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Transforaminal steroid injections for the treatment of lumbar radiculopathy

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Abstract
The utilization of transforaminal epidural steroid injections (TFESIs), an elective diagnostic and therapeutic spinal procedure, has risen dramatically over the past decade. Fluoroscopic guidance is important during lumbar epidural injection to increase the certainty of correct needle placement, thus minimizing the risk of complications. Patients with radiculopathy, who did not respond to physical therapy, anti-inflammatories, or analgesics confirmed by magnetic resonance imagining received fluoroscopically guided lumbar transforaminal epidural steroid injections at the presumed symptomatic nerve root.
This study included 32 individuals with lumber radiculopathy and followed at 1, 2 and 4 after injection.

Keywords: lumbar radiculopathy; nerve root block; steroid injection

Introduction
For radicular pain in patients with degenerative spinal disorders, Steroid injections are commonly employed as an alternative treatment [1]. The leading cause of disability in the world is low back pain, with a lifetime prevalence rate estimated between 51% and 84% [2, 3]. Lumbosacral radiculopathy is a common type of back pain that affects the lumbosacral nerve roots and causes radicular symptoms radiating into the lower extremities. The lifetime incidence is estimated at 13% to 40% [4]. In one systematic review, it was estimated that 36.6% of patients with chronic low back pain had predominantly neuropathic pain [5]. The Dura is a protective covering of the spinal cord and its nerves. The space surrounding Dura is called the epidural space. In the lower back, it is called lumbar epidural space. The injection reduces the inflammation and pain caused by pressure on the nerve. It can also be used as a diagnostic tool to help determine whether the nerve is irritated by "numbing" the nerve. One of the most common conditions to benefit from selective nerve root injections is a herniated disc that causes low back and leg pain (sciatica). Selective nerve root block injection (SNRB) is an injection of a long-lasting steroid (cortisone) around the nerve root as it exits the spinal column. So it's used to both diagnose and treat an inflamed spinal nerve [6-8]. Fluoroscopically guided transforaminal epidural steroid injections may help reduce unilateral radicular pain and improve standing and walking tolerance in patients with degenerative lumbar spinal stenosis [9]. The aim of the study is to assess the short-term effect of a single dose of corticosteroids injected close to lumber nerve roots in patients with lumber radiculopathy with radicular pain. The diagnosis is based on history, clinical examination, MRI of the lumber spine, and positive response to diagnostic SNRB.

Clinical Materials and Methods
The present study includes 32 consecutive patients, 16 men and 16 women, presenting with lumber radiculopathy. The mean age was 50 years (range 39–65), with a mean symptom duration of 54 months (Table 1). The inclusion criteria were lumber radiculopathy with radicular pain on one leg and corresponding significant degenerative pathology of the lumber

spine, at one or two levels on the same side as the radicular pain and visualized by MRI. Only MRI pathology with a close relation to the nerve root(s) is classified as significant. Diagnostic transforaminal SNRB, at level(s) presenting with MRI pathology on the same side as the radicular pain, was mandatory for a positive response to all patients. In all 32 patients, the performed investigations indicated affection of lumber nerve roots based on a degenerative disease in the lumber spine. Patients with spinal cord compression and/or myelopathy were excluded. Informed consent was taken. The study is approved by the ethical committee of SGT University.

