



EFFECTIVENESS OF EPIDURAL STEROID INJECTION FOR THE MANAGEMENT OF CHRONIC LOW BACK PAIN.

Orthopaedics

Ravi Ranjan Singh Senior Resident, Department of Orthopaedics, Nalanda Medical College and Hospital, Patna Bihar, India.

Bharat Singh* Professor, Department of Orthopaedics, Nalanda Medical College and Hospital, Patna Bihar, India. *Corresponding Author

ABSTRACT

INTRODUCTION: Low-back pain is a common clinical presentation of herniated lumbar disc. The incidence of low back pain is high in our country due to difficult working and living environment. The initial treatment of low back pain is conservative. Epidural steroid injection (ESI) is being slowly established as a simple, effective and minimally invasive treatment modality. The aim of this study is to assess the effectiveness of epidural steroid injection for low back and radicular pain.

MATERIALS AND METHODS : This is a Prospective observational study. It was carried out on the patients presenting with low back pain due to herniated lumbar disc not responding to conservational management and had Magnetic Resonance Imaging (MRI) proven lumbar disc prolapsed at different level. Injection Methyl prednisolone 80 mg and 2 ml of 0.5% bupivacaine was diluted in 8 ml of normal saline and injected into the affected lumbar epidural space. The functional status of the patient and the severity of pain were evaluated before injection and after injection during the follow-up period by using Ostrewy disability index and visual analogue score.

RESULTS: Fifty six patients received the epidural steroid injections, among them three patients did not came for regular follow up till six months and six patients required surgery. remaining forty seven were analyzed, among them 27(55.44%) were male and 20(42.55%) were female. The functional status and pain response of the patients were improved significantly during all the follow-up periods ($p < 0.001$). The success rate of this study was 83.92%. No major complications were encountered.

CONCLUSION: The ESI is a simple, safe, effective and minimally invasive modality for the management of lumbar radicular pain.

KEYWORDS

Epidural steroid injection, low back pain, herniated lumbar disc.

INTRODUCTION

Low-back and radicular pain is a common presenting complain of herniated lumbar disc. Its life time incidence in the United States is 80%.¹ The data of our country is not available but the prevalence is high because of hilly terrain, difficult working and living environment. This is a disabling condition of young adults and is the most common cause of limitation of physical activity.¹ The treatments used for this problem may be categorized as conservative management, epidural steroid injection, and surgery.^{2,3} Epidural steroid injection (ESI) is a nonsurgical treatment for managing low back and radicular pain caused by herniated lumbar disc. The low back pain of mechanical origin, accompanied by signs and symptoms of nerve-root irritation, respond to epidural steroid injection with gratifying results. It relieve pain, improve function, and reduce the need for surgical intervention. Therefore, the long acting epidural steroid injection has been widely used and slowly established as a reliable mode of minimally invasive treatment modality in many orthopaedic centres of the world. It has been shown to provide analgesia for variable periods.^{4,5}

The purpose of this study was to assess the effectiveness of epidural steroid injection for low back and radicular pain.

MATERIALS AND METHODS

This is a prospective observational study, conducted in the department of orthopedics, Nalanda Medical college and hospital, Patna, Bihar over a period of one and half year, from January 20019 to July 2020. During this period sixty patients presented to the hospital with complain of low back pain radiating to legs. Patients having back pain not responding to conservative treatment (i.e. Non-steroidal Anti-inflammatory drugs (NSAIDs), antidepressant, oral steroids, transcutaneous electrical nerve stimulation (TENS), traction and ultrasound), and had MRI proven lumbar disc prolapse at different level were included in the study. Exclusion criteria included motor deficit, prior lumbar disc surgery, diabetes, bleeding disorder, and patient refusal.

This study was approved by the hospital research committee. Written and informed consent was obtained from each patient. Then thorough history was taken and clinical examination was done. The findings of straight leg raising test (SLR), motor and sensory deficit, and deep tendon reflexes (DTR) were noted. Routine laboratory investigations including prothrombin time, bleeding time, clotting time and platelets were done. Random blood sugar was also done to rule out any subclinical diabetes. The ESI was given by trained anaesthesiologist in operation theatre. During the procedure, peripheral venous access was

secured in all the patients with 20 G intravenous cannula on the dorsum of hand. Patients were connected to the patient monitor for monitoring ECG, heart rate, non-invasive blood pressure (NIBP), and pulse oximetry. All the patient were kept in sitting position. Cleaning and draping of the part was done under aseptic precaution.

