



Research Article

A Cross-Sectional Study of Dorso-Lumbar Discs Laminectomy Complications

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Abstract

Background: Epidural Fibrosis (EF) is a risk factor for Failed-Back Syndrome (FBS) and inadequate symptom alleviation following lumbar disc surgery. There is an increase in arachnoiditis and dural tears after reoperation due to the unfavourable consequences, which compromise the result and make the nerve roots vulnerable to electrical field harm. It is possible that Suction Drains (SD) used to remove collections from the surgical site significantly contribute to the prevention of EF.

Aim: This research looked at the results and risks of dorso-lumbar disc laminectomy for herniated discs.

Methods: One hundred patients with symptomatic unilateral or bilateral single-level (L4-5 or L5-S1) lumbar disc herniation were recruited at the Department of Neurosurgery for disc surgeries. Of these patients, 65 were males and 35 were women. Researchers used a cross-sectional design. When the SD and barrier were not implanted, the results were compared to those without. Using single-level midline surgery, which was limited to the L4, L5 or L5-S1 levels, all surgeries were performed in a prone posture. In order to expose the nerve root and dural sac, techniques such as discectomy, decompression inter-laminar laminectomy, micro-, hemi- or formal laminectomy were used. A further 24-36 hours after the procedure, the SD persisted. During the appointment, the patient had a neurological evaluation and clinical evaluation with an emphasis on the patient's strength, reflexes, sensibility and pain levels in relation to the operated level. It also covered range of motion, discomfort in the low back and radicles, pain associated with physical activity and the results of Straight Leg Raise (SLR) tests, which included flexion (normal 60°), extension (normal 25°) and lateral flexion (normal 25°). We also measured the length of pain alleviation and the degree of the pain. As part of the follow-up after one year, an MRI was performed.

Results: When comparing the groups according to neurological tests, the frequency and severity of adverse events and wound healing features, no statistically significant differences were found. Fifty patients underwent surgery at the L4-5 level and fifty more were operated on at the L5-S1 level. No new neurological impairments or problems were noted. The average amount of time spent in the hospital was five days. In comparison to the results in the beginning, more patients reported feeling better (Table 1,2). A decrease in pain alleviation of more than 50% was seen in both groups. A total of 97% of patients in the therapy group reported substantial improvement in their pain levels at the 3-month, 6-month and 1- to 3-year post-operative follow-up evaluations. All members of the study group had their values compared to their baseline levels before surgery and again after the procedure. At the one-year point, there was a tendency towards better results in the therapy group. Lots of people in the therapy group had long-term relief, along with better pain and functional status, according to the criteria that says short-term relief is less than six months and long-term relief is more than six months.

Conclusion: Patients benefited greatly from suction drainage in terms of both immediate and delayed pain relief, functional improvements and SLR performance, regardless of whether it was administered alone or in combination with other therapies. Using MRI, we found that the ejection percentage was significantly lower when we used combination techniques. There was a robust clinical association between results and the degree of EF as measured by the MRI grading system.

Keywords: Dorso-Lumbar Discs Laminectomy; Disc Herniation; Epidural Fibrosis; Failed-Back Syndrome; Suction Drains

Introduction

A number of complications can arise after lumbar disc surgery. One of these is Epidural Fibrosis (EF), which can lead to Failed-Back Syndrome (FBS) and substantial inadequate symptom alleviation. Dural tears during reoperation and an increased frequency of arachnoiditis are among the unfavourable consequences that enhance the sensitivity of nerve roots to damage by EF and alter the result. Management of extraforaminal abnormalities surrounding the nerve root may be more difficult than initial disc herniation. More scarring could be the outcome of a second procedure on the scar [1,2]. Efforts to decrease EF after surgery have been many, but no one method has taken hold. Even with less invasive procedures, EF can still develop [3]. Primarily, we want to reduce postoperative haemorrhage and its development into fibrous tissue in order to lessen the chance of EF. A key component can be the Suction Drains (SD) used to remove collections from the surgical site. When it comes to protecting the healing tissues from the exposed dura, autogenous barriers are among the best solutions available. Some consider free fat grafting to be the gold standard for preventing EF after surgery [4-6]. It is possible to provide scar-reduction drugs topically as long as the patient does not experience any adverse effects [7,8]. Disc herniation patients undergoing dorso-lumbar disc laminectomy had their clinical results and risks assessed in this study.

Material and Methods

Patient Population

At the Department of Neurosurgery, we enrolled 100 patients, 35 of whom were female and 65 male, ranging in age from 22 to 64 years old. These patients were suggested for disc procedures because of lumbar disc herniations that were either unilateral or bilateral and at a single level (L4-5 or L5-S1).

