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DEXMEDETOMIDINE FOR TRANSFORAMINAL EPIDURAL INJECTION FOR LUMBOSACRAL RADICULAR PAIN IN DIABETES MELLITUS PATIENTS: A CASE SERIES

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Background: Epidural steroid injection is challenging in patients with diabetes due to its associated complications including metabolic endocrine changes and osteoporosis. Dexmedetomidine is a highly selective alpha-2 agonist that has analgesic effects without affecting respiratory depression; its analgesic effect is achieved by on and above the spinal cord level.

Case Report: Under fluoroscopy-guided transforaminal injection of dexmedetomidine 50 µg with 0.2% ropivacaine, 2 mL were administered in 10 patients with diabetes mellitus. After the procedure, the Numeric Rating Scale score, Oswestry Disability Index, motor power, and sensory examination were assessed at one-week, one-month, and 3-month intervals.

Conclusions: The use of dexmedetomidine for transforaminal injection in treating lumbosacral radicular pain appears to show encouraging results: it is feasible, safe, and associated with minimal adverse effects.

Key words: Dexmedetomidine, lumbosacral radicular pain, neuropathic pain, neuroprotective

BACKGROUND

One of the most common causes of chronic pain patients presenting in hospitals is low-back pain (LBP). The global prevalence of LBP is 70% to 85% throughout the lives of individuals (1). The foremost cause of LBP has been found to be the secondary mechanical pressure on a nerve root due to a slipped intervertebral disc, resulting in inflammatory processes and leading to a lumbosacral radicular pain cascade. The main treatment modality of lumbosacral radicular pain involves medication, physiotherapy, and an epidural steroid injection (ESI) (2). However, ESI is associated with headache, flushing, water retention, metabolic and endocrine changes, hyperglycemia, and osteoporosis (3). A rise in blood sugar after a transforaminal steroid injection is the principal issue in the diabetes population. Dexmedetomidine is a new-generation, selective a2 adrenergic receptor agonist with sedative and analgesic properties, and capacity to inhibit sympathetic nerves; its analgesic impact is accomplished by acting at the spinal cord and above the spinal cord (4). In addition, the neuroprotective properties of dexmedetomidine are due to its anti-oxidative effects. We mainly focus on clinical applications of dexmedetomidine in the relief of neuropathic pain.

METHODS

After obtaining written informed consent, all 10 patients were included in our study. All patients presented to our pain clinic with complaints of lumbosacral radicular pain radiating to the leg and foot. Patients

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underwent routine blood investigations to rule out any infection and coagulation abnormalities, and all patients' glycosylated haemoglobin (HbA1c) were more than 10 mmol/mol. The clinical findings are summarized in Table 1. The transforaminal block was carried out with patients in a prone position with a pillow under the abdomen to overcome lumbar lordosis. Then the Scottie dog sign was determined using fluoroscopy oblique view of 20°. Under strict aseptic precautions, the skin and subcutaneous tissue were infiltrated with 2% lignocaine. The lumbar transforaminal block was performed with a 12-cm-long, 22-gauge BD Quincke spinal needle (Vygon Pvt.Ltd.,Gurgaon,India) inserted in tunnel-vision view at the 6 o'clock position of the eye of the Scottie dog sign further directed toward just below the pedicle. After making sure that the needle's tip was properly placed on the anteroposterior and lateral view, 2 mL of water-soluble, radio-opaque non-ionic contrast agent was injected and a free flow of dye along the nerve root was seen. After that, the solution containing ropivacaine 0.2%, 2 mL with 50 μg dexmedetomidine was injected at each level. The block was performed as a day-care procedure and the patients were observed for 2 hours after the procedure for any complications. Patients were discharged with oral pregabalin 75 mg before bedtime. If NRS-11 > 3, acetaminophen 650 mg was administered every 8 hours. At the follow-up visit, the patient's NRS-11 score, Oswestry Disability Index (ODI) score, motor power, and sensory examination were assessed at one-week, one-month, and 3-month intervals. If improvement in NRS-11 score was above 70%, we would only perform the follow-up assessments; if the improvement was below 70%, then the re-injection was performed.

