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Research Article

The Outcome of Spinal Fusion is Similar in Women and Men

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Abstract

Background: Spinal fusions (cervical and lumbar) are widely practised procedures to address problems related to pain. A large proportion of women suffer from back pain during pregnancy and often after the event. Neck pain is a less common problem. Surgeons who perform the fusions claim between to 60% to 90% success as far as relief of pain and return to the workforce is concerned. The evidence to this optimism in Australia is very sparse.

Method: This present study was conducted to analyse the problem in 1700 consecutive patients who had spinal surgery. In 318 incidents the outcome was clear. Others could not be followed due to privacy and legal issues. The statistical analysis was conducted.

Results: These indicated that the outcome of treated and untreated patients was the same. There was no particular benefit in the lumbar spinal fusion surgery. There was some improvement following micro-discectomy and cervical surgery.

Conclusion: There is no difference between surgical and non-surgical management of their problem. Cervical fusion and micro-discectomy have better outcomes. This conclusion has been reached by other workers as well. It is necessary for the stakeholders to take a serious view of these findings.

Keywords: *Spinal Fusions; Cervical; Lumbar*

Introduction

It is common perception that the nature of the job the client performs is related to the degenerative disease and therefore is an acceptable indication for spinal fusions. The majority of the patients studied seemed to have mainly degenerative disease. The influence of obesity, smoking and age related issues required further analysis to identify the actual causes which produced both good and bad outcomes. It was also necessary to find out from this study if a positive neurological findings of nerve root compression was essential for a good outcome.

Methodology

Information regarding the individuals' smoking, clinical past history of depression, findings on clinical examination, radiological findings, diagnosis, final outcome, medications before and after the surgery, were tabulated using an Excel sheet.

Figure 1 shows the age distribution. As expected, the majority of claims are related to the working group. Figure 2 shows the type of activity performed by the claimants. Individuals (males and females) involved in heavy labour orientated occupations and those doing

repetitive jobs such as on conveyer belt made the most claims. This reflects the common perception that such occupations damage the spine. Figure 3 shows the main types of pathology recorded. Both general public and clinicians attribute degenerative disease as a result of the occupation.