Inclusion Criteria

- No response to conservative treatment
- Persistent or recurrent pain (> 3 months)

Exclusion Criteria

- Symptomatic lumbar canal stenosis instability or deformity
- Cauda equina syndrome
- Multilevel injury
- A history of epidural or intradural medicament injections
- Tuberculosis
- Chronic hip illnesses

Study Design

Researchers used a cross-sectional design. When the SD, barrier or steroids weren't implanted, the results were compared to those without. Prior to the procedure, all patients were given medication. Data on operations and patient's discharges were gathered and recorded.

Procedure

Sufficient preparation was given to every case. Using single-level midline surgery, which was limited to the L4, L5 or L5, S1 levels, all procedures were performed while the patient was prone. In order to expose the nerve root and dural sac, techniques such as discectomy, decompression inter-laminar laminectomy, micro-, hemi- or formal laminectomy were used. A further 24-36 hours after the procedure, the SD persisted. Complete drainage was noted when the SD was removed.

Outcomes Evaluation

During the appointment, the patient had a neurological evaluation and clinical evaluation with an emphasis on the patient's strength, reflexes, sensibility and pain levels in relation to the operated level. In addition, we checked for discomfort that was specific to the activity, pain in the lower back and radicles, range of motion and the ability to straighten one's legs (SLR) by measuring flexion (normal 60°), extension (normal 25°) and lateral flexion (normal 25°). Additionally, we measured the duration of pain alleviation and the degree of the pain.

Radiologic Assessment

A follow-up of one year was conducted using MRI. Iso-to hypointense signal relative to intervertebral discs on T1-weighted imaging was one of the criteria for EF identification. Other criteria were a reasonably homogenous appearance, a mass effect and retraction of the dura towards the side of the scar, as well as replacement of the epidural fat signal intensity.

Statistical Analysis

Version 22.0 of the IBM Statistical Package for the Social Sciences (IBM Corp., Armonk, NY, USA) was used to conduct all analyses. To make sense of the data, descriptive statistics like percentage, frequency, standard deviation and mean were used. To assess variations among the aetiology categories, we used the student t-test and the chi-square test, setting the threshold for statistical significance at $P < 0.05$.

Results

According to Table 1, there were no significant differences in the two groups' demographic factors. Neurological testing, adverse event rates and clinical signs and symptoms associated with wound healing features did not reveal any statistically significant differences between the groups. Both the L4-5 (n=50) and the L5-S1 (n=50) levels were surgically approached. There were no side effects and no new neurological problems emerged. The typical length of time spent in the hospital was five days.

Variables		Intervention		p-value*
		SD	Others	
Age (years)		39.2±7.5	40.1±4.2	0.08
Sex	Male	30	35	0.29
	Female	20	15	
BMI (kg/m²)		35.5±6.5	37.6±8.3	0.9
Neurological tests		Negative	Negative	-
Occurrence		No	No	-
Adverse effects		No	No	-
Wound healing		Good	Good	-
Approach	L 4-5	25	20	0.3
	L 5- S1	25	30	
*chi-square				

Table 1: Demographic and procedures of the study.

In comparing both groups regarding pain relief, a greater proportion of patients demonstrated pain relief relative to baseline findings (Table 2). Both groups demonstrated significant pain relief, exceeding 50%. The short-term pain relief outcome, assessed at 3 months, 6 months and follow-up at 1 to 3 years post-operation, demonstrated a success rate of 97% for significant pain relief in the treatment group.

Pain		Intervention		p-value*
		SD	Others	
3 months	No	35	25	0.1
	Fair	15	25	
	Bad	0	0	
6 months	Fair	14	23	0.2
	Improve	36	27	
	Bad	0	0	
1 year	No	50	50	1
	Bad	0	0	
3 years	No	50	50	1
	Bad	0	0	
*chi-square				

Table 2: Pain outcomes.

Analysis of functional outcome showed significant improvements in the intervention group compared to the baseline, as well as the control group, at intervals of 3 months, 6 months and 12 months (Table 3). Significant differences were assessed between preoperative (baseline) values and postoperative values in the whole study group. There was a trend toward better outcome at 1 year in the treatment group. Based on the definition that less than 6 months of relief was considered short-term and longer than 6 months of relief was considered long-term, a significant number of cases obtained long-term relief with improvement in pain and functional status in the treatment group.

Motions and test	Time of Outcome				p-value*
	0	6 months	1 year	3 years	
Flexion	20	35	40	66	0.05
Extension	12	20	31	40	
Lateral flexion	9	18	32	41	
Straight leg raise test	45	72	88	91	

Table 3: Functional outcomes.

