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ORIGINAL RESEARCH

A RETROSPECTIVE STUDY OF OUTCOME ANALYSIS OF CERVICAL SPINE INJURIES IN A TERTIARY CARE CENTRE

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Abstract:

Background: Cervical spine injuries considered to be a major trauma and classified in various types. They are associated with various neurological deficits & mortality rates. Cervical spine injuries account 50-75% of all spine injuries. Various studies are there associated with outcome of spinal cord injuries. Our aim was to analyse outcome of upper and lower cervical spine injuries.

Materials and Methods: It was a retrospective study in all traumatic cervical spine injuries in all age group at our Centre during last three years.All cases operated in last three years at our Centre were taken up for study. Initial hospital records were reviewed. Patient were divided on the basis of anatomic level UPPER (C1&C2) & LOWER (C3 or below), and outcome was analysed on criteria of demography, mechanism of injury , preoperative neurological status, involvement of respiratory system, time of surgery following injury. Characteristics of each group were compared by using chi square test method. Statistically significant tests were applied for analysis of outcome of cervical spine injury based on above given criteria

Results: Total study population were having 36 patients in which there were 33 (91.67%) were male and 3 (8.33%) were female .No significant difference was noticed between the sex distribution of upper and lower cervical injury patient,.Overall mortality was 2 (5.56 %) for all patients with cervical spine injuries

Conclusion: In this study patients with upper and lower cervical spine injuries survival rates were calculated on the basis of mechanism of injury, preoperative neurological status, respiratory involvement, time of surgery following injury. Operative treatment of lower

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cervical injury was associated with an improved outcome than upper cervical spine injuries. Further prospective study is needed for better assessment.

Keywords: Cervical spinal cord,Injury,outcome analysis

Introduction:

Injury to the spinal cord is one of the common causes of severe disability and death. Cervical spine injuries are considered to be a major trauma and characterised by a diversity, high risk of severe neurological complication and mortality rate.[1-4] Cervical spinal cord injury accounts for 2-3 % of trauma patients and 8.2% of all trauma related deaths.[5] It includes 50-75% of all spine injuries.[1-6] High index of suspicion, early diagnosis of injury, preservation of spinal cord function, and maintenance or restoration of spinal alignment, and stability are the keys to successful management. Approximately, 12,000 new cases (40 cases/million) are added each year to the existing 0.3–0.5 million victims, in the USA. The situation is worse in developing countries like ours where the prevalence ranges from 236 to 750 per million.

The incidence of spinal cord injury is on a rise and the impact on the healthcare system, and economy is tremendous. Advances in emergency medical care/ambulance services have positively impacted outcomes in trauma; however, the situation for SCI still remains a cause of concern. There has been a major shift from conservative management for these injuries to decompression of cord, stabilization of the spine, early mobilization, and rehabilitation. However, prevention of secondary insult to the cord in the "golden hour" is paramount. Although there have been advances in achieving spinal stabilization and decompressions of the cord; functional outcomes are a matter of concern. Several factors influence the neurological outcome following cervical SCI. There are well established criteria regarding the choice of treatment technique [7].

Material and methods:

Study setting

A complete database review was performed for all traumatic cervical spine injuries treated at Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow over a period of 3 years from 2014 to 2017. Total 36 patients were identified and their records, radiographic studies, daily progress notes, procedure records and discharge summary reports were taken to ensure completeness. Information was collected for each patient regarding age, sex, injury mechanism, neurological deficit, anatomical level of injury and respiratory involvement.On the basis of above given criteria ,results were analysed for two groups : upper and lower cervical spine and all calculations for statistical significance were done (figure 1 and 2).

Inclusion and exclusion criteria

Inclusion criteria

1. Patients with spinal injuries from C1 to C7 level.
2. Patients who were managed surgically.

Exclusion criteria

1. Patients having other associated injuries for example head injuries, penetrating injuries.
2. Patients managed conservatively.