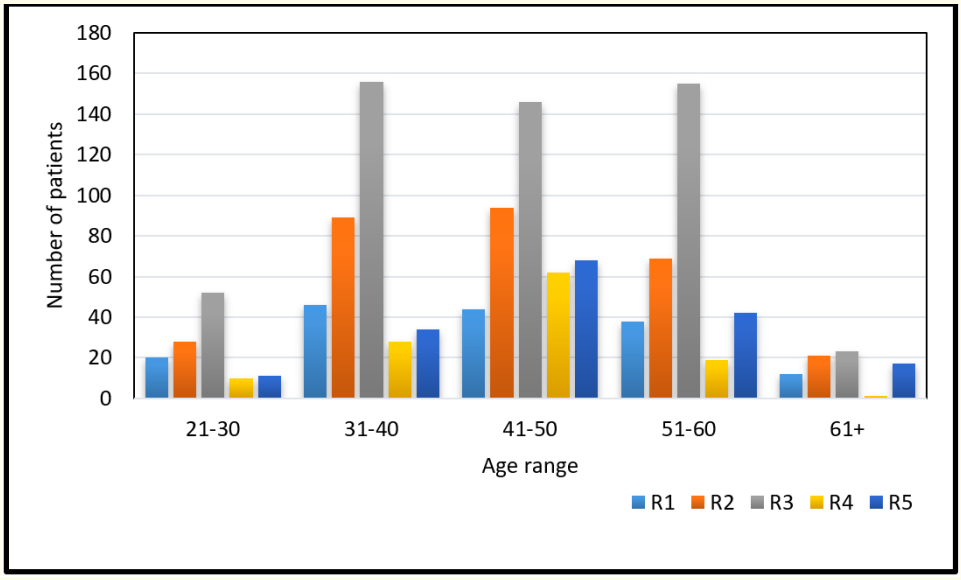

Figure 1: *Effect of age.*

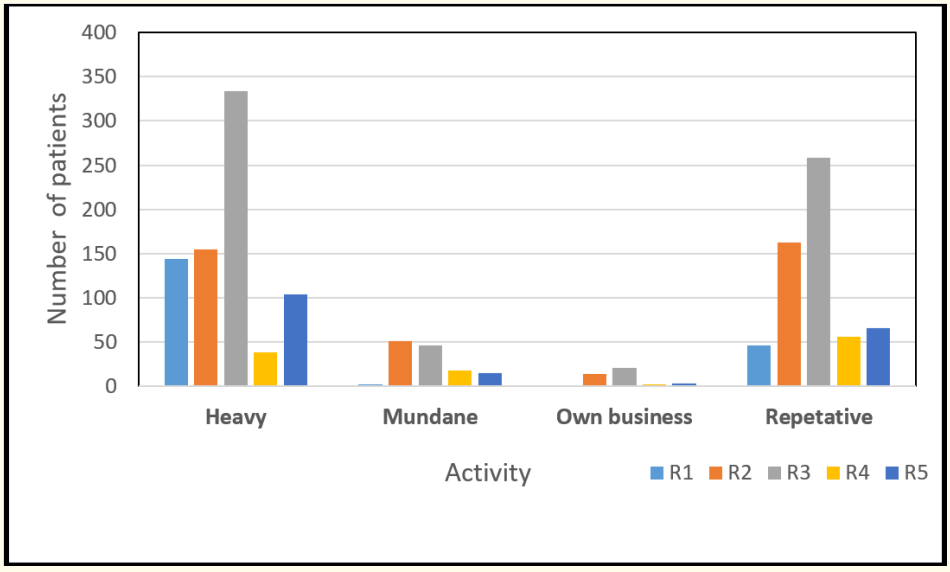

Figure 2: *Effect of activity involved.*

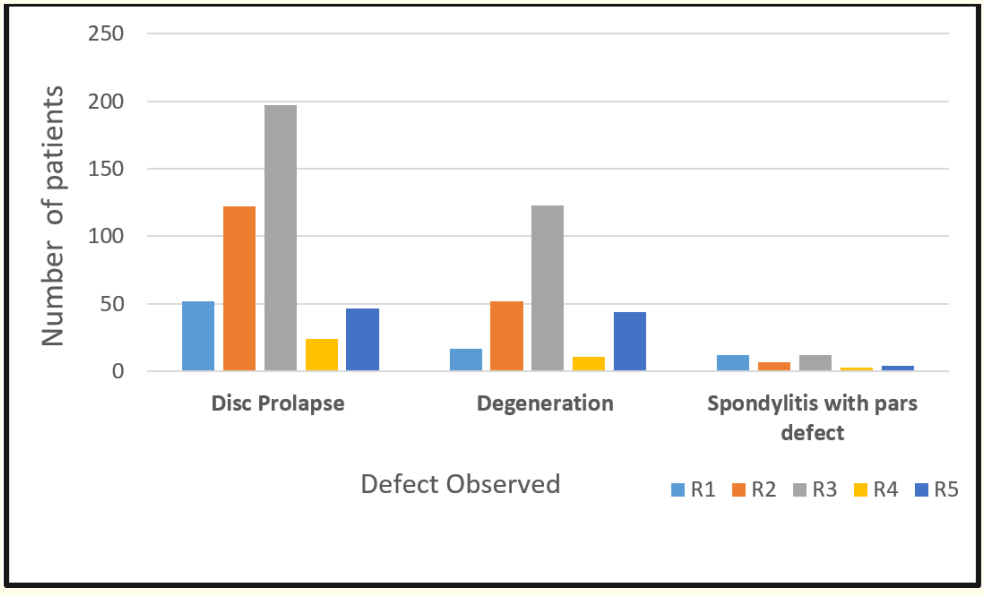

Figure 3: *Pathology.*

The treatments undergone by the patient are classified under

- T1: ACDF,
- T2: Disc replacement,
- T3: Hybrid surgery
- T4: Foraminotomy,
- T5: Micro–Discectomy
- T6 Multiple surgeries.

The end result of the treatments T1 to T6 are listed as return to work:

- R1: Job Change within the organisation,
- R2: Preinjury duties without restriction,
- R3: Preinjury duties with restrictions,
- R4: Return to work with Psychiatry support,
- R5: Unemployed.

The data accumulated was 1700 cases. This information was processed using statistical analysis.

Statistical analysis

The Non parametric test for behavioural Sciences was used for analysing the data. This is due to the fact that it has advantage being small and simple. Behavioural Sciences use this to sequence, conclude or assessing the probability and based on observed frequency, speaks of society [1,2].

One of the tests in this is the Chi-square (X^2) test for two independent sets of samples to assess the significance of differences between two independent groups. This test states that two groups differ with respect to some characteristics with regard to relative frequency group members fall in several categories. For example, R3, return to job with restriction, had more frequencies in various Treatments T1-T6 compared to R4 return to job with Psychiatric support or T5 much superior than T2 by having more frequencies in different responses. The observed frequencies deviate more than predicted frequencies in each categories of responses between these treatments. Thus, calculated X^2 value should be more than table X^2 value to assess the significant differences between responses or between treatments. Significant differences between independent groups have same distribution or one group has larger than another group as determined by value of 'U' as calculated by Mann-Whitney test [1,2].

Results

The people who had anterior cervical discectomy and fusion (ACDF), disc replacement, hybrid fusion, foraminotomy, micro-discectomy and multiple surgeries were classified and their recovery and return to work based on the kind of job that they were doing were studied by statistical analysis. Table 1 shows these values.

