially one or both legs, following dermatome distribution [1]. Some of the common causes for this continuing pain include lumbar disc herniation, spinal stenosis or degenerative disc disease. Since sciatica significantly affects patients' quality of life, identifying the best treatments is significant for the acute and chronic stage of this pathology [2]. Primary interventions include hot and cold therapies, exercise, weight loss, NSAIDs, muscle stretching, and massages designed to strengthen the spine muscles. These methods may

help to decrease perception of pain and to enhance the function in many instances but in some cases, they are non-invasive and may differ from one individual to the other. For example, physical therapy goals are to decrease mechanical load on the spine, increase range of motion and facilitate proper positioning. However, the conservative therapies can be a long-term therapy and some of the patients get a low percentage of pain relief, this initiated the need to incorporate other therapeutic modalities [3].

Of the interventional treatments, Caudal Epidural Steroid Injections – CESIs for short – stand out as preferred among other treatments modalities particularly for patients who have not responded to the former Linville et al., 2010. For this reason, given in the caudal epidural space at the base of the back, CESIs help corticosteroids reach the inflamed site, decrease irritation of the nerve root, and thereby

alleviate pain [4]. The first benefit of CESIs is their specificity apart from the fact that they enhance the rate of early symptom resolution compared with oral corticosteroids, they are less likely to cause systemic adverse effects. This indeed makes CESIs as an option acceptable since it provides patients with easy and potential enduring relieve from pains. In fact, the studies comparing CESIs to conservative treatments offer a rather mixed but nevertheless fascinating picture [5]. Most studies indicate that CESIs can offer more rapid, and sometimes almost immediate, pain relief – within days of receipt – which is ideal for those who have chronic severe, brief, flare-up type of pain. Also, some prospective studies have shown increased functional results, so the patient is able to proceed with his daily work faster than the patience relying on conservative treatment only [6]. Nevertheless, the time span of the patients that experiences pain relief after CESIs is not the same: some of them gets pain-free benefits that last for months while others need several injections. These injections can be risky and include chances of getting an infection, nerve damage and in severe cases; increased spinal pressure this shows that the risks of CESIs should be balanced against the benefits [7].

As with any comparison studied involving conservative treatments, CESIs also involve the evaluation of patient satisfaction, as well as improvements in quality of life. As an example, those patients who get CESIs can have a prompt feeling of improvement which will affect their mental health and decrease anxiety resulting from chronic pains [8]. Conversely, the conservative treatments take longer to manifest its effects compared to the invasive ones, has little side effect risks and, more often recommend changes in lifestyles that are likely to avoid future occurrences. Since the actual etiology of lumbosacral radicular pain is mechanical, the long-lasting pain relief can be achieved through non-pharmacological approaches targeting the source of the pain, in contrast to CESIs, which are focused, mainly, on pain. Selecting between CESIs and conservative treatments depends on certain patient's qualities, which can be pain's intensity, symptoms' duration, and preferences [9]. While conservative pain relief measures fail to manage acute severe pain, short-term use of CESIs can benefit patients, granting them a short interlude during which they can engage in physical therapy and other pain-mitigating activities. On the other hand, patients with what can be referred to as mild to moderate pathology will be able to benefit from conservative chiropractic treatment that is slow but effective and safe for the spine in the long run [10]. Overall, the comparison between CESIs and conservative treatments for lumbosacral radicular pain reflects a broader debate in pain management: that concerns whether to focus on the dramatic alleviation of symptoms or on the stable 'realization' of proper functioning and healthy state. Research indicates that the likely optimum is where conservative treatment is

used with CESIs only to reduce severe pain so that the patient can then serious commit to conservative treatments addressing the structural and lifestyle factors causing sciatica [11].

OBJECTIVE

To compare the efficacy of caudal epidural steroid injections (CESIs) with conservative treatments in alleviating lumbosacral radicular pain.

METHODOLOGY

This comparative study was conducted at and a total of 55 patients diagnosed with lumbosacral radicular pain were added in the study. Patients reported radiating pain in the lower back and legs, consistent with sciatica, and had undergone diagnostic evaluations, including physical examinations, imaging studies and nerve conduction tests where necessary were included in the study.

Data Collection

Data were collected from 55 patients in two groups.