Regarding the clinical outcome analysis in relation to MRI findings at 1-year follow-up, as shown in Table 4, there was a trend toward better outcome.

EF	MRI				p-value*
	Hypointense	Homogeneous	Mass effect	Retraction	
Mild	10	4	3	0	0.05
Moderate	5	0	2	0	
Severe	0	0	0	0	

Table 4: MRI findings in relation to EF in 1 year follow-up.

Discussion

Failed Back Surgery Syndrome (FBSS) affects 15% to 60% of surgical patients and is caused by fibrosis of the dura and nerve roots in the back, which can happen at or around the surgical sites [9-15]. Results showed that EF was the underlying cause in 10% to 24% of FBS patients. There was a strong correlation between EF and the return of postoperative pain after a period of no pain [14]. A dramatic rise to over 60% in the Ejection Fraction (EF) rate during reoperation led to less than ideal results [16]. The entrapment of the nerve root in fibrosis makes it more vulnerable to compression due to the anchoring effect of the scar tissue around it. Reoperations are more complicated and risky when EF is present. The risk of dural tear after reoperation is increased in patients with EF [17]. Unfavourable outcomes and worse scarring are common consequences of reoperation in these cases [18]. When EF is the only reason for FBS, it is not advised to undergo reoperation [19].

Normal wound healing can cause postoperative lumbar EF, which could be avoided if fibrous tissue from other tissues invades the surgical bed haematoma [20]. In addition to increasing vulnerability due to stimulation of the dura and nerve roots, entrapment, compression and tethering occur when granulation tissue develops into thick fibrous tissue [15,21]. Persistent disc discomfort and an increase in osteophyte growth are characteristics of this result [11].

Regarding clinical recovery, Ding, et al., could not discover a link between EF and pain ratings [10]. Results from Magnetic Resonance Imaging (MRI) of the oesophagus show a robust association with NVR scale scores. There was a statistically significant difference in the groups' levels of short-term and long-term pain reduction, as the introduction of SD significantly reduced the frequency and degree of EF.

The SD group outperformed the control group at 3,6,12 and 36 months. When comparing the groups' levels of immediate and delayed pain alleviation, a statistically significant difference was noted. Patients with SD had a considerable reduction in activity-related discomfort. Over time, when SD was used in conjunction with other techniques, it significantly reduced discomfort, made straight leg raising much easier and improved functional results across the board when measured by flexion, extension and lateral flexion angles.

In the six weeks to six months following surgery, EFs develop, which may be clearly seen on Magnetic Resonance Imaging (MRI) by at least three months, reaches a stable state by six months and shows no signs of additional changes at twelve months [22,23]. This study used a 12-month follow-up for MRI evaluation because of how well it performed analytically. On T1-weighted MRI images, the EF stood out because to its modest signal intensity, which was in stark contrast to the high signal intensity of epidural fat and the extremely low signal intensity of cerebrospinal fluid. After contrast was administered, EF usually showed uniform improvement. It is easier to distinguish between EF and disc herniation if EF has been identified [23-25].

This study analyses the instances that were studied by calculating the incidence rate and EF grades. By the 12-month mark, 82.2% of cases had shown some EF, with no intervention group reaching very high EF scores. Mild to moderate EF was seen in SD individuals, while significant EF was reported in non-SD patients; EF was either avoided or was less severe in SD patients. The creation of EF is inhibited when there is a barrier between the dura and blood, according to this discovery. The incidence and breadth of EF were consistently reduced by both SD and combos. Combinations were quite effective, reaching 100% with few or no side effects.

Recurrent radicular pain was shown to be 3.2 times more common in individuals with extensive EF as compared to less extensive EF, according to research by Witkam, et al., [24]. There was a strong correlation between radicular pain recurrence and the existence of widespread EF. Although our results were in line with previous research, they did not agree with Lastra-Power, et al., on this association [18,24-26]. Compared to the control group, individuals who were expected to experience persistent, refractory low back and lower extremities pain due to FBS following lumbar disc surgery had improvements in NVR ratings. Functional outcomes, such as evaluations of range of motion and straight leg lift, showed improvements when compared to measurements taken at the beginning. According to the data, using SD following decompressive surgery significantly improved outcomes in the short and long term.

Conclusion

Patients benefited greatly from suction drainage in terms of both immediate and delayed pain relief, functional improvements and SLR performance, regardless of whether it was administered alone or in combination with other therapies. Using MRI, we found that the ejection percentage was significantly lower when we used combination techniques. There was a robust clinical association between results and the degree of EF as measured by the MRI grading system.

Conflict of Interests

The authors have no conflict of interest to declare related to this article.

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