The disc level for ESI was located by surface anatomy. Using strict aseptic technique, two millilitres of 1% lidocaine was infiltrating to the skin and subcutaneous tissue for surface anaesthesia. An 18 gauge Toughy epidural needle was inserted into the epidural space of the herniated lumbar disc through trans-lumbar route with the bevel upward and stylet in position. The epidural space was identified by loss of resistance to air technique.

Injection methylprednisolone 80 mg (Depo-Medrol® by pfizer) and 2 ml of 0.5% bupivacaine (Sensorcaine® by Astra Zenica) was diluted in 8 ml of normal saline and injected into the lumbar epidural space. After the procedure, patients were advised to lie supine. During this period they were observed for any possible complications. The patients were first reviewed after one week, and then further follow up was carried out at one month & six months after the epidural steroid injection. During follow up, the Oswestry disability index (ODI) and visual analog score (VAS) were used to evaluate the response of treatment. The ODI was employed to quantitate the level of functional disability.

It consist of ten questions, each with six alternative scores 0–5⁶⁻⁸ The sum of the scores was expressed as a percentage. A change of more than 10 points or a change of a minimum of 20% was considered a significant clinical improvement. VAS score was used for assessment of current back and lower extremity pain, ranging from 0 (no pain) to 10 (worst pain possible). If a patient subjectively reported a decrease in pain within one week after a single injection, no more injections were administered. If the patient didn't have improvement within a week, a second injection was performed. Patients with low back pain not responding to second dose of ESI were considered for surgery. If the patient didn't have subjective improvement even after a second dose of ESI considered as failure of ESI. The success rate of epidural steroid injection was presented as percentage. The total number of patients who received the epidural steroid injection irrespective of follow up status was considered as denominator. All patients were advised to take mild analgesics (Tab. diclofenac 75 mg per oral eight hourly for 1 day) during the post-injection period. No special exercise program or other physical therapy was employed after the injections.

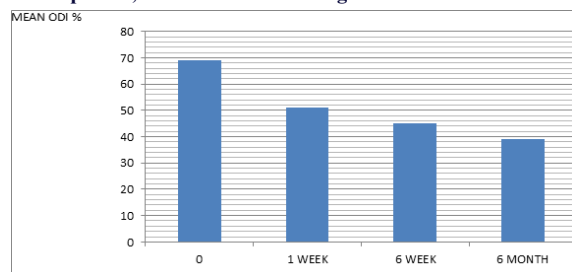
The data analysis was done by using the software SPSS 11.0. Paired t-

test was applied to compare changes in functional status and pain intensity. P value of <0.05 was considered as significant.

RESULTS

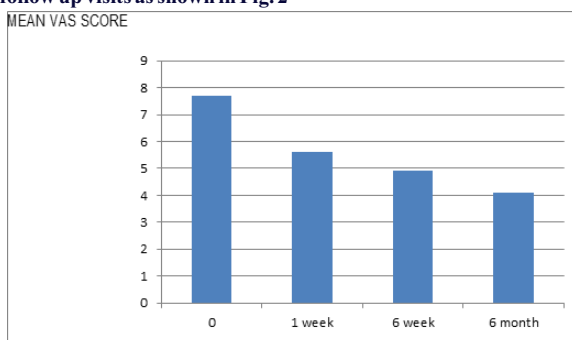
Out of sixty patients, four patients were excluded from the study because of patient refusal, coagulopathies and not meeting the inclusion criteria. Fifty Six two patients received epidural steroid injection, among them three patients did not come for follow up for six months and six patients required surgery. The remaining forty seven patients were analyzed, among them 27 (55.44%) were male and 20(42.55%) female. The mean age of patients was 43.52($\pm$ 10.42) years. The commonest intervertebral disc involved was L4-5 (38%) followed by L5-S1 (20%) in single level PIVD. However, in multi-level disc prolapsed L4-5, L5-S1 (33%) was commonest level. Single level disc prolapse was seen in 30 patients (63.82%) and multi level disc prolapse in 17 patients (36.17%).