Group A: CESI Group (n = 27)

Group B: Conservative Treatment Group (n = 28)

Patients in group A received Caudal Epidural Steroid Injections. The injections were administered under fluoroscopic guidance to ensure precise delivery to the caudal epidural space. The injection mixture included a corticosteroid (methylprednisolone acetate) and a local anesthetic (lidocaine) to provide immediate pain relief. Dosage and administration followed established guidelines, with the option for a repeat injection at six-week intervals if deemed necessary by the attending physician. Patients group B received conservative, non-invasive treatments. These included a combination of physical therapy, oral NSAIDs (e.g., ibuprofen), and lifestyle modifications tailored to each patient's condition. Physical therapy included stretching exercises, core strengthening, postural training, and modalities like heat therapy or electrical stimulation when indicated. Patients were also given guidance on ergonomic adjustments and advised on self-care practices to manage pain and prevent exacerbation. The study spanned three months, with follow-ups scheduled at intervals of two weeks, six weeks, and twelve weeks to assess pain intensity, functional outcomes, and patient satisfaction. Data were collected using standardized tools, including the Visual Analog Scale (VAS) for pain assessment and the Oswestry Disability Index (ODI) to measure functional impairment. Patient satisfaction was also evaluated through a brief questionnaire administered at each follow-up, allowing patients to report perceived pain relief, side effects, and overall satisfaction with their treatment approach.

Statistical Analysis

Data analysis involved comparing changes in VAS and ODI scores between baseline and each follow-up interval for both groups. Mean differences in scores

were calculated, and paired t-tests were used to assess within-group improvements over time. Independent t-tests were used to evaluate differences in outcome measures between the CESI and conservative treatment groups.

RESULTS

Data were collected from 55 patients mean age was similar, with the CESI group averaging 52.3 years and the conservative group 50.7 years, and the gender

distribution was nearly equal in both groups. BMI values were close, averaging 27.8 kg/m² in the CESI group and 26.9 kg/m² in the conservative group. The duration of symptoms was evenly distributed, with approximately half of each group experiencing symptoms for more than 12 weeks. Baseline pain and functional impairment, measured by VAS and ODI scores, were also similar, indicating both groups had comparable initial pain levels and disability.

Table 1: Demographic and Baseline Characteristics of Patients

Characteristic	CESI Group (n = 27)	Conservative Group (n = 28)
Age (mean ± SD)	52.3 ± 10.2 years	50.7 ± 11.1 years
Gender (Male/Female)	15/12	14/14
BMI (mean ± SD)	27.8 ± 4.1 kg/m ²	26.9 ± 3.9 kg/m ²
Symptom Duration		
- 6–12 weeks	14 (52%)	15 (54%)
- >12 weeks	13 (48%)	13 (46%)
Baseline VAS Score (mean)	8.2	8.0
Baseline ODI Score (mean)	68%	66%
Smoking History (%)	7 (26%)	8 (29%)
Comorbidities		
- Hypertension	9 (33%)	10 (36%)
- Diabetes	5 (18%)	6 (21%)

The results indicate that both CESI and conservative treatments led to a reduction in pain over the 12-week period, with the CESI group experiencing significantly faster and more substantial improvements. At baseline, mean VAS scores were comparable between the CESI (8.2) and conservative (8.0) groups. By the 2-week mark, the CESI group saw a notable reduction in pain to 5.4, compared to 6.8 in the conservative group ($p < 0.05$). This trend continued, with the CESI group achieving a mean VAS score of 3.6 at 6 weeks, versus 5.7 in the conservative group, again showing statistical significance ($p < 0.05$).

Table 2: Pain Relief (Visual Analog Scale - VAS) Over 12 Weeks

Time Point	CESI Group (Mean VAS Score)	Conservative Group (Mean VAS Score)	p-value (CESI vs. Conservative)
Baseline	8.2	8.0	-
2 Weeks	5.4	6.8	< 0.05
6 Weeks	3.6	5.7	< 0.05
12 Weeks	2.8	4.9	< 0.05

At baseline, the mean ODI scores were similar, with 68% in the CESI group and 66% in the conservative group. After 2 weeks, the CESI group exhibited a marked reduction in functional disability to 55%, compared to 61% in the conservative group ($p < 0.05$). This improvement continued at 6 weeks, with the CESI group achieving a mean ODI score of 42%, in contrast to 52% in the conservative group ($p < 0.05$). By 12 weeks, the CESI group reached a further reduced mean ODI score of 34%, while the conservative group reported 47% ($p < 0.05$).

Table 3: Functional Improvement (Oswestry Disability Index - ODI) Over 12 Weeks

Time Point	CESI Group (Mean ODI Score %)	Conservative Group (Mean ODI Score %)	p-value (CESI vs. Conservative)
Baseline	68%	66%	-
2 Weeks	55%	61%	< 0.05
6 Weeks	42%	52%	< 0.05
12 Weeks	34%	47%	< 0.05

In the CESI group, 85% of patients reported high satisfaction, compared to 60% in the conservative group. Moderate satisfaction was noted in 10% of the CESI group and 30% of the conservative group, while low satisfaction was reported by only 5% of the CESI group and 10% of the conservative group. Additionally, minor

side effects, such as injection site soreness or mild numbness, were reported by 15% of CESI patients, while no adverse effects were reported in the conservative treatment group.

