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POST SURGICAL LUMBAR SEGMENTAL INSTABILITY FOLLOWING LUMBAR SPINE SURGERY-BIVARIATE ANALYSIS-FEW PARAMETERS.

Neurosurgery

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KEYWORDS

INTRODUCTION:

Background: Lumbar disc disease is the most common cause of low back pain and sciatica. The lifetime incidence of sciatica ranges between 13 to 40%, and the annual incidence ranges from 1 to 5%.[1] The point prevalence of low back pain in adult general population was 12 to 33% and one year prevalence was 22 to 65%.[2] The life time prevalence of low back pain is 65 to 80%.[3] Low back pain is the leading cause of activity limitation and work absence throughout much of the world.[4] Lumbar disc herniation is one of the most common causes of low back pain. Prevalence of lumbar disc herniation is around 1 to 3% in Finland and Italy depending on the age and sex.[5]

Lumbar disc surgery is the most common surgery performed by neuro surgeons and orthopaedic surgeons. However not all the patients are successfully relieved of their symptoms after lumbar spine surgery. A subset of patients develops new or persistent pain after lumbar spine surgery. Persistence or recurrence of symptoms after lumbar spine surgery is also known as failed back surgery syndrome. The causes for failed back surgery syndrome are inappropriate patient selection, poor surgical decision making, poor operative techniques, extensive bony and ligamentous excision and post operative complications.

One of the common causes of failed back surgery syndrome is the development of post operative spinal instability.

Spinal instability is defined as the loss of ability of the spine under physiological loads to maintain its pattern of movement. Inter-vertebral joints provide mobility and stability. Disruption of inter-vertebral disc, facet, lamina and the ligaments alter the load bearing character of the spine. This increases the risk of instability. Even minor instability can cause strain in the components of motion segment leading to pain and muscle spasm. It leads to a very intriguing problem and is difficult to manage. Hence it is necessary to identify those patients who are likely to develop post operative spinal instability and to do prophylactic stabilization to avoid such complications.

There are many factors that could lead to postoperative lumbar spine segmental instability. Failure to notice the existing instability before surgery and ignoring the obvious factors which could lead to post operative lumbar spine segmental instability are the main causes of persistent back pain. The other major contributing factor is aggressive intra operative surgical bony, ligamentous and disc excision.

Many authors have tried to predict the development of post operative instability. Various contributing factors like age, disc height, facet angles and the amount of bone excision have been studied as contributory factors. However till date the contributing factors causing post operative lumbar spine segmental instability have not been identified clearly and discrepancies still exist. If the subset of patients who are likely to develop post operative instability could be identified beforehand, such patients can be stabilized during the initial surgery itself. This will avoid post operative instability and persistent back pain.

The aim of the present study is to analyse the various pre operative and intraoperative factors which could contribute post operative instability and to provide a predicting system which helps spinal surgeons in surgical decision making. **This paper is the continuation of my previous paper with IJSR 2019 we have analysed the few of Bivariate analysis of our study. The other factors will continue in our next paper.**

Bivariate analysis:-

B i v a r ia te analysis is one of the simplest forms of the quantitative (statistical) analysis. It involves the analysis of two variables (often denoted as *X*, *Y*), for the purpose of determining the empirical relationship between them. In order to see if the variables are related to one another, it is common to measure how those two variables simultaneously change together (see also covariance).

B ivariate analysis can be helpful in testing simple hypotheses of association and causality – checking to what extent it becomes easier to know and predict a value for the dependent variable if we know a case's value of the independent variable (see also correlation).

B i variate analysis can be contrasted with univariate analysis in which only one variable is analysed. Furthermore, the purpose of a univariate analysis is descriptive. Subgroup comparison – the descriptive analysis of two variables – can be sometimes seen as a very simple form of bivariate analysis (or as univariate analysis extended to two variables). The major differentiating point between univariate and bivariate analysis, in addition to the latter's looking at more than one variable, is that the purpose of a bivariate analysis goes beyond simply descriptive: it is the analysis of the relationship between the two variables. Bivariate analysis is a simple (two variable) special case of multivariate analysis (where multiple relations between multiple variables are examined simultaneously).