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3. Patients with severe autonomic disturbances such as systolic blood pressure <90 mm hg and heart rate <40.

Patient characteristics

S. no.	Parameter	Frequency (n)
1.	**Age group**	
	<35 years	15
	≥ 35 years	21
2.	**Gender**	
	Male	33
	Female	3
3.	**Mechanism of injury**	
	RTA	13
	Fall	23
4.	**Duration of injury**	
	<1 week	26
	>1 week	10
5.	**Neurological deficit**	
	Present	33
	Absent	3
6.	**Respiratory involvement**	
	Present	13
	Absent	23
7.	**Level of injury**	
	Upper	6
	Lower	30

Statistical analysis

Characteristics of each group were compared by using chi square test method. Statements of statistical significance were made at α <0.05 level. The Yate's modification was applied where frequencies were less than 5.

Results:

Total study population were having 36 patients in which there were 33 (91.67%) were male and 3 (8.33%) were female (Table1).

Table 1: Table showing gender distribution

Level of injury	Sex		Total
	Male	Female	
Upper	5 83.33	1 16.67	6 100.00
Lower	28 93.33	2 6.67	30 100.00
Total	33	3	36

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	91.67	8.33	100.00

Pearson chi2(1) = 0.6545 Pr = 0.418

No significant difference was noticed between the sex distribution of upper and lower cervical injury patients(Table2).

Table 2: Table showing improvement in different gender.

Level of injury	Improvement and Sex			
	No		Yes	
	Male	Female	Male	Female
Upper	1	-	4	1
Lower	-	1	28	1

Statistical analysis was performed to measure association between sex and level of injury. No association ($p>0.05$) was found between level of injury and sex of subject.

Majority of injury in both population were caused by falls 23 (63.89%). Patients with upper cervical spine injury more likely to get trauma by fall than in case of lower cervical spine injury, but it was not showing any statistical significant difference. In our study patient with lower cervical spinal injuries are found to be more associated with higher energy mechanism as compared to upper cervical spine injury (Table 3).

Table 3:Table showing mechanism of injury

Level of injury	Mechanism		Total
	Road Traf	Fall	
Upper	2 (33.33)	4 66.67	6 100.00
Lower	11 (36.67)	19 63.33	30 100.00
Total	13 (36.11)	23 63.89	36 100.00

Pearson chi2(1) = 0.0241 Pr = 0.877

Out of 36 patients, 3 (8.33%) were not having any neurological deficit, 29 (96.67%) out of 30 patients in lower cervical spine injury group having neurological deficit, and 4 (66.67%) patients of upper cervical injury having neurological deficit. So patients with upper spinal injuries were found to have less chances of neurological deficit (Table 4).

Table 4 .Table showing neurological deficits in both groups

Level of injury	Neuro deficit		Total
	No	Yes	
Upper	2 33.33	4 66.67	6 100.00
Lower	1 3.33	29 96.67	30 100.00
Total	3 8.33	33 91.67	36 100.00

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Pearson chi2(1) = 5.8909 Pr = 0.015

In our study 13 out of 36 (36.11%) patients were found to involve respiratory system in upper cervical spine injuries 4 patients (66.67%) were found to involve respiration while 9 (30.00%) were found to have involvement of the same. But this difference was not statistically significant (Table 5).

Table 5: Table showing respiratory system involvement at various levels of injury

Level of injury	Resp. involvement		Total
	No	Yes	
Upper	2 33.33	4 66.67	6 100.00
Lower	21 70.00	9 30.00	30 100.00
Total	23 63.89	13 36.11	36 100.00

Pearson chi2(1) = 2.9137 Pr = 0.088

Overall mortality was 2 (5.56 %) for all patients with cervical spine injuries presenting to our tertiary care centre. One patient died (16.7%) in upper cervical spine injuries and 1 (3.3%) in lower cervical spine injuries. This difference was not found to be statistically significant as shown in Table6.

