

Original Research Article

THE INFLUENCE OF EPIDURAL STEROID INJECTION ON SURGICAL SITE INFECTION FOLLOWING LUMBAR SPINAL SURGERY- OUR EXPERIENCE IN PAKISTAN

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ABSTRACT

Background: The prevalence of lumbar radiculopathy was reported to be 3-5 % among male and female. Conservative treatment is the first remedy to treat chronic lower back pain. If symptoms not improved then epidural steroid injection (ESI) is the non-surgical technique to alleviate patient symptoms. Information regarding influence of ESI on rate of SSI is limited in developing nation like Pakistan. Therefore, we aim to determine influence of ESI on SSI following lumbar decompression surgery with or without arthrodesis.

Materials and Methods: This was a single center retrospective study conducted in Bolan Medical Complex Hospital, Quetta Pakistan. Patients included were those who underwent for decompressive laminectomy or lumbar fusion surgery for degenerative lumbar spine conditions following ESI. Spinal tumor, infection or decompression surgery performed for fracture was excluded. Timing of ESI was categorized into 30 days, 30-60 days and 61-90 days before surgery. Continuous variables were presented as mean $\pm$ standard deviation whereas categorical variables were presented in frequencies and percentages. Categorical variables were analyzed through Chi square test, whereas student-t test was used to analyzed continuous variables. Multivariable regression analysis was performed to determine independent risk factors associated with SSI following lumbar spinal surgery.

Results: Total 756 patients underwent for lumbar spinal operation during the study period. Out of 756 patients, 374 patients underwent for lumbar decompression surgery with or without arthrodesis. 33 patients were lost to follow-up so were not included. Therefore 341 patients were enrolled in our study. Decompression was performed in 157 (46%) cases whereas decompression with arthrodesis performed in 184 (53.9%) cases. The SSI rate following lumbar decompression surgery in our study was found to be 14%. The SSI rate following lumbar decompression and arthrodesis surgery was found to be 10.3%.

Conclusion: We conclude that ESI had positive effect on occurrence of SSI following lumbar decompression surgery with or without arthrodesis. Multivariable regression analysis revealed that age, duration of surgery, modified CCI and timing of ESI were the most common factors associated with SSI following lumbar spinal surgery.

Keywords: Lumbar Radiculopathy, ESI, Surgical decompression, Spinal Fusion, SSI.

INTRODUCTION

Lumbar radiculopathy is the most common complaint faced by spine surgeon.^[1] Its prevalence was reported to be 3-5% among male and female. It commonly occurs due to age related degenerative changes in the spine. Male patients are commonly affected in fourth decade whereas female patients are affected in their fifth or sixth decade.^[2] Conservative treatment such as physiotherapy, non-steroidal anti-inflammatory drugs (NSAIDs) and life style modification was considered a first line treatment of lumbar radiculopathy. The symptoms resolve spontaneously in 23-48% patient.^[3] Epidural steroid injection (ESI) was used as a remedy of treatment for lumbar radiculopathy since 1953. Published literature confirms that there are inflammatory mediators that trigger lumbar radiculopathy. The main function of ESI is to inhibit inflammatory mediators that trigger lumbar radiculopathy.^[4] The choice of surgery in case of prolapsed disc herniation is decompression. However, when instability is associated with herniation then lumbar fusion must be performed.^[5] The effect of ESI on occurrence of surgical site infection (SSI) is controversial. Earlier two single center retrospective studies were performed to determine association between preoperative ESI and postoperative SSI.^[6,7] Both studies concluded that there was no association between ESI and SSI especially in patients who underwent for lumbar decompression only. However another study concluded that rate of SSI increased in case of lumbar fusion.^[8] The influence of timing of ESI on rate of SSI is another controversial issue. A case-control study was performed regarding the impact of ESI on SSI rate. In their study the infection rate was 1.6%. The risk of infection increases in patients who received ESI within first three months of surgery compared to controls.^[9]

SSI rate among Pakistani population in the context of arthroplasty and surgical management of acetabular fractures was well mentioned before.^[10,11] Information regarding the influence of ESI on rate of SSI in patients who underwent for lumbar fusion surgery is limited in developing nation like Pakistan due to lack of adequate data collection and follow-up. We hypothesized that rate of SSI increases if ESI given within 90 days of surgery.

MATERIALS AND METHODS

This was a retrospective study conducted in Bolan Medical Complex Hospital, Quetta Pakistan Patient enrolled for the study were those who were operated for lumbar decompression or fusion surgery for degenerative lumbar spine conditions in between January 2018 and January 2023. Data was principally collected from hospital records. The study was approved by the ethics review committee of hospital.

Inclusion Criteria

- All patients who underwent for lumbar decompression or fusion surgery for degenerative lumbar spine conditions following ESI.
- Those who completed follow-up period of 90 days.

Exclusion Criteria

- Spinal tumor or infection, pseudoarthrosis
- Decompression performed for fracture.
- Revision lumbar spinal surgeries.

