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Early outcome of radiculopathy with local application of steroid in perineural space in lumbar discectomy

Mohammad Farid Raihan, Asifur Rahman, Abu Saleh Mohammad Abu Obaida, Md Shahnawaz Bari, Md Atikur Rahman, Hafiz Asif Raihan, Olinur Razib, Mohammad Kamruzzaman Bhuiyan, Md Jaynul Islam, Mirza Hafizur Rashid, Mohammad Hossain

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Department of Neurosurgery, BSMMU, Dhaka (MFR, AR, ASMAO, MSB, MAR, OR, MH); Department of Neurosurgery, MAG Osmani Medical College, Sylhet (HAR); Department of Physical Medicine and Rehabilitation, BSMMU, Dhaka(MKB); Department of Neurosurgery, National Institute of Neuro Science & Hospital, Dhaka(MJI, MHR)

For Correspondence:
Mohammad Farid Raihan
Email: faridraihan8@gmail.com

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Abstract

Lumbar disc herniation resulting in compression and inflammation of nerve roots causes low back pain and radiculopathy. Per-operative use of steroids may help reduce inflammatory reaction and scar formation, causing less postoperative pain. The study aimed to assess the early outcome of radiculopathy with local application of steroids in peri-neural space after lumbar discectomy. This experimental study was carried out in the Department of Neurosurgery of the National Institute of Neuroscience and Hospital (NINS&H), Dhaka from March 2019 to August 2020. A total of 68 patients operated for prolapsed lumbar intervertebral disc (PLID) at L4/L5 and /or L5/S1 levels were divided into two groups. Patients who did not receive steroids (n=34) and those who received steroids (n=34) in peri-neural space were considered group A and group B, respectively. Patients were examined on the 1st, 2nd and 14th postoperative days to measure the pain intensity by the Visual Analogue Scale (VAS). Pre-operatively mean (standard deviation, sd) VAS was 7.41 (1.28) in Group A and 7.91 (0.9) in Group B (p-value >.05). Mean (sd) improvement of pain intensity on day 1, was 58.82 (17.55)% in Group A and 70.59 (12.26)% in Group B from pre-operative VAS. On day 2, 71.69 (12.43)% improvement was seen in Group A and 79.78 (9.74)% in Group B. On day 14, 75.37 (9.96)% improvement was seen in Group A and 83.46 (7.36)% in Group B from pre-operative. The improvements of VAS in all 1st, 2nd and 14th days were statistically significant (p-value <.05) between the two groups. Local application of steroids in peri-neural space found effective in reducing early postoperative radiculopathy following lumbar discectomy.

Introduction

Lumbar discectomy is effective in improving pain, quality of life and function in patients with lumbar intervertebral disc herniation and radiculopathy.1 However, in the immediate postoperative period, many patients experience low back pain, radiculopathy, delayed rehabilitation and hospital discharge.[1,2] The commonly used and well-established strategies to treat postoperative pain include analgesics, both NSAIDs and opioids in oral or injectable forms.[3] Nowadays, the application of anaesthetics in peri-neural space is becoming a new modality to reduce radicular pain. After discectomy and before the closure of the wound, a corticosteroid solution is applied around the nerve root that has been decompressed. The rationale for this is that steroid reduces local inflammation around the neural elements; this, in turn, reduces the pain experienced by the patient. However, the use of intraoperative epidural corticosteroids is debatable.[5-6] So, we aimed to access the early outcome of radiculopathy following lumbar discectomy, a common surgery in Bangladesh with the local application of steroids in peri-neural space.

