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Comparative study between operative and conservative treatment in cases of spinal cord injury: An analytical, case control and prospective study in a tertiary care hospital of Bihar

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ABSTRACT

Introduction: Spinal cord injury (SCI) following trauma is a functional, psychological and socioeconomic disorder, results in serious secondary medical complications with increased morbidity and mortality. In most of the cases it leads to increased hospitalization, loss of employment and decreased quality of life.

Aims & Objectives: To observe and compare the outcome of conservative and operative methods of treatment in patients of traumatic paraplegia due to spinal cord injury.

Materials and Methods: This was an analytical, case control, prospective study. Twenty-one consecutive patients of spinal cord and spinal column injuries of age between 10 to 60 years and both the gender were included. Using Thoracolumbar Injury Classification and Severity Score (TLISS) they were divided into conservative group (n=13, TLISS score ≤ 3 and 4) and operative group (n=8, TLISS score ≥ 5). Follow up was done on 3rd week, 12th week, 24th week and 36th weeks of treatment.

Results: Most of the patients in this study were in 31-40 years, male, from rural area, injured due to fall from height. Out of 13 patients treated conservatively, 7 had excellent, 4 had good, and 2 had bad outcome according to clinical and radiological findings at the end of follow up months. There was no significant difference in sensory control, motor control, bladder/bowel voluntary control and complications among patients undergone conservative and operative treatment. But the radiological findings for deformity correction was significantly higher among patients undergone operative treatment with respect to conservative treatment.

Conclusions: In this study operative management of spinal cord injury was more efficacious, more compliant but had similar co-morbidity with respect to conservative management. But on the basis of treatment cost and complications conservative management is mostly preferred in rural areas.

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1. Introduction

Spinal cord injury results temporary or permanent change in the cord's normal motor, sensory or autonomic function. Those spinal cord injury which remains undiagnosed or managed sub-optimally repercuss in neurological deficit which can compromise the function and quality of life of

a patient permanently or may lead to death.¹

Spinal cord injury (SCI) is a grave condition that produces functional, psychological and socioeconomic complications. On long-term secondary medical complications are very common and plays crucial role in the process of management of patients with SCI. Complications includes frequent morbidity and mortality, increased rates of rehospitalization, loss of employability and decreased quality of life.

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Males are most prone to spinal cord injuries (80.7%). Neurological complications are complete paraplegia (22.1%, most common), incomplete Tetraplegia (21.7%), incomplete paraplegia (21.7%) and complete tetraplegia (16.3%, least common). In recent years complete injuries have decreased moderately.²

Spinal column injury comprises 6% of different fractures and 90% of them occur in thoracic or lumbar regions and majority of them show affect to the motion segments between T11 and L2 (thoracolumbar junction). These levels of spine are transitional zone so that they may experience substantial biomechanical stresses during traumatic incidents, hence more susceptible to fracture.³

Lumbar spine injuries are severe but not life-threatening but early diagnosis and adequate management is vital for good prognosis.⁴ Thoracolumbar injuries have bimodal distribution, which more common in males under 30 years of age and also in elderly persons. But these fractures in younger patients, normally arise due to high-energy blunt trauma such as road traffic accident, fall from a height and injuries related to sports.⁵

Thoracic and lumbar spinal cord may damage one or both sides of the body and may be complete or incomplete. It damages the vertebral column and also the neural tissues. Management objectives of fracture and dislocations of spine along with paraplegia is to restore alignment and stability of the spine and treating it as unstable until proven otherwise. This will give foundation of future weight bearing, also it will free the cord and nerve roots from possible compression which will prevent any obstruction to spontaneous recovery, prevent further damage and neural lesion.^{6,7}

After management patients can be self-sufficient to perform their mobility and hygienic needs. They are able to operate their manual wheelchair and may even be able to walk for short distances. But patients of lumbar nerve injuries encounter weakness as a prominent issue and physical therapy for them is must in the recovery phase.

Cauda equina syndrome (CES) is a medical emergency which affects nerves of lumbar spine. It may cause incontinence and undoubtedly results in permanent paralysis of the legs. Symptoms appear slowly but requires immediate surgery after the confirmed diagnosis.

2. Aims & Objectives

To observe and compare the outcome of different modalities treatment in cases of traumatic paraplegia. In this study we had compared two treatment modalities

1. Non-operative methods (conservative)-like Plaster jacket, Molded jackets, Corset braces, Hyperextension braces, Neck braces, Rigid braces, Sacroiliac and lumbosacral belts, Trochanteric belts.
2. Operative methods like Hard shill fixation and Pedicle screw fixation.

3. Materials and Methods

3.1. Study site

Department of Orthopaedics, DMCH, Darbhanga, Bihar.

3.2. Study duration

One year from January 2015 to December 2015.