Table 1: Duration of symptoms and Treatment effect

No	Sex	Age	Duration of symptoms (months)	Root	Treatment effect At 4 week
1	M	56	4	L4-L5	1
2	F	49	85	L4-5,L5-S1	1
3	M	50	52	L4-5,L5-S1	1
4	M	65	56	L4-L5	1
5	M	47	69	L3-4,L4-5	1
6	M	46	25	L4-L5	0
7	F	55	78	L4-L5	1
8	M	60	54	L4-L5	0
9	F	42	8	L3-4,L4-5	1
10	M	44	64	L4-L5	1
11	F	43	34	L4-5,L5-S1	0
12	M	56	78	L3-L4	1
13	F	39	87	L4-L5	0
14	F	43	67	L3-4,L4-5	1
15	F	50	47	L3-4,L4-5	1
16	M	55	32	L4-L5	1
17	F	61	87	L4-L5	1
18	F	47	90	L4-L5	0
19	M	47	5	L5-S1	0
20	F	49	86	L4-L5	1
21	F	50	66	L3-4,L4-5	0
22	F	56	53	L4-L5	1
23	F	50	34	L4-5,L5-S1	0
24	M	53	85	L3-L4	1
25	F	44	69	L5-S1	1
26	M	46	54	L4-L5	0
27	M	60	43	L4-5,L5-S1	1
28	F	43	55	L5-S1	1
29	F	55	64	L4-L5	0
30	M	45	35	L5-S1	1
31	M	50	46	L4-5,L5-S1	0
32	M	44	46	L4-5,L5-S1	1

Technique

Injection procedures are:

1. Injection xylocard 2%
2. Injection bupivacaine 0.5%
3. Injection of triamcinolone acetate (Steroid, especially for therapeutic procedures)
4. Injection omnipaque (300 ppm iodine)

A 10 cc syringe is loaded with 2% xylocard for initial infiltration of the injection track. A 5 cc syringe is loaded with a mixture of 2% xylocard, 0.5% bupivacaine and steroid (wherever indicated). Another 2 cc syringe is loaded with the radiopaque dye (omnipaque)

Transforaminal Discography

Discogram is usually performed to ascertain the disk morphology as well as to elicit a concordant pain response on provocation so as to ascertain that a particular disk as the source of pain. Another recent indication for a discography that is more useful than provocation is the analgesic discogram. By analgesic discogram, we mean that the needle is introduced into the disk space and after injecting the radiopaque dye into the disk to ascertain the internal disk morphology, we inject 1–2 cc of bupivacaine to ascertain if blocking that particular disk relieves the patient's pain or not. This has been shown to have a better predictability of the disk as the source of pain. The skin entry point for performing a discogram is chosen in the oblique view. The starting point lies just anterior to the superior articular process of the inferior vertebra at the level of the middle of the disk space. The needle is advanced along the direction of the C-arm and 1-2 mm anteriorly.

Place the patient prone position, prepared skin area and drape the area. Under anteroposterior fluoroscopic guidance, identify target interspace and anesthetized .22 G spinal needle advance under fluoroscopy until contact is made with the lower edge of the superior transverse process near its junction with the superior articular process then retract 2-3 mm, redirect toward the base of the appropriate pedicle in 6-o" clock position under fluoroscopy (adjust c –arm to confirm position) inject 1ml nonionic contrast agent to produce perineurosheathogram. After an adequate dye pattern was observed, inject slowly steroid with 0.5% bupivacaine.

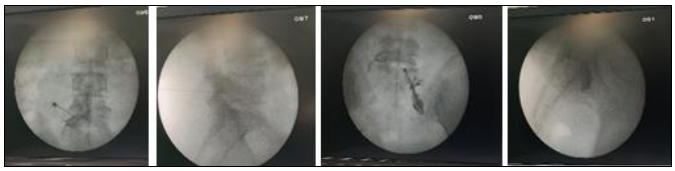

Fig 1: Perinueroshesthogram (C-arm image) of S1 and L5 for transforaminal block

Patient Selection

Follow-up patients were evaluated immediately prior to and 4 weeks following the injections. A surgeon performed all evaluations and included patient examination and completion of a subjective symptom/reaction questionnaire.

Questionnaire

A questionnaire including six questions was used as follow up of the treatment (Table 2). The aim of the questionnaire was to cover subjective changes in symptoms associated with lumber radiculopathy, including the location of pain, muscle strength, sensory changes, analgesic dose, and sleep quality.