Methods

This experimental study was carried out on 68 patients diagnosed with prolapse lumbar intervertebral disc (PLID) at L4/L5 and/or L5/S1 levels in the Department of Neurosurgery of National Institute of Neuroscience and Hospital (NINS&H), Dhaka, Bangladesh from March 2019 to August 2020. Ethical clearance for the study was taken from the Department of Neurosurgery and IRB, NINS&H and informed written consent was taken from each patient. Pre-operative

neurological examinations were done. The patients were divided equally into group A and group B, each having 34 patients based on local application of steroids in peri-neural space following discectomy. Surgery was carried out without local application of steroids in Group A and with the local application of steroids in Group B. Patients were re-examined on the 1st, 2nd and 14th post-operative days to measure the intensity of radicular pain. Following meticulous haemostasis, 40 mg of methylprednisolone acetate was given around the decompressed nerve root in group B (steroid group). In group A (non-steroid group), nothing was given, and the wound was closed in a standard procedure. Postoperatively, patients of both groups were assessed by VAS score and recorded on the 1st, 2nd and 14th postoperative days.

The pain intensity was graded from 0 (no pain) to 10 (the most severe pain). The VAS scores between the groups were compared using an unpaired t-test. Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS INC Chicago, Illinois, USA) version 25.0 for windows. A descriptive analysis was performed for all data. A p-value <.05 was considered statistically significant.

Results

Table-I shows the distribution of the study patients by age. It was observed that more than one-third (40.9%) of the patients belonged to age 31-40 years in Group A and 15(44.1%) in Group B. The mean (sd) age was 39.59 (11.17) years in Group A and 39.74 (10.43) in Group B (p-value >.05).

Table - II shows the distribution of the study patients by sex. It was observed that almost two-two-thirds (61.8%) of patients were male in both Group A and Group B (p-value >.05).

It was observed that the mean (sd) VAS was 7.41 (1.28) in Group A and 7.91(0.9) in Group B before the operation. On the 1st day, mean (sd) VAS was 3.29 (1.4) in Group A and 2.35 (0.98) in Group B. Similarly, on the 2nd day, mean (sd) VAS was 2.26 (0.99) in Group A and 1.62 (0.78) in Group B. In addition, on the 14th day, mean (sd) VAS was 1.97 (0.8) in Group A and 1.32 (0.59) in Group B, which were a significant decline from pre-operative in both groups in all follow-up but more decline in Group B. On the other hand, the mean percentage of VAS improvement on day 1 from the preoperative period was 58.82±17.55% in Group A and 70.59±12.26% in Group B. The mean percentage of VAS improvement on day 2 from the preoperative period was 71.69±12.43% in Group A and 79.78±9.74% in Group B. The mean percentage of VAS improvement at day 14 from the preoperative period was 75.37±9.96 and 83.46±7.36 in Group A and Group B, respectively. The mean percentage of VAS improvement on a postoperative day 1st, day 2nd and day 14th were statistically significant (p<0.05) in Group B, which indicates that the application of steroids in peri-neural space reduced early postoperative pain following lumbar discectomy.

Table-I

Distribution of the study patients by age (n=68)

Age (years)	Non-Steroid Group A (n=34)		Steroid Group B (n=34)		p value
	n	%	n	%	
≤30	6	17.4	7	20.5	
31-40	14	40.9	15	44.1	
41-50	9	26.4	7	20.5	
51-60	5	14.6	5	14.6	
Mean±SD	39.59±11.17		39.74±10.43		0.912ns

Table-II

Distribution of the study patients by sex (n=68)

Sex	Non-Steroid Group A (n=34)		Steroid Group B (n=34)		p value
	n	%	N	%	
Male	21	61.8	21	61.8	1.000ns
Female	13	38.2	13	38.2	

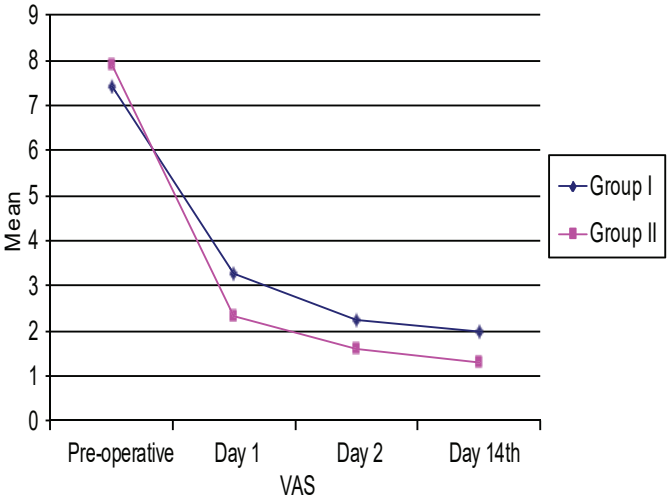

Figure 2: Line chart showing the distribution of the study patients according to VAS