Types of analysis

Common forms of bivariate analysis involve creating a percentage table or a scatterplot graph and computing a simple correlation coefficient. The types of analysis that are suited to particular pairs of variables vary in accordance with the level of measurement of the variables of interest (e.g., nominal/categorical, ordinal, interval/ratio). If the dependent variable—the one whose value is determined to some extent by the other, independent variable— is a categorical variable, such as the preferred brand of cereal, then probit or logit regression (or multinomial probit or multinomial logit) can be used. If both variables are ordinal, meaning they are ranked in a sequence as first, second, etc., then a rank correlation coefficient can be computed. If just the dependent variable is ordinal, ordered probit or ordered logit can be used. If the dependent variable is continuous—either interval level or ratio level, such as a temperature scale or an income scale—then simple regression can be used.

AIMS & OBJECTIVES

1. To analyse the impact of factors like clinical, radiological, and the extent of surgical procedure etc, which could lead to post operative lumbar spine segmental instability.
2. To evaluate a scoring system for prediction of post operative segmental instability.
3. To perform prophylactic stabilization using the scoring system and evaluate the results of prophylactic surgery.

RESULTS:

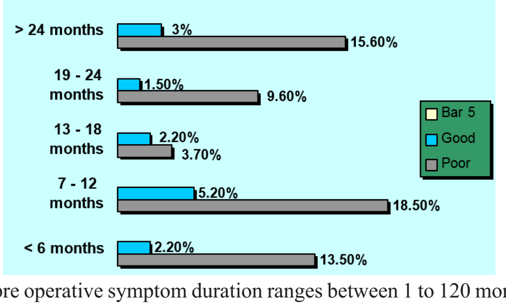
Table 1 - Outcome in relation to preoperative symptom duration

Pre-operative symptom duration – months	Description	Outcome		Total
		Good	Poor	

< 6	Number of patients	52	3	55
	% within Outcome	44.8%	15.8%	40.7%
	% of Total	38.5%	2.2%	40.7%
7 – 12	Number of patients	25	7	32
	% within Outcome	21.6%	36.8%	23.7%
	% of Total	18.5%	5.2%	23.7%
13 – 18	Number of patients	5	3	8
	% within Outcome	4.3%	15.8%	5.9%
	% of Total	3.7%	2.2%	5.9%
19 – 24	Number of patients	13	2	15
	% within Outcome	11.2%	10.5%	11.1%
	% of Total	9.6%	1.5%	11.1%
> 24	Number of patients	21	4	25
	% within Outcome	18.1%	21.1%	18.5%
	% of Total	15.6%	3%	18.5%
Total	Number of patients	116	19	135
	% within Outcome	100%	100%	100%
	% of Total	85.9%	14.1%	100%

Chi square = 8.703. P= 0.069, >0.05. Not significant.

Chart 1 - Outcome in relation to preoperative symptom duration



The pre operative symptom duration ranges between 1 to 120 months. The mean symptom duration was 16.84 months. 55 (40.7%) patients had symptom duration of less than 6 months. 32 (23.7%) patients had symptom duration between 6 months to one year. 8 (5.9%) patients had symptom duration between 12 to 18 months. 15 (11.1%) patients had symptom duration between 19 to 24 months.

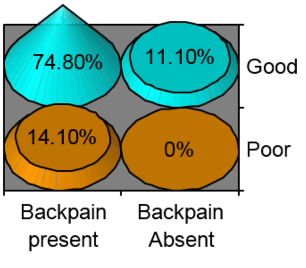
25 (18.5%) patients had symptom duration of more than 24 months. Of the total 19 (14.1%) poor outcome group 3 (2.2%) patients had symptom duration less than 6 months. 7 (5.2%) patients had symptom duration 6 to 12 months, 3 (2.2%) patients had symptom duration of 13 to 18 months, 2 (1.5%) patients had symptom duration of 19 to 24 months and 4 (3%) patients had symptom duration more than 24 months. There is no statistical significant correlation between the duration of symptom and poor outcome.

