

COMPARATIVE RESEARCH OF SURGICAL AND CONSERVATIVE SPINAL CORD INJURY TREATMENT IN A BIHAR TERTIARY CARE HOSPITAL: ANALYTICAL, CASE-CONTROL AND PROSPECTIVE STUDY

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ABSTRACT

Background

Spinal cord injuries (SCI) pose a substantial clinical challenge due to their complex nature and profound impact on patients' quality of life. Effective management strategies, including operative and conservative treatments, are crucial for improving patient outcomes. This study aims to compare the outcomes of operative versus conservative treatments in individuals with spinal cord injuries, focusing on functional recovery, complication rates, and overall patient outcomes.

Methods

A total of 300 participants were comprised, with 150 individuals in the operative treatment group and 150 in the conservative treatment group. Data were collected through clinical examinations and radiological evaluations. Patients were grouped based on the thoracolumbar injury severity score (TLISS). Functional outcomes were assessed using the ASIA impairment scale and Frankel grading system. Statistical analysis was done using SPSS version 23.0.

Results

The operative group showed significantly better functional outcomes, with a 26.7% improvement in ASIA scores and a 30% improvement in Frankel grades compared to 16.7% and 18.7%, respectively, in the conservative group. The recovery rate was faster in the operative group, with 36.7% recovering within three months compared to 20% in the conservative group. Complications were fewer in the operative group, with lower incidences of infection (6.7% vs. 13.3%), persistent pain (13.3% vs. 23.3%), and mortality (1.3% vs. 5.3%).

Conclusion

Operative treatment for spinal cord injuries offers superior benefits over conservative treatment, resulting in better functional outcomes, faster recovery rates, and fewer complications and mortality rates. These findings support the recommendation of operative intervention for suitable patients with SCI to optimize recovery and reduce adverse outcomes.

Recommendations

It is advised to conduct more studies with bigger sample sizes and a wider range of demographics to confirm these results and create thorough protocols for the treatment of spinal cord injuries.

Keywords: Spinal cord injury, Operative treatment, Conservative treatment, Functional outcomes, Recovery rate.

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INTRODUCTION

Spinal cord injuries (SCI) represent a significant clinical challenge due to their complex nature and the profound impact they have on patients' quality of life. These injuries often result in permanent disabilities, necessitating comprehensive medical and rehabilitative interventions. The global incidence of SCI is valued to be between 250,000 and 500,000 cases annually, with road traffic accidents, falls, and sports injuries being the primary causes [1]. Effective management strategies for SCI are crucial for improving patient outcomes and reducing the

long-term healthcare burden associated with these injuries.

Traditionally, the management of SCI has involved either conservative or operative treatments. Conservative treatment includes immobilization, pharmacological interventions, and physical therapy aimed at minimizing further injury and promoting natural recovery. In contrast, operative treatment involves surgical interventions to stabilize the spinal column, decompress neural elements, and correct anatomical abnormalities. Recent advancements in surgical techniques and postoperative

care have expanded the potential benefits of operative treatment, prompting a reevaluation of its role in SCI management [2].

Several studies have explored the comparative efficacy of operative and conservative treatments in SCI patients, yielding mixed results. A meta-analysis highlighted the potential advantages of early surgical intervention in improving neurological outcomes and reducing hospital stay durations [3]. Similarly, a study demonstrated that patients who underwent early surgery showed significant improvements in motor and sensory functions compared to those managed conservatively [4]. These findings suggest that operative treatment may offer superior clinical benefits, particularly in cases of severe SCI.

However, the choice between operative and conservative treatment remains a subject of ongoing debate. Factors such as injury severity, patient comorbidities, and resource availability influence treatment decisions. Moreover, the risk of surgical complications, including infections and hardware failure, necessitates a careful assessment of the risks and benefits of operative interventions [5]. As such, there is a pressing need for more comprehensive and methodologically robust studies to provide clearer guidance on the optimal management of SCI.

This study aims to compare the outcomes of operative versus conservative treatments in patients with spinal cord injuries, focusing on functional recovery, complication rates, and overall patient outcomes.

METHODOLOGY

Study Design

An analytical, case-control, and prospective study.

Study Setting

The study took place during a period from January 2021 to January 2023 at the Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India.

Participants

The study included 300 participants.

Inclusion Criteria

- Patients aged between 10 to 60 years, both genders
- Diagnosed cases of spinal column and spinal cord injuries

Exclusion Criteria

- Cases with associated other fractures

Sample size

To calculate the sample size for this study, the following formula was used for estimating a proportion of a population:

$$n = \frac{Z^2 \times p \times x (1-p)}{E^2}$$

Where:

- n = sample size
- Z = Z-score corresponding to the desired level of confidence
- p = estimated proportion in the population
- E = margin of error

Bias

Efforts were made to minimize selection bias by consecutively including eligible patients based on the predefined inclusion and exclusion criteria. Observer bias was reduced by having multiple independent assessors evaluate the clinical and radiological findings.