	R1 Job change in same organization	R2 Return to job without restriction	R3 Return to with restriction	R4 Return to with Psychiatric support	R5 Unemployed	Total
T1 ACDF	13	14	42	2	13	84
T2 Disc replacement	2	3	0	0	2	7
T3 Hybrid	1	2	9	1	6	19
T4 Foraminotomy	8	4	24	1	11	48
T5 Micro discectomy	12	33	45	11	7	108
T6 Multiple surgeries	9	6	35	2	28	80
Total	45	62	155	17	67	346

Table 1: *Total patient's responses to various treatments based on age of the patients.*

Calculated $X^2 = 59.17$ *and table value of* $X^2_{0.05, 20} = 31.41$ *and* $X^2_{0.01, 20} = 37.57$.

It was found that the majority of the patients were able to return to modified duties following their claim for workers compensation problems.

The patients return to work with age as a factor is shown in table 1. It is seen that the results seen are mostly non-significant. Figure 1 is the plot of various recovery levels against the various age range.

As for the gender was concerned the male subjects' recovery were slightly better than the females This could be due to social reasons also.

Table 2 shows the data classified on the basis of the BMI of patients. We notice the variation is mostly non-significant.

	R1 Job change in same organization	R2 Return to job without restriction	R3 Return to with restriction	R4 Return to with Psychiatric support	R5 Unemployed	Total
T1 ACDF	13	14	42	2	13	84
T2 Disc replacement	2	3	0	0	2	7
T3 Hybrid	1	2	9	1	6	19
T4 Foraminotomy	8	4	24	1	11	48
T5 Micro- discectomy	12	33	45	11	7	108
T6 Multiple surgeries	9	6	32	2	28	20
Total	45	62	115	17	67	346

Table 2: *Patient's responses by returning to various jobs for various treatments (total of BMI).*

Calculated $X^2 = 59.169^{**}$ *and table value of* $X^2_{0.05, 20} = 31.41$ *and* $X^2_{0.01, 20} = 37.57$.

The pre-treatment activity of the clients was classified into four groups:

- Heavy type of work.
- Administrative kind of work.
- People who owned their own business.
- And people who claimed repetitive activities such as working on a conveyor belt.

The effect of this, on the return to job, is shown in the figure 3.

Table 3 shows the patient response of returning to various treatments for various neurological defects seen clinically, viz., cervical spondylosis or degeneration of single or multiple segments or disc prolapse. Here again we see a lot of non-significant data. Figure 3 shows the data seen.

	R1 job changed	R2 without restriction	R3 with restriction	R4 with Psychiatric support	R5 un-employed	Total
T1 ACDF	3	5	12	0	8	28
T2 Disc replacement	1	5	0	0	0	6
T3 Hybrid	1	2	3	0	2	8
T4 Foraminotomy	8	4	8	2	4	26
T5 Microdiscectomy	9	30	35	6	10	90
T6 Multiple surgeries	6	6	19	3	18	52
Total	28	52	77	11	42	210

Table 3: *Patient's response by returning to various jobs for various treatments viz., cervical spondylosis, degeneration of single or multiple segments or disc prolapse.*

Calculated $X^2 = 40.57^{**}$ *and table value of* $X^2_{0.05,20} = 31.41$ *and* $X^2_{0.01,20} = 37.57$.

The cortisone injection is a frequently performed procedure. The cortisone injections are normally given before surgery, after surgery sometimes both before and after surgery. Data on this is given in table 4. Here the response to Cortisone injection is classified as Brief-relief, Improved and None. The treatments in this table will be NINE (T1 to T9). The data on the table 5 and table 5A reveal that the cortisone injection before surgery with 'None' relief has high frequency. In particular One cortisone injection before surgery might relieve the patient and patient may return to work sans surgery. This situation causes results hence this is not considered for evaluation.

Treatments	Response		1 injection	2 injections	3 injections	More than 3 injections	Total
Before Surgery	Brief	(T7)	18	11	1	1	31
	Improved	(T8)	5	3	2	0	10
	None	(T9)	27	14	6	3	50
Before and after surgery	Brief	(T4)	1	2	0	2	5
	Improved	(T5)	0	0	0	0	0
	None	(T6)	2	0	3	4	9
After surgery	Brief	(T1)	2	1	0	2	5
	Improved	(T2)	2	2	0	0	4
	None	(T3)	9	2	5	0	16
Total			66	35	17	12	130

Table 4: *Influence of cortisone injections on treatments - responses to back pain.*

Calculated $X^2 = 47.05^{**}$ *table Value* $X^2_{0.05,24} = 36.42$; $X^2_{0.01,24} = 42.98$.