Table 2 - Outcome in relation to preoperative back pain

Pre-operative back pain	Description	Outcome		Total
		Good	Poor	
Absent	Number of patients	15	0	15
	% within Outcome	12.9%	0%	11.1%
	% of Total	11.1%	0%	11.1%
Present	Number of patients	101	19	120
	% within Outcome	87.1%	100%	88.9%
	% of Total	74.8%	14.1%	88.9%
Total	Number of patients	116	19	135
	% within Outcome	100%	100%	100%
	% of Total	85.9%	14.1%	100%

Chi square = 2.764. P=0.096. >0.05, Not significant

Chart 2 - Outcome in relation to preoperative back pain



Back pain was present in 120 (88.9%) patients. All the 19 patients with poor outcome group (14.1%) had back pain, where as none of the patients group without back pain developed post operative instability.

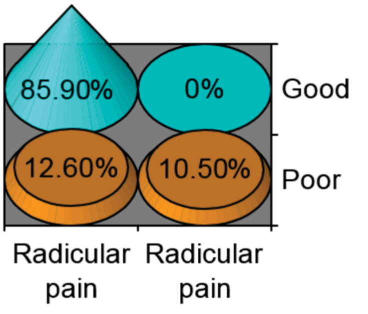
The average Visual Analogue Scale was 5.19.

Table 3 - Outcome in relation to preoperative radicular pain

Pre-operative Radicular Pain	Description	Outcome		Total
		Good	Poor	
Absent	Number of patients	0	2	2
	% within Outcome	0%	10.5%	1.5%
	% of Total	0%	1.5%	1.5%
Present	Number of patients	116	17	133
	% within Outcome	100%	89.5%	98.5%
	% of Total	85.9%	12.6%	98.5%
Total	Number of patients	116	19	135
	% within Outcome	100%	100%	100%
	% of Total	85.9%	14.1%	100%

Chi square= 12.394. P=0.000. <0.05, Significant.

Chart 3- Outcome in relation to preoperative radicular pain



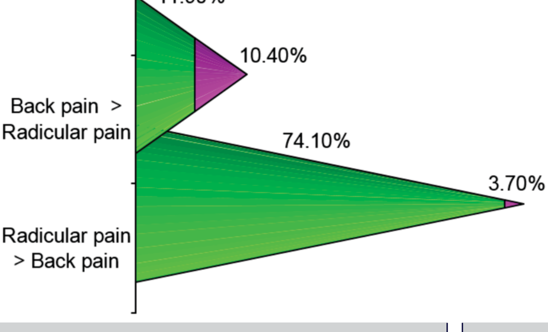
Radicular pain was present in 133 (98.5%) patients. Of the 19 post operative instability group, 17 patients (89.5%) had radicular pain. The average VAS (Visual Analog Scale) was 8.39. The mean pre operative Oswestry score was 67.42%. The mean preoperative Oswestry score among good outcome group was 67.28%. The mean preoperative Oswestry score among poor outcome group was 68.32%.

Table 4 - Outcome in relation to comparison of severity of Instability back pain with radicular pain

Radicular pain / nstability back pain score comparison	Description	Outcome		Total
		Good	Poor	
Radicular pain more than instability back pain	Number of patients	100	5	105
	% within Outcome	86.2%	26.3%	77.8%
	% of Total	74.1%	3.7%	77.8%
Instability back pain more than radicular pain	Number of patients	16	14	30
	% within Outcome	13.8%	73.7%	22.2%
	% of Total	11.9%	10.4%	22.2%
Total	Number of patients	116	19	135
	% within Outcome	100%	100%	100%
	% of Total	85.9%	14.1%	100%

P= 0.000. <0.05, Significant.

