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MANAGEMENT OF LUMBAR DISC PROLAPSE: FACTORS INFLUENCING SURGICAL INTERVENTION

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Abstract
Lumbar disc herniation is the most common cause of lumbar radiculopathy. Most commonly seen in adult population 20-50 years of age, most common site of occurrence is L4-L5 and L5 and S1evels. Non-operative management of this condition may include physical therapy, anti-inflammatory medications, and epidural steroid injections. After the patient's informed consent was obtained, 150 patients with lumbar disc prolapse were subjected to epidural steroid infiltration out of which 101 underwent IL procedure and 49 underwent TF epidural steroid injections under the fluoroscopic guidance according to surgeon's preference. As per our study it was inferred that 83.3% patients had moderate OD score following surgery at the end of 6 months whereas 74.6% patients had mild OD score following only epidural steroid which was also found to be statistically significant.
Keywords: Management, lumbar disc prolapse, surgical intervention

Introduction

Low back pain is an extremely common ailment encountered in our day to day practice. The prevalence rate of low back pain in a number of studies ranged from 22% to 65% in one year and the life time prevalence ranged from 11% to 84%.Although back pain is common complaint, a pathologic cause cannot be determined. Epidemiologic studies determined the risk factors related to the development of back pain include job dissatisfaction, repetitive lifting, and low frequency vibration, low educational levels, smoking and social problems. Low backache is the leading cause of lost working days all over the world[1].

Back pain often develops without a specific causethatcanbeidentified with a test or imaging study. Common causes of back pain include bulging orruptured disc, muscle or ligament strain and muscle spasms occurring due to repeated heavy lifting, sudden awkward moment or constant strain on back. Low back pain due to Intervertebral disc herniation, intervertebral disc degeneration without disc herniation, are the most common diagnoses of chronic persistent low back and lower extremity symptoms[2].

The spinal column consists of vertebral bodies and discs, Discs act as cushions between the bones (vertebrae) in spine. The disc contains the nucleus pulposus surrounded by a fibrous ring, the annulus fibrosis. When the fibrous ring becomes diseased due to injury or any other condition then nucleus pulposus is pushed out or prolapses in to the spinal canal and causes compression of the spinal cord and accompanying nerve roots. This condition is called herniation or disc prolapse. The symptoms are low back pain, radiation pain, numbness, weakness, or loss of bowel and bladder control.

Lumbar disc herniation is the most common cause of lumbar radiculopathy. Most commonly seen in adult population 20-50 years of age, most common site of occurrence is L4-L5 and L5 and S1evels. Non-operative management of thiscondition may include physical therapy, anti-inflammatory medications and epidural steroid injections.

Epidural steroid injection may modulate the inflammatory cells, cytokines, or other pain mediators associated with lumbar disc herniation-related pain, although it is not believed that an epidural steroid injection directly causes regression of a herniated nucleus pulposus[3].

There is considerable controversy about the clinical efficacy of epidural steroid injections in the management of lumbar disc herniation. Improvements in outcome have been reported at three, six, sixteen, and eighteen months after epidural steroid injections. Other studies have demonstrated no difference in outcome after epidural steroid injection. The largest study of epidural injections is a prospective, randomized trial of 160 patients, and this study showed a benefit of steroid treatment at two weeks but none at three, six, or twelve months[4].

The symptoms of 80-90% of patients with disc prolapse usually resolve with conservative treatment.Operative management is advised in cases ofnoncompliance to conservative treatment progressive neurological deficits, patients with radiculopathy with significant compression by disc herniations on investigation and patients with

cauda equine syndrome[5].
Epidural steroid injections (ESI) are one of the most common interventional techniques for managing chronic low back pain with or without lower extremity radiation. They are most commonly offered as an option in acute radiculopathy as a second- line treatment after prior treatment with NSAIDS, possibly a short course of an oral steroid, and a waiting period of at least three weeks with/without other adjunctive treatment measures (exercise, spinal manipulation, physiotherapy etc.). Epidural steroid injections (ESIs) localize the drug around the area of affected nerve roots. In addition to their anti-inflammatory effects, steroids may inhibit pain viatheir ability to suppress ectopic discharges from injured nerve fibers and depress conduction in normal unmyelinated C fibers[6].