Table-III

Distribution of the study patients according to visual analogue scale preoperative and postoperative day 1, day 2 and day 14 (N=68)

VAS	Group A (n=34) Mean±SD	Group B (n=34) Mean±SD	p-value
Pre-operative VAS	7.41±1.28	7.91±0.9	0.067ns
Postoperative VAS (day 1)	3.29±1.4	2.35±0.98	0.002s
% of improvement from Pre-operative VAS	58.82±17.55	70.59±12.26	0.001s
Postoperative VAS (day 2)	2.26±0.99	1.62±0.78	0.004s
% of improvement from Pre-operative VAS	71.69±12.43	79.78±9.74	0.001s
Postoperative VAS (day 14)	1.97±0.8	1.32±0.59	0.001s
% of improvement from Pre-operative VAS	75.37±9.96	83.46±7.36	0.001s

s=significant, ns=not significant, p value reached from unpaired t-test

Discussion

The incidence of lumbosacral radiculopathy is estimated to be approximately 3–5%.[6,7] The prolapsed lumbar intervertebral disc is one of people's most common vertebral column diseases leading to back pain, radicular pain, and neurological deficit due to nerve root compression.[8] Intraoperative epidural steroids have been used as adjuvant pain therapy in lumbar disc surgery. They reduce postoperative pain by suppressing mediators of inflammation.[9] Thus, the use of steroids reduces postoperative pain by minimizing the early inflammatory reaction and helps in less scar tissue formation, ultimately reducing hospital stay, back pain radicular pain and neurological deficits.[8] The age and gender distribution of the present study are compatible to the other previous studies.[9]

In this current study, it was observed that the mean percentage of VAS improvement on postoperative days 1, 2 and 14 were significantly ($p<0.05$) more in Group B, which indicates that the application of steroids in peri-neural space reduced early postoperative radicular pain following lumbar discectomy. Preoperative VAS scores between the two groups were not statistically significant ($p>0.05$). Postoperatively on day 1, VAS scores were 3.29 and 2.35; on day 2, it was 2.26 and 1.62; and on day 14, is was 1.97 and 1.32 for control and steroid groups, respectively, suggesting significant relief in back pain and radiculopathy compared to preoperative status. However, there was a statistically significant difference in VAS score on day 1 ($p=0.002$), day 2($p=.004$) and day 14($p=.001$) postoperatively when comparing group A and group B. The pain level can be communicated through a visual analogue scale.[9] A low dose of methylprednisolone (40 mg), which was left on the decompressed nerve root, was found to be able to decrease the intensity of the immediate postoperative radicular pain and also found statistically significant in the first and second postoperative days and in the sixth to twelfth days. Steroids administered epidurally in patients with disc hernia were also found to provide significant radicular pain relief postoperatively in 78% of the patients.[10]

Studies found that epidural methylprednisolone during lumbar discectomy reduced hospital stay, recovery time, leg pain, and neurological deficits. There were no side effects of epidural methylprednisolone in the 2-year follow-up period.[5] Oedema and inflammation of the nerve root or dorsal root ganglions and handling of the nerve root are responsible for creating uncomfortable situations for many patients and may increase the postoperative requirement of anti-inflammatory analgesics or morphine derivatives and expose the patient to adverse effects related to these medicines.[9] Radicular pain following disc surgery is related to a number of factors that include the inflammatory cascade which is triggered by tissue trauma and direct manipulation of the nerve root. It is thought that using steroids reduces postoperative pain by suppressing mediators of pain and inflammation such as prostaglandins, leukotrienes, bradykinin and histamine.[5]

Conclusion

It can be concluded that the local application of steroids in peri-neural space reduces immediate postoperative pain effectively.