The data on the patients returning to the job after Cortisone injections, before or after or before and after surgery was analysed. We did not find any correlation.

Table 5 shows the data of patients who got brief relief, improved or no relief from the cortisone injections. Here again we did not find any correlation. We have included the table 5a to show the Mann-Whitney test U value computations for information.

Cortisone injection response	1 injection	2 injections	3 injections	More than 3 injections	Total
After surgery	13	5	5	2	25
After and Before surgery	3	2	3	6	14
Before surgery	50	28	9	4	91
Total	66	35	17	12	130

Table 5: *Influence of cortisone injection treatment - on brief, improved or none response of patient as reflected by returning to job.*

Calculated $X^2 = 26.33^{**}$ *table* $X^2_{0.05,6} = 12.59$ *and at* $X^2_{.0.01,6} = 16.81$.

	U≤	P ≤ 4,4 value	number of injections	U≤	P ≤ 3,3 value
T1 vs. T2	6^{NS}	0.343	1 Vs 2	3^{NS}	0.350
vs. T3	3^{NS}	0.100	Vs 3	4^{NS}	0.500
T2vs T3	1*	0.029	Vs more	2^{NS}	0.200
			2 Vs 3	4^{NS}	0.500
			Vs more	3^{NS}	0.350
			3 VS more	3^{NS}	0.350

Table 5a: *Mann-Whitney test U value and its probability level of significance for table 6.*

Table 6 shows the treatment-response of smokers and non-smokers for both genders was assessed and were found to be non-significant. Except for smokers of both gender viewed together response significantly good. Between response 4 and 5 i.e. with Psychiatric support returning to job compared to becoming unemployed. Other treatments differences showed significant response between Hybrid compared to Foraminotomy or Multiple surgeries or Micro-discectomy; between Foraminotomy with Micro-discectomy; between ACDF with Micro-discectomy and between Multiple-surgeries with Micro-discectomy. These results suggest that, amongst smokers Micro-discectomy treatment was significantly superior to other treatments.

Non smokers							Smokers					
Treatments	**R1**	**R2**	**R3**	**R4**	**R5**	**Total**	**R1**	**R2**	**R3**	**R4**	**R5**	**Total**
T1 ACDF	3	3	4	0	4	14	0	2	6	0	2	10
T2 Disc replacement	1	4	0	0	0	5	0	0	0	0	0	0
T3 Hybrid	1	1	3	0	1	6	0	2	0	0	0	2
T4 Foraminotomy	4	3	3	3	3	16	4	0	3	0	1	8
T5 Micro-discectomy	5	17	20	3	4	49	3	10	18	3	5	39
T6 Multiple surgery	4	5	15	4	9	37	2	1	3	0	8	14
Total	18	23	45	10	21	127	9	15	30	3	16	73
Calculated X^2= 27.47^{NS}							Calculated X^2= 36.98*					

Table 6: *Patient's response by returning to various jobs for various treatments for non-smokers and smokers.*

Discussion

Figure 1 shows the age distribution. As expected, the majority of claims are related to the working group. Figure 2 shows the type of activity performed by the claimants. Individuals involved in heavy labour orientated occupations and those doing repetitive jobs such as on conveyer belt made the most claims. This reflects the common perception that such occupations damage the spine. Figure 3 shows the main types of pathology recorded.

The majority of the individuals were suffering from constitutional genetically determined degenerative disease. It is a common perception that degenerative disease is significantly related to the nature of employment. This is not supported by evidence-based studies [3].

The twin spine study titled Contribution to a Changing View of Disc Degeneration clearly indicates that the genetic factors were the predominant cause for degenerative disease and that employment was not the main cause [4-8].

Harris' analysis is confined to mainly to the lumbar spine and motor vehicle accidents [9,10]. This indicates that in their studies people with lumbar fusions had a very poor outcome. The similar findings are found in other studies also [11-19]. Cochrane review did not find any scientific evidence on the effectiveness of any form of fusion compared with placebo or conservative management [15].

Jellema [20] and Koes., *et al*. [21] concluded that structured cognitive behavioural therapy was more effective than surgery.

The statistical analysis concerns both cervical and lumbar spine surgeries. This study indicates that the best outcomes were found in people who had micro-discectomy for clinically verifiable neurological findings and cervical surgery. Spinal fusions of various types did not show any difference. It indicates that as far as the relief of pain, medication and return to work is concerned spinal fusions were of poor outcome irrespective of the type of the fusion that was performed.

Conclusion

Degenerative disease is a genetically determined constitutional problem. Back pain is common during pregnancy. Because of mechanical reasons spinal fusion is not likely to make their condition better. There is no difference between surgical and non-surgical management of their problem. Cervical fusion and micro-discectomy have better outcomes. This conclusion has been reached by other workers as well. It is necessary for the stakeholders to take a serious view of these findings.

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