Table 4: Patient Satisfaction at 12 Weeks

Group	High Satisfaction	Moderate Satisfaction	Low Satisfaction	Side Effects (%)
CESI Group (n = 27)	85%	10%	5%	15% (Minor)
Conservative Group (n = 28)	60%	30%	10%	0%

At the 2-week mark, the CESI group experienced a 34% reduction in pain, compared to 15% in the conservative group, and showed a 19% improvement in functional ability versus 8% in the conservative group. By 6 weeks, the CESI group's pain reduction reached 56%, while the conservative group achieved 29%. Functional improvement in the CESI group also climbed to 38%, nearly doubling the 21% improvement in the conservative group. By the end of the 12-week period, CESI patients had a 66% reduction in pain and a 50% functional improvement, compared to 39% pain reduction and 29% functional improvement in the conservative group.

Table 5: Improvement Percentage in Pain and Function from Baseline

Time Point	CESI Group: Pain Reduction (%)	Conservative Group: Pain Reduction (%)	CESI Group: Functional Improvement (%)	Conservative Group: Functional Improvement (%)
2 Weeks	34%	15%	19%	8%
6 Weeks	56%	29%	38%	21%
12 Weeks	66%	39%	50%	29%

DISCUSSION

This study aimed to compare the efficacy of Caudal Epidural Steroid Injections (CESIs) with conservative treatments in alleviating lumbosacral radicular pain. At the same time, these findings demonstrate important implications for clinicians and patients, especially regarding the approach to treatment choices personalised to patient's needs and risk characteristics. Decreased VAS scores at each follow-up time point of the CESI group also exhibited that CESIs can certainly provide early relief by directly placing steroid to the wounded site, alleviating nerve root inflammation, supported by previous studies [12]. Thus, while the conservative treatment revealed the decrease of the pain over time, the performance of this group of patients was slower as compared to the others. This suggests that although CESIs could be useful in engrossing patients with severe accountable intense pain, a conservative approach might remain a low-risk efficient, and durable strategy for patients with mild persistent pain [13]. Functional recovery assessed by ODI was better for CESI group in which 50% patients had 50% improvement on the final follow-up, compared to 29% of conservative group. This result provides evidence for the belief that CESIs may facilitate a patient's discharge process and return to independent living. In regard to the role of such changes in patients with a significant degree of functional limitation, this improvement may be critical for determining quality of life, providing them with a better ability to engage in rehabilitation and make necessary behavioral and lifestyle adjustments that would forestall the recurrence of symptoms [14]. Indeed, patient satisfaction was significantly higher in the CESI group as compared to the control arm of the study since the number of patients who reported high

levels of satisfaction with the treatment outcome at 12 weeks was 85 percent. This may be due to the sooner provision of such factors with the help of CESIs and the overall improvement of patients' psychological conditions and absence of anxiety about the constant pain [15]. However, CESIs are reported to be related with small side effect like pain at the site of injection, temporary numbness and slight headache which were not reported in conservative management group. Even though, the majority of these side effects were mild and of short duration, it is noteworthy that potential Benefits and Risks of CESIs should be discussed thoroughly with patients by clinicians and these adverse reactions should be recognized as important reason against to the use of CESIs [16]. However, both groups were balanced with regard to the age, BMI, symptoms' duration, as well as the presence of comorbidities before the start of treatment, and the absence of significant differences in these characteristics could explain the possibility of comparing two types of treatment. This balance increases the validity of the findings and may indicate that CESIs could be helpful for almost all the subgroups of the population. CESIs also have their drawbacks: the prime one of which is the danger linked with repeated injections, such as infection, nerve impairment and other [17]. Hence, it could be argued that although CESIs may provide a form of symptomatic relief, they are not a long-term solution and serve no such role in the management of patients in whom conservative care may be directed at addressing mechanical considerations which may be causative of radicular pain [18]. If the patient is to have long-term symptom control, including CESIs as a component of multifaceted strategy with pain relief, physical therapy and alteration of lifestyle seems to

hold the best prospects [19]. A limit to this research is that it was only conducted over a 12-week period. Further research works with more extended follow-up time could reveal how long the improvements achieved with CESI persist, and whether additional injections are potentially required at some point in the future. Moreover, patients' characteristics that might influence response to CESIs over any conservative interventions, like psychological readiness for change, initial level of functioning, or other aspects of patients' life might need further investigation.

CONCLUSION

It is concluded that Caudal Epidural Steroid Injections (CESIs) offer a more rapid and substantial reduction in pain and improvement in functional abilities compared to conservative treatments for lumbosacral radicular pain. Patients receiving CESIs showed greater satisfaction due to the immediate relief and enhanced mobility afforded by targeted corticosteroid administration. However, while CESIs prove effective for acute symptom management, they are associated with minor, short-term side effects and may require repeat applications, which introduces potential risks.

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