The SSI was defined on basis of center for disease control and prevention. Infection was so called superficial if it occurs in the area of skin where surgical incision was given. Infection was considered deep if it occurs in muscles and surrounding tissues. Factors retrieved from hospitals record includes age of patients at which surgery was performed, gender, duration of surgery in minutes, duration of hospital admission in days, use of tobacco, comorbidities, body mass index (BMI), type of operation performed (decompression with or without fusion), surgical approach (anterior or posterior), pre-operative hemoglobin level and intra-operative blood loss. Tobacco use was considered only when patient used it within 1 year prior surgery. BMI was scored according to World Health Organization (WHO) classification. Comorbidity status was scored by Modified Charlson Comorbidity index (CCI) ranges from 0-24 points by scoring 12 comorbidities. Timing of ESI was categorized into 30 days, 30-60 days and 61-90 days before surgery. The primary outcome was SSI following lumbar spinal surgery. Patients who underwent for lumbar spinal surgery and had previous history of ESI were followed till 90 days. Statistical analysis was performed using SPSS version 20.0 (IBM Co., Armonk, NY, USA). Continuous variables were presented as mean $\pm$ standard deviation whereas categorical variables were presented in frequencies and percentages. Categorical variables were analyzed through Chi square test, whereas student-t test was used to analyze continuous variables. Multivariable regression analysis was performed to determine variable associated with SSI following lumbar spinal decompressive surgery or arthrodesis with respect to interval of ESI.

RESULTS

Total 756 patients underwent for lumbar spinal operation during the study period. Out of 756 patients, 374 patients underwent for lumbar decompression surgery with or without arthrodesis. 33 patients were lost to follow-up, so were not included. Therefore 341 patients were enrolled in our study. The mean age of patients in our study was 50 $\pm$ 30 years. Decompression was performed in 157 (46%) cases whereas decompression with arthrodesis performed in 184 (53.9%) cases. The detailed demographic characteristic of patients included in our study is

found in [Table 1 & 2]. We found age, modified CCI, duration of hospitalization and intraoperative blood loss significant in our study with P value <0.05 as shown in [Table 2]. Timing of ESI with respect to surgical operation is presented in [Table 3]. Administration of ESI prior surgery is categorized into three such as <30 days, 30-60 days and 61-90 days. 82 (52.2%) patients received ESI in <30 days, whereas 42 (26.7%) patients received ESI in 30-60 days and 33 (21%) patients received ESI in 60-90 days prior lumbar decompression surgery. The SSI rate following lumbar decompression surgery in our

study was found to be 14%. 71 (38.5%) patients received ESI in <30 days, whereas 58 (31.5%) patients received ESI in 30-60 days and 55 (29.8%) patients received ESI in 61-90 days prior decompression and arthrodesis surgery. The SSI rate following lumbar decompression and arthrodesis surgery was found to be 10.3% as shown in table 3. Multivariable regression analysis revealed that age, duration of surgery, modified CCI and timing of ESI were the most common factors associated with SSI following lumbar spinal surgery as shown in [Table 4].

Table 1: Demographic characteristics of patients

Variables	N=341
Age (In years)	
21-40	30(8.8%)
41-55	91(26.7%)
56-70	138(40.5%)
>70	82(24.1%)
Gender	
Male	199(58.4%)
Female	142(41.6%)
Tobacco Use	
Yes	182(53.4%)
No	159(46.6%)
Obesity	
Yes	89(26.1%)
No	252(73.9%)
Co-morbid	
Yes	103(30.2%)
No	238 (69.7%)
Surgical Operation	
Decompression	157 (46%)
Decompression & Arthrodesis	184 (53.9%)
Surgical Approach	
Anterior	89 (26%)
Posterior	171(50.1%)
Both	44 (12.9%)

Table 2: Correlation in characteristics of patients (n=341)

Variables	Mean ± SD	p-value
Age (years)	50±30	0.000
Duration of surgery (minutes)	152±87	0.09
Modified CCI	1.6±2.4	0.001
Pre-operative Hb level (g/dl)	13.2±7.8	0.12
Hospitalization duration (days)	3.3±2.6	0.001
Intraoperative blood loss (ml)	175±247	0.000

CCI- Charlson Comorbidity index, SD- Standard Deviation.

Table 3: Timing of epidural steroid injection and SSI.

Surgical operation	ESI	SSI	Number of patients	P value
Lumbar Decompression (n=157)	<30 days 30-60 days 61-90 days	22 (14%)	82 (52.2%) 42(26.7%) 33 (21%)	0.000
Both Lumbar decompression and arthrodesis (n=184)	<30 days 30-60 days 61-90 days	19(10.3%)	71 (38.5%) 58(31.5%) 55 (29.8%)	0.008

P value <0.05 is considered significant, ESI- Epidural Steroid Injection, Chi Square Test applied.

Table 4: Multivariable Regression Analysis.