Table 2 Design of follow-up questionnaire used to detect the effect from the treatment. Following the completion of the questionnaire, a clinical investigation was undertaken. In order to assess early as well as late changes from the treatment, the patients were asked to relate changes of symptoms to the first, second, and four weeks

Table 2: Effect of after treatment

Have You felt any changes in leg pain?	No	Yes, to the better	Yes, to the worsen
Has the power of Your foot/leg undergone any changes?	No	Yes, it increased	Yes, it decreased
Has the sensibility in Your foot/leg undergone any changes?	No	Yes, to the better	Yes, to the worsen
Have Your leg mobility undergone any changes?	No	Yes, it increased	Yes, it decreased
Have You changed your intake of analgesics?	No	Yes, it increased	Yes, it decreased
Have Your quality of sleep undergone any changes?	No	Yes, to the better	Yes, to the worsen

Data analysis

The clinical criteria of positive response to the treatment were a significant subjective reduction of the radicular pain and/or significant subjective reduction of neurological symptoms. When performing the statistical analysis of treatment results, all data from the questionnaire were compared (Table 3). Questionnaire results were compiled according to the first, second, and four weeks following treatment. All data were analyzed using a computer software package (SPSS, release 10.0.0).

Table 3: Treatment Effect

Have You felt any changes in leg pain?	LP	0 –no effect 1-positive effect
Has the power of Your foot/leg undergone any changes?	PC	
Has the sensibility in Your foot/leg undergone any changes?	CIS	
Have Your leg mobility undergone any changes?	LM	
Have You changed your intake of analgesics?	CIA	
Have Your quality of sleep undergone any changes?	SQ	

Table 4: Positive (1) and negative (0) findings of 32 patient's data regarding the questionnaire asked in Table No 3.

NO	LP	PC	CIS	LM	CIA	SQ
1	1	0	0	1	1	1
2	1	1	1	1	1	1
3	1	0	0	1	1	1
4	1	0	1	1	1	1
5	1	1	1	1	1	1
6	0	1	1	0	0	1
7	0	0	1	0	0	0
8	0	0	0	0	0	0
9	1	0	1	1	1	1
10	1	1	1	1	1	1
11	1	1	1	1	1	1
12	1	1	1	1	1	1
13	1	1	1	1	1	1
14	0	0	0	0	0	0
15	1	0	0	0	0	1
16	1	0	0	1	1	1
17	1	1	1	1	1	1
18	0	0	1	0	1	1
19	1	1	1	1	1	1
20	1	0	0	0	0	1
21	1	0	0	1	1	1
22	0	0	0	0	1	0
23	1	0	0	1	0	1
24	1	1	1	1	1	0
25	1	1	1	1	1	1
26	1	0	0	1	0	0
27	0	0	0	0	0	0
28	1	1	1	1	0	0
29	0	0	0	0	0	0
30	1	0	0	1	1	1
31	0	0	0	0	1	0
32	1	1	1	1	1	1

Results

Patients for steroid treatment, twenty patients received treatment with steroids and local anesthesia at one level and twelve patients at two levels. Twenty one out of the 32 patients reported a positive response from the treatment, and in eighteen out of the twenty-one patients, the effect lasted 7 days or more. Sixteen patients reported a remaining effect from the treatment at follow up after 4 weeks (Table1).

Statistical analysis

Statistical analysis revealed a significant difference ($P < 0.05$) for the measured parameters at 1, 2, or 4 weeks after the treatment.

Complications

The study showed no serious complications. At 4 weeks follow up, none of the patients reported persisting negative effects from the treatment.

Discussion

The results in this study showed a positive response with the combination of steroid and local anesthetics for the treatment of lumbar radiculopathy. This is of interest as steroid injections are used as a non-surgical approach to lumbar radiculopathy. In this prospective cohort study, Botwin KP, Gruber RD, Bouchlas CG reported 34 patients with lumbar radiculopathy and were followed for 1 yr. Seventy-five percent of patients had successful long-term outcome, reporting at least a >50% reduction between preinjection and postinjection pain scores, with an average of 1.9 injections per patient. Sixty-four percent of patients had improved walking tolerance, and 57% had improved standing tolerance at 12 mo [9].

Conclusion

Unilateral radicular pain reduction and improve standing and walking tolerance in patients with degenerative lumbar spinal stenosis by fluoroscopically guided transforaminal epidural steroid injection.

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