Significant Functional status improvement was observed in all follow up visits, which was shown in Fig.1



TIME INTERVAL

Similarly significant reduction in pain intensity was observed in all follow up visits as shown in Fig. 2



TIME INTERVAL

six patients (10.17%) showed no improvement of pain even after two doses of ESI. These patients underwent surgery. All of them had multi level disc prolapse. Three patients did not come for follow up. So the success rate of this study was 83.92%. No complication was observed except local pain over injection site in three patients (5.3%).

DISCUSSION

Epidural steroid injections have been used for decades in the management of low back pain. It is minimally invasive and effective treatment modality in many orthopaedic centres. The first reported use of epidural steroid was in 1952 by Robecchi and Capra⁹ and are still an integral part of non-surgical management of low back and radiating pain. They used hydrocortisone in the first sacral root. Later on various researchers were used injection methylprednisolone (Depomedrol) and reported better results. In this study we also used methylprednisolone and demonstrated that it was effective for relieving the symptoms of herniated disc as well as improving the functional status of the patients. Several studies in literature also have shown that ESI is effective in LBP.

In Bogduk series, out of 40 studies more than 4000 patients on lumbar and caudal steroid injections, 36 studies recommended in favour of the use of ESI in lumbosacral pain.¹⁰

Similarly, Koes *et al* review the 12 randomised controlled trials to assess the efficacy

of epidural steroid injections for low-back pain and found effective in six studies.¹¹

Helliwell *et al.* also demonstrated that ESI significantly improved the LBP.¹² In several studies patients were followed after ESI for periods ranging from weeks to one year, showed to be beneficial.¹³⁻¹⁶ In this study we followed only for six months.

In this study Oswestry disability index (ODI) was used for the assessment functional status of low back pain. It is based on a patient's subjective impression on his own state of disability.⁷ The ODI was decreased by more than 27% by first week and by more than 41% by the end of six month following epidural steroid injection. Similarly VAS score was decreased by 29% in the first week and by 51% at the end of six months. This result indicates that the functional status of patients and pain intensity was significantly improved in all follow up visits.

The treatment of low back pain with radicular involvement has remained a matter of controversy because of multifactorial etiology and varying therapeutic modalities. Non-steroidal antinflammatory drugs, antidepressant, parenteral steroids, transcutaneous electrical nerve stimulation (TENS), traction and ultrasound have been used alone or in combination but without any proved efficacy.¹⁷ Surgery is particularly indicated in cases with definite surgically correctable herniated discs but with a failure rate of as high as 30%. The incidence of persistent back pain after surgery was found to be inversely proportional to the degree of herniation.¹⁸ Hence ESI was found to be an alternative treatment modality with good results in symptomatic herniated disc, we also found the same result in this study.

The mechanism of pain due to herniated disc is Mechanical or chemical stimulation initiates a sequence of events responsible for the generation of back pain and radiculopathy. Mechanical irritation caused by compression, traction and chemical irritation result in intraneural inflammation characterized by ischemia, edema, fibrosis, and demyelination. As a result physiologic changes lead to an alteration of nerve function including muscle weakness, sensory deficit and hyperexcitability-pain. The pain due to herniated disc is thought to be arise from the release of arachidonic acid metabolites namely prostaglandin E2, thromboxane, phospholipase A2, tumour necrosis factor, and interleukin from herniated disc cells. The nerve roots, close proximity of herniated disc may sensitize by the above chemical mediator and cause low back and radicular pain.^{19,20}

In this study we used methylprednisolone and bupivacaine for the management of low back pain. Our study showed significant relieve of the symptoms of herniated disc as well as improvement in the functional status of the patients.²¹ Thus our study supports the findings of the studies by Belivesus *et al*, they also showed that epidural injection of methyl prednisolone was more effective in long standing back pain and sciatica.²²