3.3. Study design

This was an analytical, case control, prospective study with comparative groups. Twenty-one consecutive diagnosed cases of spinal column and spinal cord injuries from outpatient department of Orthopaedics and Casualty/Emergency of DMCH, Darbhanga were included in this study. This study was approved from Institutional Ethics Committee of DMCH, Darbhanga. Informed consent was taken from all patients.

3.4. Inclusion criteria

1. Cases of age between 10 to 60 years of both the gender were included in this study.
2. Cases with spinal column and spinal cord injuries were included in this study after diagnosis.

3.5. Exclusion criteria

1. Cases had age ≤ 10 and ≥ 60 years were excluded.
2. Excluding associated other fractures.

Cases were examined clinically and evaluated radiologically. Selected definitive case of spinal column injury and spinal cord injury prospectively studied.

Patients were distributed in 2 groups according to the scoring of thoracolumbar injury severity score (TLISS) (Vaccaro et al. 2005).⁸

Following findings were estimated at the time of admission

1. Demography- Age, Gender, Rural or Urban region.
2. Clinical examination- Mode of injury, Fracture site, Fracture type, Neurological involvement.
3. Radiological findings- Mechanism of injury, Fracture type, Neurological involvement, posterior ligamentous complex integrity.

Out of 21 patients, 11 had TLISS score ≤ 3 and 2 had TLISS score 4, so they were treated with conservative measures (n=13) like plaster jacket and other thoracolumbar orthosis (TLOS). 8 patients had TLISS more than 5 hence they were treated by operative methods like pedicle screw fixation (PSF, n=4) and hard shill fixation (HSF, n=4). Follow up was done on 3rd week, 12th week, 24th week and 36th weeks.

During follow up we had done following observations

Table 1: Thoracolumbar injury classification and severity score

	Points
A) Fracture Mechanism Qualifiers	
1) Compression None	1
2) Compression Lateral Angulation >15°	1
3) Compression Burst	1
4) Translation/rotation	3
5) Distraction	4
B) Neurological Involvement Qualifiers	
1) Intact	0
2) Nerve root	2
3) Cord, conus medullaris Incomplete	3
4) Cord, conus medullaris Complete	2
5) Cauda equine	3
C) Integrity of Posterior Ligamentous Complex Integrity	
1) Intact	0
2) Injury suspected/indeterminate	2
3) Injured	3
Score of ≤3—nonoperative treatment	
Score of 4—either nonoperative or operative treatment, depending on qualifiers such as comorbid medical conditions and other injuries	
Score of ≥5—operative treatment	

Table 2: Thoracolumbar injury classification and Severity Score (TLISS) of patients (n=21)⁸

	No of patients
Score of ≤3: Nonoperative treatment	11 (52.38%)
Score of 4: Either nonoperative or operative treatment, depending on qualifiers such as comorbid medical conditions and other injuries	2 (9.52%)
Score of ≥5: Operative treatment	8 (38.10%)

1. Sensory improvement
2. Motor improvement
3. Autonomic Nervous System improvement like Bladder control and Bowel control
4. Complications like Urinary tract infection (UTI), Chest infection, Bed sore and others
5. Comparison of radiological findings between pre- and post-treatment and also any deformity during follow up.

4. Result and Discussion

In most developing countries like India, the accurate cause of incidence of SCI are mostly unknown due to lack of national database. In Indian context around 1.5 million persons are living with SCI. Every year 20,000 new cases of SCI gets added. Majority of them are male between 16-30 years of age group and most (60-70%) of them are illiterate, poor villagers. This indicates higher incidence of SCI in young, active and productive residents of the community.^{9,10}

Table 3: Demographic profile of patients

		No. of the patients (%)
Age of the patients	11-20	5 (23.81%)
	21-30	1 (4.76%)
	31-40	9 (42.86%)
	41-50	4 (19.05%)
	51-60	2 (9.52%)
Gender	Male	16 (76.19%)
	Female	5 (23.81%)
Region	Rural	16 (76.19%)
	Urban	5 (23.81%)
Mode of Injury	Fall from height	14 (66.67%)
	Road Traffic	7 (33.33%)
	Accident	

Table 4: Outcome according to the method of treatment

Methods of treatment	Excellent outcome	Good outcome	Bad outcome	
Conservative (n=13)	7	4	2	
Operative (n=8)	Pedicle Screw Fixation (PSF, n=4)	2	1	1
	Hard Shell Fixation (HSF, n=4)	2	1	1

The occurrence ratio of SCI in Male versus Female has been considerably decreased in past few years. This indicates transformation of social pattern and females are playing more active role in this fast-going modern era. In Indian context most common etiological factor of SCI was fall from height. But incidence of road traffic accidents has been increased in past few years which is a clear signal of progressive urbanization of community and increase in number of vehicles on roads in India. Summer season has strikingly increased incidence of SCI, denoting enhanced movement of persons during this season.^{9,10}