RESULTS

All patients had pre-procedure NRS-11 scores ranging from 4 to 8, which were reduced following the block and subsequent follow-up visits at one week, one month, and 3 months (Figs. 1,2). The demographic parameters of the patients are described in Table 2. The mean NRS-11 score before the block was 6.4 ± 1.429. NRS-11 scores at one-week, one-month, and 3-month follow-ups were 4.8 ± 0.918, 3.2 ± 1.229, and 2.7 ± 1.159, respectively; these reductions were statistically significant for one-month and 3-month time intervals (Table 3). Among all 10 patients, ODI scores were reduced to minimal disability after 3 months of follow-up. For case number 4 and case number 10, the reduction in NRS-11 score was less than 70% at 3 months, therefore a repeat block was performed. No patients showed any neurological, sensory, or motor deficit during the follow-up visit. Only one patient had bradycardia after the injection, which was managed with atropine 0.6 mg. No other adverse effect was seen in the rest of the patients.

DISCUSSION

Our study showed that dexmedetomidine substantially decreased the NRS-11 and ODI scores for up to 3 months. Currently, nonparticulate steroids (e.g., dexamethasone) are gaining popularity over particulate ones (e.g., triamcinolone) due to the many adverse effects of particulate corticosteroids (5). Dexmedetomidine, an extraordinarily selective alpha-2 agonist, will increase the activity of noradrenergic neurons inside the locus coeruleus of the brainstem and consequently complement the inhibitory action of gamma-amino-butyric acid inside the ventrolateral preoptic neurons, sooner or later enhancing the analgesic effects. Dexmedetomi-

Table 1. Clinical examination and MRI findings.

Case No.	Duration of Pain (mos)	NRS-11 at Presentation	Lasegue's Test Positive at (degree)	ODI at Presentation	MRI Films Showing Intervertebral Disc Protrusion at Various Nerve Roots
1	14	8	45	24	Right-L4-L5
2	13	5	40	10	Left-L5
3	12	6	60	20	Left-S1
4	16	7	35	21	Right-L5
5	10	4	55	12	Right-L5-S1
6	12	8	50	21	Right-L4-L5
7	16	5	40	21	Left-L5-S1
8	18	7	45	16	Left-L5-S1
9	10	6	50	18	Right-L5-S1
10	8	8	30	22	Left-L4-L5

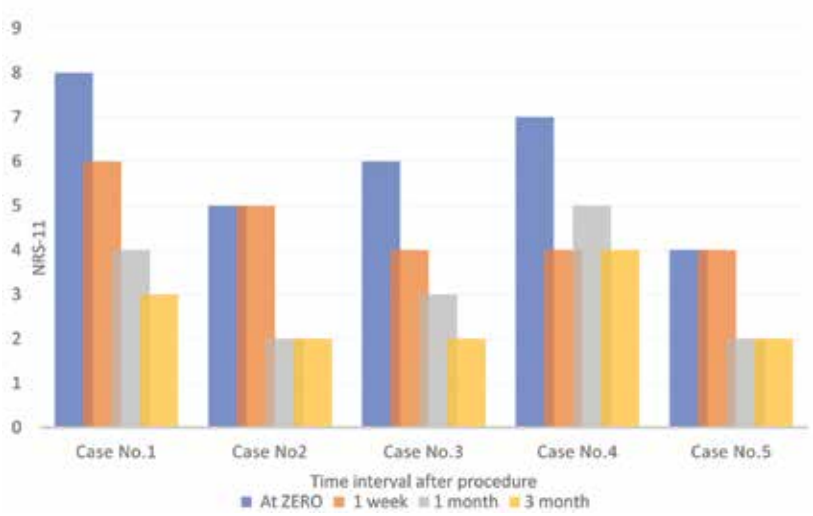

Fig. 1. Comparisons of NRS-11 scores pre- and post block at various time intervals.
Abbreviation: NRS-11, Numeric Rating Scale