The various mechanisms have been described to account for the analgesic effect of ESI. Methyl prednisolone is corticosteroid and is well known for its anti-inflammatory properties²³ and also stabilizes neural membranes, suppress ectopic neural discharges²⁴ and may have direct anaesthetic effect on small unmyelinated nociceptive C-fibers.²⁵ Bupivacaine is a local anaesthetic agent, also act as 'flushing' agents to dilute the chemical or immunologic agents that promote inflammation. It help to flush out inflammatory mediators from around the area that may be a source of pain and also help to curtail inflammation by inhibiting phagocytosis, decreasing phagocytic oxygen consumption, reducing polymorphonuclear leukocyte lysosomal enzyme release, and diminishing superoxide anion production.²⁶⁻²⁸ Additionally, it improves neural blood flow and dysfunction.²⁹ So our study shows that the combination of methyl prednisolone and bupivacaine more effective for the management of low back pain.

Biomechanically 80-90% of the movements of the lumbar spine occur at the L4-L5 and L5-S1 intervertebral discs. So, these lumbar spine positions are at risk for producing low back pain. In this study, we found the commonest level of affected intervertebral disc prolapsed was L4-5 (38%) followed by L5-S1 (20%).

In our study we found 6 patients did not improve with ESI. Among them 3 patients undergone discectomy, 3 patients did not come for

follow up. Considering those who didn't come for follow-up as failures, the success rate was 83.92%. Our findings support the studies done by Swerdlow *et al* and Winnie *et al*. They reported the success rates ranging from 63% to 80%^{30,31}. Dilke and colleagues published a double blind, controlled and randomized prospective study in 100 patients. Their overall success rate was 45%.³² In this study we select only MRI proven symptomatic herniated disc, carried out follow up for only six month, because of that our success rate may have become high compared to other studies. There are several factors for varied results like patient selection, technique of injection, dosage of steroid and follow up. In this study the patient who had undergone discectomy had large herniated disc, multilevel disc prolapse and obese patient.

Epidural injections are a relatively safe procedure as total complications in most series were 5%.² In this study only 3 (5.3%) patients reported with local pain over the injection site, which subsided without treatment. There are reports of epidural abscess, epidural hematoma, and durocutaneous fistula, Cushing syndrome, bacterial meningitis and post-dural puncture headache.¹¹ None of these complications were seen in our study. Thus this finding shows that epidural steroid injections are simple, safe, minimally invasive and early pain relief for symptomatic herniated lumbar discs.

CONCLUSION

We conclude that epidural steroid injection for lumbar radicular pain in effective method of treatment. However the frequency of dose of epidural injection may vary depending upon the outcome of the procedure.