Methodology

Written informed consent for participation in the study was obtained from all the subjects. After the patient's informed consent was obtained, 150 patients with lumbar disc prolapse were subjected to epidural steroid infiltration out of which 101 underwent IL procedure and 49 underwent TF epidural steroid injections under the fluoroscopic guidance according to surgeons preference. Epidural IL or TF injections were given at the level of pathology, methyl prednisolone (depo medrol 80mg) in IL approach, and dexamethasone in TF approach, by determining the appropriate dermatomal level for injection by characteristic distribution of the patient's pain and corresponding MRI findings.
In order to perform IL epidural steroid injections (IL group; 101), the patients were placed in either sitting position, lateral position or prone position with a pillow underneath the abdomen to partially correct lumbar lordosis and facilitate the opening of interspinous spaces. That way, we facilitated the access to the epidural space. The back area was prepared and draped. 19 G Touhy needle advanced until advanced just a few millimetres posterior to the epidural space. At this point, loss of resistance (LOR) was performed using glass syringe with simultaneous advancement of a needle. A solution of 80mg methylprednisolone acetate with 4cc of 0.25% bupivacaine was then injected.
For the TF epidural steroid injections (TF group 30), the patients were placed in the prone position on fluoroscopic table. The back area was prepped and draped in appropriate manner. The fluoroscopic beam was turned 20-30 degrees in oblique direction (to the side of pathology). The entry site was identified at desired foraminal level and a 23-gauge needle advanced until change in resistance felt. Then, lateral view was taken to assure needle tip placement within the epidural space. A injection of nonionic contrast assured proximal sprand no vascular uptake and it was completed in AP view. If the vascular uptake noticed, needle was repositioned until appropriate contrast spread observed. For the confirmation of anterior epidural spread, lateral fluoroscopic image was obtained. A solution of 4 mg of dexamethasone with 2 cc of 0.25% bupivacaine was injected. For breakthrough pain, the patients were allowed to use tramadol one to two tablets, 50 mg q 6 hours as the rescue medication as needed (max 400 mg/24 hour).
The patients were then followed and assessed at each visit at 1,3 and 6 weeks following the injection using visual analog scale of 0 to 10 for assessment of current back and lower-extremity pain. A pain drawing was used to indicate the distribution of the pain (with a high score representing a greater area of bodily pain), and an Oswestry Disability Scale was employed to quantitate the level of function (on a 0 to 100-point scale, in which a higher score represented greater disability) and followed up as per the proforma
Those who have no improvement or worsening of symptoms,whose VAS score is persistently same or increasing,oswestry disability index(ODI) is worsening or same,who develop Progressive neurological deficits and Patients wanting surgery for worsening symptoms Are subjected to surgical intervention i.e. lumbar discectomy.

Results

Table 1: Correlation of Age Group and Surgery

			Surgery		**Total**
			Yes	**No**	
Ages	25-35 y	Count	16	70	86
		% within Surgery	35.6%	66.7%	57.3%
	36-45 y	Count	29	35	64
		% within Surgery	64.4%	33.3%	42.7%
Total		Count	45	105	150
		% within Surgery	100.0%	100.0%	100.0%

According to our study, 64.4% cases in the age group 36 to 45 years had to proceed to surgery for the symptoms

to resolve. This finding of having greater number of patients in this age group proceeding to surgery was found to be statistically significant.

Table 2: Sex Distribution of Patients Undergoing Surgery

			Surgery		Total
			Yes	No	
Sex	M	Count	17	60	77
		% Within Surgery	37.8%	57.1%	51.3%
	F	Count	28	45	73
		% within Surgery	62.2%	42.9%	48.7%
Total		Count	45	105	150
		% within Surgery	100.0%	100.0%	100.0%

As per our study 62.2% of the females who were given epidural steroid proceeded to surgery compared to 37.8% males which was also found to be statistically significant.

Table 3: Correlation of Occupation with Patients Undergoing Surgery

			Surgery		Total
			Yes	No	
Occupation	SW	Count	36	56	92
		% within Surgery	80.0%	53.3%	61.3%
	NSW	Count	9	49	58
		% within Surgery	20.0%	46.7%	38.7%
Total		Count	45	105	150
		% within Surgery	100.0%	100.0%	100.0%

80% of patients who were in strenuous occupations proceeded to surgery compared to 20% in non-strenuous work group who proceeded to surgery which was also found to be statistically significant.

Table 4: Correlation of OD index at 6 months follow up with surgery

			OD_6THMonth		Total
			Mild	Mod	
Surgery	Yes	Count	35	10	45
		% within OD_6Ct	25.4%	83.3%	30.0%
	No	Count	103	2	105
		% within OD_6Ct	74.6%	16.7%	70.0%
Total		Count	138	12	150
		% within OD_6Ct	100.0%	100.0%	100.0%

As per our study it was inferred that 83.3% patients had moderate OD score following surgery at the end of 6 months whereas 74.6% patients had mild OD score following only epidural steroid which was also found to be statistically significant.

Discussion

History of intervertebral disc prolapse dates back to 1543, when Vesalius first described it. Aurelius described the symptom sciatica. The early Greeks backache and radiating pain as disease and prescribed rest massage for this ailment. In 1858 Luschka used pathological specimens to show degenerative changes annular tears through which prolapse occurred.

Spine pain is the most common of all chronic pain disorders, with a lifetime prevalence reported to be from 54 to 80%. The landmark description by Mixter and Barr in 1934 of intervertebral disc herniation led many practitioners to assume that intervertebral disk herniation is the most common cause of back problems[7].

However, modern evidence implicates intervertebral disk herniation in only a small percentage of back complaints. Thus, a simple compression or mass effect cannot be the mechanism of pain due to disk disease. In fact, several studies evaluating the progress of disk herniation have shown that even though the resolution of symptoms tends to be associated with diminution of the size of the disk herniations, it is not always the case, as

compression may continue in spite of the resolution of the symptomatology. In addition, it is also well known that disk herniations that are evident on computerized tomographic axial scan or on magnetic resonance imaging scan can be asymptomatic.