Table6: Table showing mortality rates at both levels of injury

Level of injury	Mortality		Total
	No	Yes	
Upper	5 83.33	1 16.67	6 100.00
Lower	29 96.67	1 3.33	30 100.00
Total	34 94.44	2 5.56	36 100.00

Pearson chi2(1) = 1.6941 Pr = 0.193

In our study 3 (50%) out of 6 of patients were found to present in duration of less than a week duration in upper cervical spine injury group. In lower cervical spine injury group 23 (76.67%) out of 30 patients presented in less than a week duration. While 3 (50%) of patients presented after 1 week duration in upper cervical spine injury and 7 (23.3%) presented after 1 week duration in lower cervical spine injuries. However this difference was not statistically significant in both the groups.(Table 7).

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Table 7: Table showing duration of injury before surgery

Level of Injury	Duration		Total
	<1 week	> 1 week	
Upper	3 (50.0%)	3 (50.0%)	6 (100.0%)
Lower	23 (76.7%)	7 (23.3%)	30 (100.0%)
Total	26	10	36

Discussion:

Our study comprised of 36 patients in which only 6 (16.67%) belongs to upper cervical spine injury group .The low percentage of upper cervical spine injury differs from the other previous studies. Age is an important factor for neurological outcome and recovery. Although it involves mainly young age group, extreme of age is also not spared .In our study 15 out of 36 patients belongs to age group of 35 or less and 21 belongs to age >35 years. According to national statistical centre (NSCISC, Birmigham, Alaboama,2012) the average age of injury is 41 years with 80% spinal cord injuries in males. Most common etiology according to NSCISC, is RTA corresponding to 39%. In our study 36.11 % patients had cervical injury due to RTA and 63.89 % was due to fall.

In our study, incidence of lower cervical spine injury was 30 (84.35%) out of 36 patients was high as compared to upper cervical injuries 6 (16.65%) out of 36 patients. The percentage of improvement was more in lower cervical spine injury (96.57% Vs 83.35%) patients.

Controversy exists regarding the timing of surgery in SCI. Proponents of both early and late surgery can be found in the literature. Until now 22 studies attempted to define optimal timing of surgery for acute traumatic SCI, 9 utilized the 24 h limit to define an early decompression,[8-16] 8 used 72 h[17-24], and 4 used other benchmarks such as 8hrs, 48hrs, or 4 days[25-28]. Interestingly, none of the studies have reported adverse neurological outcomes with early surgical intervention.

All these studies have brought a paradigm shift in favour of early surgical intervention. The rationale behind this is based on the patho-physiology of acute SCI indicate that there are both primary and secondary mechanisms that lead to neurological injury. Preventing and mitigating the secondary mechanisms is where opportunity for neuro-protection lies and where most attempts at therapeutic intervention staged.

Fehlings *et al.*, 2012 (STASCIS TRIAL)[29], in a multicenter, international, prospective study in adults aged 16–80 with cervical SCI, concluded that decompression before 24 h after injury is significantly associated with improved neurological outcome at 6 months follow-up.

In this study, due to delay in referrals, poor respiratory status , there was a considerable delay before surgical decompression. Because of these reasons, we categorized into two groups such as those operated within 7 days of injury considered as early surgical group, those were operated after 7 days considered as late surgical group. The percentage of patients died was 3.8% in early surgical group (≤7 days), whereas it was 10% in late surgical group (≥7 days) and it was statistically not significant.

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Limitations of study

The major limitations of this study were a small sample size and a multivariate analysis was not possible as their was no group to compare on basis of mortality.

Conclusions

In this study patients with upper and lower cervical spine injuries survival rates were calculated on basis of mechanism of injury, preoperative neurological status, respiratory involvement, time of surgery following injury. Operative treatment of lower cervical injury was associated with an improved outcome than upper cervical spine injuries. Further prospective study is needed for better assessment, as statistically no significant difference was noted in our study due to small sample size.