REFERENCES

1. Keith DW, Ashley LP. Low back pain and disorders of intervertebral discs. S. Terry Canale, editor- Campbell's operative orthopaedics. Vol-III. 9th ed. Mosby, 2003; 3014-80.
2. Abdi S, Datta S, Trescot AM *et al*. Epidural steroids in the management of chronic spinal pain: a systematic review. *Pain Physician* 2007; 10: 185-212.
3. Cuckler JM, Bernini PA, Wiesel SW, Booth RE, Rothman RH, Pickens GT. The use of epidural steroids in the treatment of lumbar radicular pain. A prospective, randomized, double-blind study. *J Bone Joint Surg Amer* 1985; 67: 63-6.
4. Benzon HT. Epidural steroid injections for low back pain and lumbosacral radiculopathy. *Pain* 1986; 24: 277-95.
5. Glenn R. Buttermann. Treatment of lumbar disc herniation: epidural steroid injection Compared with discectomy: a prospective, randomized study. *J Bone Joint Surg* 2004; 86: 670-9.
6. Fairbank JCT, Pynsent PB. The Oswestry Disability Index. *Spine* 2000; 25: 2940-53.
7. Davidson M, Keating J. A comparison of five low back disability questionnaires: reliability and Responsiveness. *Physical Therapy* 2002; 82: 8-24.
8. Niskanen RO. The Oswestry low back pain disability questionnaire a two-year follow-up of spine surgery patients. *Scand J Surg* 2002; 91: 208-11.
9. Robecchi A, Capra R. Hydrocortisone; first clinical experiments in the field of rheumatology. *Minerva Med* 1952; 43: 1259-63.
10. Bogduk N. Epidural steroids for low back pain and sciatica. *Pain Digest* 1999; 9: 226-7.
11. Koes BW, Scholten RJPM, Mens JMA, Bouter LM. Efficacy of epidural steroid injections for low-back pain and sciatica: a systematic review of randomized clinical trials. *Pain* 1995; 63: 279-88.
12. Helliwell M, Robertson JC, Ellis RM. Outpatient treatment of low back pain and sciatica by a single extradural corticosteroid injection. *Brit J Clin Pract* 1985; 39: 228-31.
13. Dilke TF, Burry HC, Grahame R. Extradural corticosteroid injection in management of lumbar nerve root compression. *Brit Med J* 1973; 2: 635-7.
14. Yates DW. A comparison of the types of epidural injection commonly used in the treatment of low back pain and sciatica. *Rheumatol Rehabil* 1978; 17: 181-6.
15. Mathews JA, Mills SB, Jenkins VM *et al*. Back pain and sciatica: controlled trials of manipulation, traction, sclerosant and epidural injections. *Brit J Rheumatol* 1987; 26: 416-23.
16. Ridley MG, Kingsley GH, Gibson T, Grahame R. Outpatient lumbar epidural corticosteroid injection in the management of sciatica. *Brit J Rheumatol* 1988; 27: 295-9.
17. Maher CG. Effective Physical Treatment for Chronic Low Back Pain. Ashish D. Diwan, Safdar N. Khan *Ortho Clin North Amer* 2004; 57-64.
18. Spangfort EV. The lumbar disc herniation. A computer-aided analysis of 2,504 operations. *Acta Orthop Scand* 1972; 142: 1-95.
19. Raj PP. Intervertebral disc: anatomy-physiology/pathophysiology- treatment. *Pain Pract* 2008; 8: 18-44.
20. Burke JG. Intervertebral discs causing LBP secrete high levels of pro inflammatory mediators. *J Bone Joint Surg* 2002; 84: 196-201.
21. Yabuki S, Kawaguchi Y, Nordborg C, Kikuchi S, Rydevik B, Olmarker K. Effects of lidocaine on nucleus pulposus-induced nerve root injury. A neurophysiologic and histologic study of the pig cauda equina. *Spine* 1998; 23: 2383-9.
22. Beliveau P. A comparison between epidural anesthesia with and without corticosteroid in the treatment of sciatica. *Rheumatol Phys Med* 1971; 11: 40-45.
23. Flower RJ, Blackwell GJ. Anti-inflammatory steroids induce biosynthesis of a phospholipase A2 inhibitor which prevents prostaglandin generation. *Nature* 1979; 278: 456-9.
24. Devor M, Govrin-Lippmann R, Raber P. Corticosteroids suppresses ectopic neural discharge originating in experimental neuromas. *Pain* 1985; 22: 127-37.
25. Johansson A, Hao J, Sjolund B. Local corticosteroid application blocks transmission in normal nociceptive C-fibers. *Acta Anaesthesiol Scand* 1990; 34: 335-8.
26. Hasue M. Pain and the nerve root. An interdisciplinary approach. *Spine* 1993; 18: 2053-8.
27. MacGregor RR, Thorner RE, Wright DM. Lidocaine inhibits granuloocyte adherence and prevents granuloocyte delivery to inflammatory sites. *Blood* 1980; 56: 203-9.
28. Cullen BF, Haschke RH. Local anesthetic inhibition of phagocytosis and metabolism of human leukocytes. *Anesthesiol* 1974; 40: 142-6.
29. Yabuki S, Kikuchi S. Nerve root infiltration and sympathetic block. An experimental study of intradiscal blood flow. *Spine* 1995; 20: 901-6.

30. Swerdlow M, Sayle-Creer W. A study of extradural medication in the relief of lumbosacral syndrome. *Anesth* 1970; 25: 341.
31. Winnie AP, Hartman JT, Meyers HL, Ramamurthy S, Barangan V. Pain clinic II: intradural and extradural corticosteroids in sciatica. *Anesth Analg* 1972; 51: 990.
32. Dilke TF, Burry HC, Grahame R. Extradural corticosteroid injection in management of lumbar nerve root compression. *Brit Med J* 1973; 2: 635-7.