Frequency of age group for incidence of SCI has been increased from 28.7 years to 40.7 years in recent few decades. Also, most common cause of SCI has switched from fall from height to road traffic accidents and violence. Developing countries like India lacks epidemiological data on Acute Spinal Cord Injury (ASCI).^{9,10}

Singh R et al. (2003), documented that in 45% cases of ASCI the cause was fall from height (trees or roof or electricity pole or terraces) followed by RTA (35%). 20 persons in one million per year population is the estimated incidence of ASCI in India.^{9,10}

Most of the patients in this study were in 31-40 yrs (n=9, 42.86%) of total and least commonly these injuries occur in 21-30 yrs of age (n=1, 4.76%). Out of 21 patients 16 were male and 5 were female, that is 76.19% victims were male. In the present study, it was found that rural population were more prone to spinal column and spinal cord injuries (76%)

Table 5: Comparison between treatments during follow up

Methods of treatment	Sensory control		Motor control		Bladder/ Bowel Voluntary control		Complications			Radiological findings- Deformity Corrected				
	+ve	-ve	1/5	2/5	3/5	4/5	+ve	-ve	UTI	CI	BS	NAD	Yes	No
Conservative (n=13)	10	3	1	2	9	1	10	3	2	1	5	5	2	11
	10	3	2	0	4	7	8	5	0	5	2	6	2	11
	11	2	1	2	8	2	8	5	2	3	0	8	2	11
	11	2	1	2	9	1	8	5	4	1	2	5	2	11
Operative (n=8)	6	2	1	1	4	2	5	3	3	1	2	4	5	3
	6	2	1	0	3	4	5	3	1	2	2	3	5	3
	6	2	1	1	5	1	5	3	2	3	0	3	5	3
	6	2	1	1	5	1	5	3	3	1	0	4	5	3

UTI- Urinary Tract Infection, CI- Chest Infection, BS- Bed Sore, NAD- No Abnormality Detected

as compare to urban population (24%). Out of 21 patients 16 belong to rural areas and 5 from urban region. Commonest mode/cause of injury was falling from height (66%) and incidence of road traffic accident was 44%. 14 patients out of 21 got spinal column, and spinal cord injury by falling from height. 7 got damage from road traffic accident.

Out of 13 patients treated conservatively 7 had excellent, 4 good, and 2 patient had bad outcome on clinical findings and radiological findings at the end of follow up months as per TLISS score. Out of 4 patients treated with PSF 2 had excellent result, 1 had good, and 1 patient had bad outcome. Out of 4 patients treated with HSF, 2 had excellent, 1 had good, and 1 patient had bad result.

There was no significant difference of sensory control, motor control, bladder/bowel voluntary control and complications among patients undergone conservative and operative treatment. But the radiological findings for deformity correction was significantly higher among patients undergone operative treatment with respect to conservative treatment.

Since long time the management part of unstable fractures and fracture-dislocations of the thoracic and lumbar spine is debatable. Various researchers, like Guttman L (1976)¹¹ & Bedbrook GM (1979)¹² recommended nonoperative or conservative management, but studies done after, like by Levine and Edwards (1985),¹³ Bohlman HH (1985),¹⁴ Bradford et al. (1977),¹⁵ McAfee, Bohlman, and Yuan (1985),¹⁶ Luque, Cassis, and Ramirez-Wiella (1982),¹⁷ Eismont et al. (1994),¹⁸ and Cotrel Y and Dubousset (1985)¹⁹ and Cotrel Y, Dubousset J, Guillaumat M (1988),²⁰ have highlighted the benefits of open reduction and rigid internal fixation with posterior instrumentation.

Wood et al. (2003),²¹ Shamim MS et al. (2011),²² Rahimi-Movaghar V (2005)²³ and Rehtine GR^{2nd} et al. (1999)²⁴ demonstrated that operative treatment had no statistically significant radiographic or functional outcome benefits with respect to conservative/non-operative treatment. Also documented that the patients who were managed operatively had experienced higher care cost and higher complication rate than those treated non operatively. Also, hospital stay was prolonged in non-operative treatment.

But in present study, significant radiographic outcome advantages were found in case of operative treatment with respect to conservative treatment. The functional outcomes were similar in both treatment groups. Operative management was costly with higher complication rate.

5. Conclusion

In this study operative management of spinal cord injury was more efficacious, more compliant but had similar comorbidity with respect to conservative management. But on the basis of treatment cost and complications conservative management is mostly preferred in rural areas. In India, management and rehabilitation of SCI patients lags far

behind due to inadequate rescue, retrieval systems and specialized centres for the management.

Healthcare workers including doctors, nurses or other paramedical staffs of rural or urban area needed to be adequately trained about early and prompt handling and cautious transportation of patients of spinal cord injuries. For this comprehensive multidisciplinary management and rehabilitation perspective should be acquired to reintegrate patients with SCI to the community.

6. Source of Funding

None.

7. Conflict of Interest

The author declares no conflict of interest.

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