Variable	Odds Ratio	CI	P value
Age	0.78	(0.35-1.13)	0.008
Duration of surgery	14.2	(11.2-15.3)	0.001
Modified CCI	1.28	(0.28-1.91)	0.001
Duration of hospitalization	2.12	(1.89-3.42)	0.08
Timing of ESI	4.24	(3.43-4.89)	0.000
Intraoperative Blood loss	19.2	(17.2-20.4)	0.07
Pre-operative Hemoglobin level	0.72	(0.12-2.12)	0.134

DISCUSSION

The main purpose of our study was to determine the influence of ESI on occurrence of SSI following lumbar spinal surgery. The rate of SSI following lumbar decompression surgery in our study was 14% whereas the rate of SSI following lumbar decompression and arthrodesis surgery was 10.3%. We found that there is positive influence of ESI on SSI rate in both group of patients. Age, duration of surgery, modified CCI and timing of ESI were the most common independent factors associated with SSI following lumbar spinal surgery. To the author's best knowledge, this study is first from Pakistan to determine the influence of ESI on rate of SSI following lumbar spinal surgery. Earlier in 2023, a prospective multicenter study was conducted in Zurich, Switzerland to determine association of ESI and SSI rate. This was a matched case-control study. Total 422 patients were included in the study. ESI before surgery was categorized into 0-3 months, 0-6 months or any time before surgery. They concluded that risk of SSI was not associated with preoperative ESI irrespective of timing of ESI. However, they further confirmed that safe interval of ESI prior lumbar surgery is still unknown.^[12] A nationwide case-control study was performed to investigate patients who underwent for lumbar decompression surgery without instrumentation. The parameters were then compared with the control group. They revealed that ESI is a good modality to delay surgery in symptomatic patients but it increases risk of SSI following lumbar decompression.^[13]

ESI was considered a second remedy for chronic lower back pain after physiotherapy and analgesics. Although ESI is an effective treatment for persistent lower back pain, it also has side effects.^[14,15] There were mixed findings in the literature regarding the association of ESI and SSI following lumbar spinal surgeries. The increase in the risk of postoperative SSI is mainly due to administration of exogenous material into the dural space, skin flora and immunosuppressive effects of steroids as well.^[16] In their study, they revealed that there is an association of postoperative SSI and preoperative ESI. The further confirmed that risk of SSI increases if ESI given within 3 months prior lumbar decompression surgery. In our study, we found that there is an increase in SSI rate following decompression with or without arthrodesis in patients who had history of ESI administration prior surgery. The findings of this study were comparable with our study. We also observed 82(52.2%) patients who suffered from SSI having ESI administered close to lumbar decompression surgery. On other hand, 71 (38.5%) patients suffered with SSI having ESI close to decompression and arthrodesis surgery. This might be due to the fact that effect of ESI wears off with time, hence the chances of SSI declines. This

indicates that timing of ESI prior lumbar spinal surgery is also an important risk factor in predicting SSI. This is the reason that both surgeon and patients must be aware of the fact that early surgery after administration of ESI would have deleterious effect on surgical outcome. Previous published reports confirmed the relationship of SSI in patients who underwent for shoulder, hip, knee and ankle arthroplasty within 3 months of intra-articular steroid injection.^[17-19]

In our study, duration of surgery also increases SSI risk following lumbar decompression with or without arthrodesis. Duration of surgery might be prolonged in situations where stenosis is severe. This was the reason that patients with severe stenosis might not get benefit from ESI and underwent for surgical decompression. Recently, a meta-analysis was performed to determine association between SSI and ESI. The review was performed according to preferred reporting items for systematic reviews and meta-analysis (PRISMA) guidelines. Their meta-analysis revealed that the rate of SSI increases in the ESI group as compared to control group following decompression surgery with arthrodesis if administered within 30 days prior surgery. This link is significantly greater in people who have had fusion surgery. They found non-significant association between SSI and ESI if administered in between 30-90 days prior surgery.^[20] Intra-operative ESI can be used to provide prolonged pain relief following surgery.^[21,22] This ultimately reduces intermittent narcotic requirements following surgery. Previously, a meta-analysis performed over 17 studies which confirmed that intra-operative epidural steroids are not associated with increased risk of SSI.^[23] Decompression surgeries are less invasive with minimal chance of blood loss as compared to lumbar fusion surgery. Therefore the chance of SSI is less with decompression surgery as compared to fusion surgery. This is in contrast with findings of our study. We had 19 (10.3%) patients in fusion group, whereas 22(14%) patients in decompression group who suffered with SSI.

A single center, retrospective, small sample size and lack of control group were the major limitations of our study. Secondly we were unable to assess incidence of SSI following lumbar spinal decompression surgery with or without arthrodesis with difficulty in making causal inference. The results of our study were robust enough to make spinal surgeons to analyze the deleterious effect of ESI if administered close to the lumbar decompression surgery with or without arthrodesis.

CONCLUSION

Our study concludes that there was positive influence of ESI on SSI following lumbar decompression surgery with or without arthrodesis. Patients with

decompression and fusion surgery were at risk of developing SSI if ESI administered close to surgery.

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