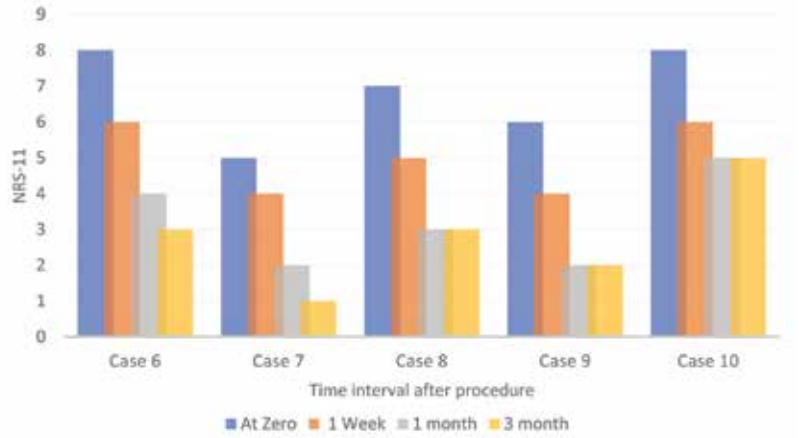

Fig. 2. Comparisons of NRS-11 scores pre- and post block at various time intervals.
Abbreviation: NRS-11, Numeric Rating Scale

dine has demonstrated analgesic impact in an animal study for both acute and chronic inflammatory pain (6). Dexmedetomidine is associated with a few complications, which include bradycardia. Therefore, strict tracking is needed in its use. Moreover, in addition to the neuroprotective impact of dexmedetomidine, the drug has begun to be studied in neuropathic pain diseases (7). The addition of dexmedetomidine as an adjuvant in epidural anaesthesia was found to be safe and perform synergically; it intensified the analgesic effects of local anesthetics (8). Eskandr et al (9) demonstrated the powerful utilization of dexmedetomidine along with epidural steroids to manipulate pain in patients with failed back surgery procedure syndrome. Furthermore, Tauheed et al (10) included one mcg/kg of clonidine with methylprednisolone in transforaminal epidural injections and reported significantly greater

Table 2. Demographic and vitals parameters.

Case No.	Age / Gender	Weight (kg)	BMI (kg/m^2)	Heart Rate (per min)	Mean Blood Pressure (mm Hg)
1	45 y / M	58	24.33	87	86
2	70 y / F	80	26.55	76	70
3	51 y / M	68	22.34	90	90
4	34 y / M	70	28.20	65	78
5	45 y / F	83	26.54	74	85
6	64 y / M	65	25.56	86	76
7	58 y / M	65	26.84	78	94
8	35 y / M	55	21.54	94	82
9	60 y / F	78	25.65	89	74
10	38 y / M	73	24.50	82	80

Table 3. Mean Numeric Rating Scale score before and after the block.

Time of Assessment	NRS-11 Score (Mean ± SD)	*P* Value
Before intervention	6.4 ± 1.429	
1 wk after intervention	4.8 ± 0.918	0.080
1 mo after intervention	3.2 ± 1.229	0.001
3 mo after intervention	2.7 ± 1.159	0.001

Abbreviations: BMI, body mass index; F, female; MRI, magnetic resonance imaging; M, male; NRS-11, Numeric Rating Scale; ODI, Oswestry Disability Index; SD, standard deviation

pain comfort than with methylprednisolone alone. However, Zargar et al (11) concluded that neostigmine and dexmedetomidine could reduce chronic LBP after epidural block. Imani et al (12) conducted a comparative study and found that 50 µg of dexmedetomidine is more effective for the reduction of lumbar radicular pain than 20 mg of triamcinolone. The limitations of our study were that an assessment of serum calcium, magnesium, and vitamin D levels were not performed. A randomized controlled trial with a larger sample size and longer duration of follow-up is needed to establish the role of dexmedetomidine in patients with lumbosacral radicular pain.

CONCLUSIONS

The present study showed that the transforaminal block with dexmedetomidine encompasses a vital impact on the reduction of pain and disability as measured by the NRS-11 and ODI in patients with lumbosacral radicular pain. In the case of patients with diabetes, there are fewer chances of hyperglycemia and osteoporosis; hence, dexmedetomidine can be considered an appropriate alternative to steroids.

Author Contributions

S. Ahmad performed the transforaminal block and A. Kumar K. Singh were involved in data collection, data interpretation, data analysis, and literature review. S. Naaz helped in manuscript preparation, including figures and writing.

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