Chart 4 - Outcome in relation to comparison of severity of Instability back pain with radicular pain



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It is interesting to note that patients who had severe instability back pain visual analogue score were more likely to develop post operative segmental instability compared to patients with radicular pain visual analogue score. 30 patients (22.2%) had higher instability back pain visual analogue score comparing with radicular pain score. Among them 14 patients developed post operative instability. 73.7% of postoperative instability group had higher instability back pain than radicular pain. It is statistically significant with the 'P' value 0.000.

Clinical sign of painful catch was not appreciated. Instability catch was present in only one patient. Apprehension was present in 38 (28.1%) patients and it is not statistically significant.

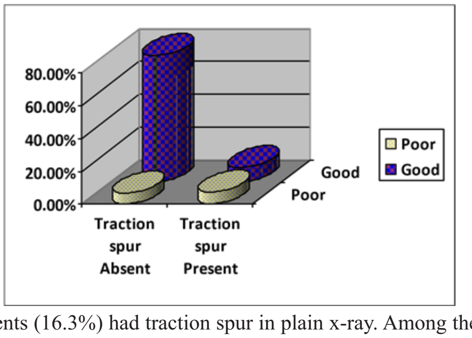
Twenty patients had large claw osteophytes. There was no correlation between the outcome and the presence of claw osteophytes.

TABLE5- Presence of traction spur in preoperative x-ray in relation to outcome

Traction spur in preoperative x-ray	Description	Outcome		Total
		Good	Poor	
Absent	Number of patients	104	9	113
	% within Outcome	89.7%	47.4%	83.7%
	% of Total	77%	6.7%	83.7%
Present	Number of patients	12	10	22
	% within Outcome	10.3%	52.6%	16.3%
	% of Total	8.9%	7.4%	16.3%
Total	Number of patients	116	19	135
	% within Outcome	100%	100%	100%
	% of Total	85.9%	14.1%	100%

Chi square = 21.402. P = 0.000. < 0.05, Significant.

CHART 5 Presence of traction spur in preoperative x-ray in relation to outcome



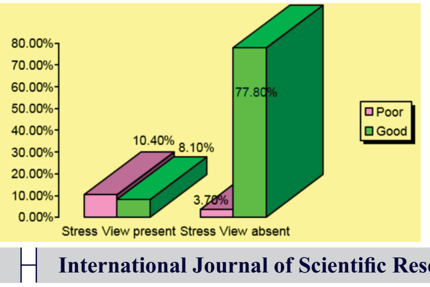
22 patients (16.3%) had traction spur in plain x-ray. Among the poor outcome group, 10 (52.6%) patients had traction spur. It is statistically significant with the 'P' value 0.000.

TABLE 6 Abnormalities in preoperative stress view in relation to outcome

Abnormality in preoperative stress view	Description	Outcome		Total
		Good	Poor	
Absent	Number of patients	105	5	110
	% within Outcome	90.5%	26.3%	81.5%
	% of Total	77.8%	3.7%	81.5%
Present	Number of patients	11	14	25
	% within Outcome	9.5%	73.7%	18.5%
	% of Total	8.1%	10.4%	18.5%
Total	Number of patients	116	19	135
	% within Outcome	100%	100%	100%
	% of Total	85.9%	14.1%	100%

Chi square = 44.597. P = 0.000. < 0.05, Significant.

Chart 6 - Abnormalities in preoperative stress view in relation to outcome



Flexion and extension x-ray views showed evidence of abnormal mobility in 25 (18.5%) patients. Among them, 14 (56%) patients were in poor outcome group which is statistically significant. One patient with disc prolapse had unilateral pars defect and this patient underwent micro lumbar discectomy. The patient developed progressive post operative listhesis with severe back pain and underwent stabilization surgery.

RESULTS AND CONCLUSION:

The pre operative symptom duration ranges between 1 to 120 months. The mean symptom duration was 16.84 months. 55 (40.7%) patients had symptom duration of less than 6 months. 32 (23.7%) patients had symptom duration between 6 months to one year. 8 (5.9%) patients had symptom duration between 12 to 18 months. 15 (11.1%) patients had symptom duration between 19 to 24 months.

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