Various proposed mechanisms for radicular pain include partial axonal damage, neuroma formation, and focal demyelination; intraneural edema and impaired microcirculation. The other explanation surrounds the theory of chemical irritation and inflammation around the disks and nerve roots, which is considered a pain generator in conjunction with or without mechanical factors. The evidence for an inflammatory mechanism, is convincing. This includes inflammatory properties of the nucleus pulposus demonstrated by sustained discharges in A and B fibers following application of nucleus pulposus to dorsal root ganglia. In addition, delayed nerve conduction velocity of nerve root is produced by placing the nucleus pulposus in the epidural space but without mechanical compression; mechanical hyperalgesia follows placement of the nucleus pulposus in the epidural space, which correlates with phospholipase A2 (PLA2) immunoreactivity; thermal hyperalgesia and mechanical hypoalgesia are produced by placing the annulus fibrosis and nucleus pulposus in the epidural space, which correlates with nitric oxide levels in the disk material; blood flow is reduced in the dorsal root ganglion following application of the nucleus pulposus to tnerve root; endoneurial fluid pressure in the dorsal root ganglion is increased by application of nucleus pulposus to the nerve root and cultured disk material produces nitric oxide. Even though inflammatory reactions between the nucleus pulposus and nerve roots have been suggested as playing an important role in disc herniation with sciatica, the pathogenic mechanisms linking herniated nucleus pulposus, nerve root injury and sciatica are not completely known. However, it is presumed that sensory neurons in the associated dorsal root ganglia are affected by this chemical injury[8].

Lee *et al*., concluded that the behavioral pattern changes observed in the irritating nerve root model were caused in part by a high level of phospholipase A2 activity initiated by inflammation, and that the mechanism of action of epidural steroid injection in this model was inhibition of phospholipase A2 activity. Thus, investigations provide clinical support for use of epidural steroid injections in managing chemical irritation and inflammation around the discs and nerve roots. In addition, it has been demonstrated experimentally that epidural application of the nucleus pulposus can induce pronounced morphologic and functional changes in the nerve roots. Intravenous methylprednisolone was shown to reduce the nerve root injury produced by placement of nucleus pulposus in the epidural space. Similarly, epidural injection of betamethasone in a model of lumbar radiculopathy showed a significant effect on thermal hyperalgesia. Minamide*et al*., also studied the effects of steroid and lipopolysaccharide on spontaneous resorption of herniated intervertebral disks in an experimental study in a rabbit and concluded that lipopolysaccharide accelerated the process of herniated intervertebral disk resorption, whereas high dose steroid suppressed the process[9].The advent of the interlaminar approach to the epidural space was considered as a preferable route, as it is directed more closely to the assumed site of pathology facilitating the delivery of injectate directly to its target and requiring less volume. However, subsequently, the disadvantages of the interlaminar approach, including extradural placement of the needle, which may go unrecognized without fluoroscopic guidance, and various other disadvantages and reports of the failure of interlaminar epidural steroids to provide statistically significant improvement, raised questions not only about interlaminar epidural administration of steroids but also about administration of corticosteroids in itself[10].

Transforaminal lumbar epidural injections have been emerging as an alternative to interlaminar and caudal epidural injections. In 1952, Robecchi and Capra administered periradicular injection of hydrocortisone into the first sacral nerve root and reported relief of lumbar and sciatic pain in a woman.

Lievre et.al. (1953) reported transforaminal injection of steroids into the first sacral nerve root. There were no American reports until 1971, when Macnab described the diagnostic value of selective nerve root infiltration for radiculopathy. Since then, transforaminal epidural injections, also described as selective nerve root blocks, selective nerve root infiltration, or nerve root sleeve injections, have been widely used because they allow simultaneous morphologic and functional diagnosis of radiculopathy. During this time, clinical use of transforaminal epidurals in the management of low back and lower extremity pain was also initiated; and encouraging evidence has been emerging[11].

As evidenced from the medicare expenditures there is an increasing preference of Epidural steroid injections to treat low back pain. Epidural steroid injection is frequently used therapeutic modality in the management of radicular pain from disc herniations and spinal stenosis, as well as axial spinal pain. The rationale for administration of ESIs is based on the assumption that inflammation of spinal nerve root causes radicular pain and the epidural corticosteroids relieves pain allowing time for healing and physiotherapy. It is believed that depositing steroids close to the nerve roots results in more efficacious control of the local inflammation[12].

Treatment via epidural steroid injection of corticosteroids was first described in 1952 and first reported in the United States in 1961. It is postulated that corticosteroids reduce inflammation by inhibiting either the synthesis or release of number of pro inflammatory substances and causing reversible local anaesthetic effect.

Conclusion

According to our study, 64.4% cases in the age group 36 to 45 years had to proceed to surgery for the symptoms to resolve. This finding of having greater number of patients in this age group proceeding to surgery was found to be statistically significant.

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