Conflict of Interest

None

Figure 1: Images of lower cervical spine injury operated by anterior cervical approach.

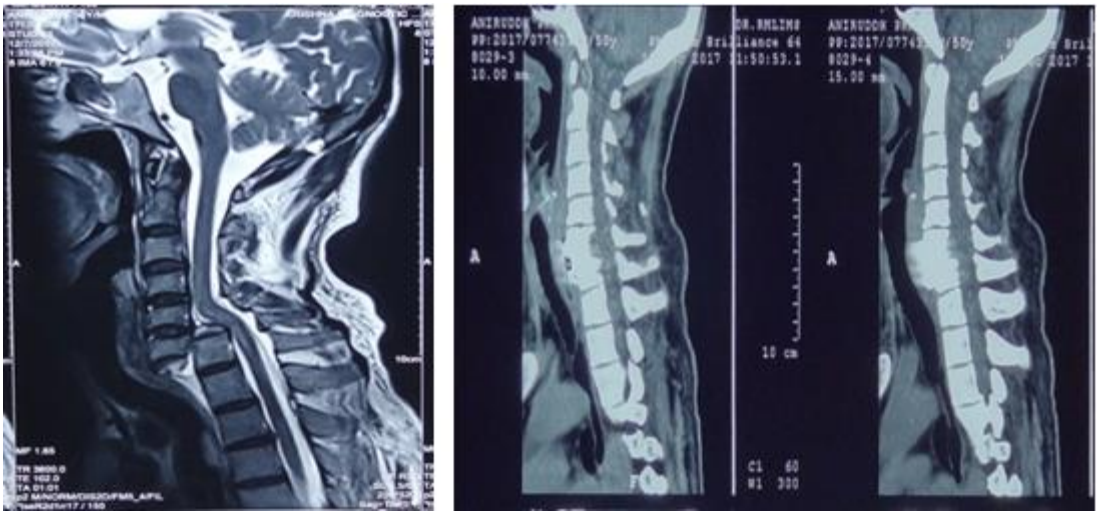
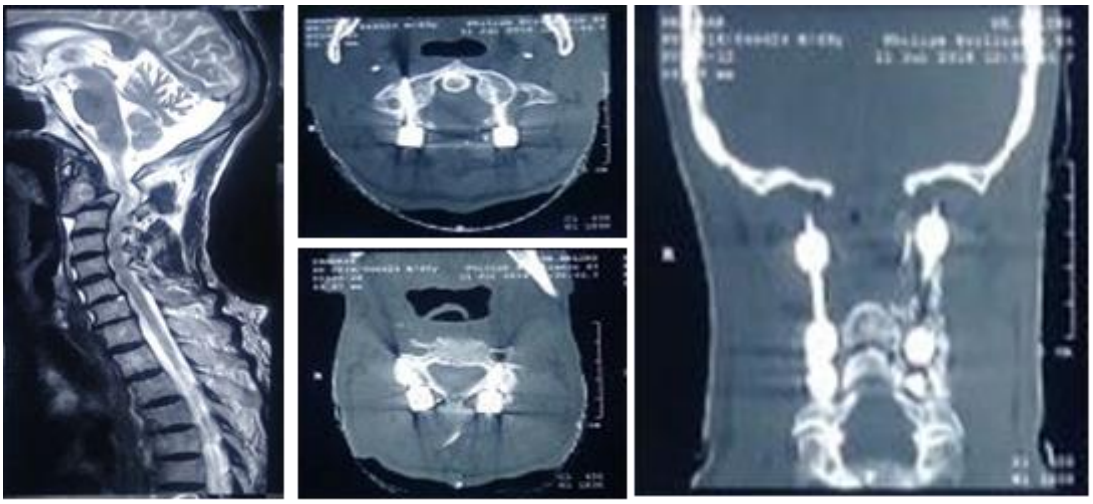


Figure 2: Image of upper cervical spine injury operated by posterior approach.



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