Variables

Variables included treatment type (operative vs. conservative), age, gender, TLISS score, functional outcomes, recovery rate, and complications.

Data Collection

Data were collected through clinical examinations and radiological evaluations. Patients were then divided into two groups based on the thoracolumbar injury severity score (TLISS):

1. Operative Treatment Group
2. Conservative Treatment Group

Procedure

Participants with spinal column and spinal cord injuries were clinically examined and evaluated using radiological imaging. Based on the TLISS, patients were categorized into two groups (operative and conservative treatment). Each group received the respective treatment as per the standard protocols. Patients were followed up periodically to assess their recovery and any complications.

Statistical Analysis

SPSS version 23.0 was used to analyze the data. To compile the data, descriptive statistics were employed. Using suitable statistical methods, such as the t-test for continuous variables and the chi-square test for categorical variables, a comparative study between the two treatment groups was carried out. Statistical significance was attained when the p-value was less than 0.05.

Ethical considerations

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

RESULT

Of the 300 individuals, 150 were allocated to the group receiving surgical treatment, and another 150 to the group receiving conservative care. Table 1 provides a summary of the participant's demographic data.

Table 1: Demographic Characteristics

Variable	Operative Group	Conservative Group	p-value
Mean Age	35.2 ± 12.4	34.8 ± 13.1	0.768
Gender			
- Male	90	85	0.541
- Female	60	65	
Mean TLISS Score	6.8 ± 1.5	6.6 ± 1.4	0.372

Functional outcomes were measured using the American Spinal Injury Association (ASIA) impairment scale and the Frankel grading system. Table 2 shows the comparison of functional outcomes between the two groups at the end of the study period.

Table 2: Functional Outcomes

Outcome Measure	Operative Group	Conservative Group	p-value
ASIA Score Improvement	40 (26.7%)	25 (16.7%)	0.034
Frankel Grade Improvement	45 (30%)	28 (18.7%)	0.021

The recovery rate was assessed based on the time taken for patients to achieve partial or complete recovery. The operative group showed a significantly faster recovery rate compared to the conservative group.

Table 3: Recovery Rate

Recovery Time	Operative Group	Conservative Group	p-value
<3 months	55 (36.7%)	30 (20%)	0.002
3-6 months	60 (40%)	45 (30%)	0.041
>6 months	35 (23.3%)	75 (50%)	0.001

The rate of complications was also compared between the two groups. The operative group experienced fewer complications compared to the conservative group, as shown in Table 4.

Table 4: Complications

Complication Type	Operative Group	Conservative Group	p-value
Infection	10 (6.7%)	20 (13.3%)	0.047
Reoperation	5 (3.3%)	0 (0%)	0.024
Persistent Pain	20 (13.3%)	35 (23.3%)	0.033

The mortality rate was also assessed in both groups. The results are presented in Table 5.

Table 5: Mortality Rate

Mortality	Deaths
Operative Group	2 (1.3%)
Conservative Group	8 (5.3%)
p-value	0.049

DISCUSSION

There were no notable variations in age, gender distribution, or TLISS scores between the two groups of the 300 participants in the study, who had similar demographic features. This balance ensures that the comparison of treatment outcomes is not influenced by these variables, providing a fair basis for evaluating the relative effectiveness of the two treatment approaches.

The results showed a statistically significant improvement in functional outcomes for the operative group in contrast to the conservative group. Specifically, 26.7% of individuals in the operative group experienced an

improvement in their ASIA scores, compared to 16.7% in the conservative group (p=0.034). Similarly, 30% of the operative group showed improvement in Frankel grades, versus 18.7% in the conservative group (p=0.021). These results suggest that for patients with spinal cord injuries, surgical intervention is more beneficial in improving neurological function and overall rehabilitation.

The recovery rate analysis revealed that individuals in the operative group had a significantly faster recovery compared to those in the conservative group. A greater fraction of individuals in the operative group achieved partial or complete recovery within three months (36.7%

vs. 20%, $p=0.002$) and within three to six months (40% vs. 30%, $p=0.041$). Conversely, a greater percentage of patients in the conservative group required more than six months to recover (50% vs. 23.3%, $p<0.001$). These results underscore the benefits of operative treatment in accelerating recovery time.

The incidence of complications was lower in the operative group. Specifically, the operative group had substantially fewer infections (6.7% vs. 13.3%, $p=0.047$), reoperations (3.3% vs. 0%, $p=0.024$), and cases of persistent pain (13.3% vs. 23.3%, $p=0.033$). Additionally, the mortality rate was lower in the operative group (1.3% vs. 5.3%, $p=0.049$). These findings suggest that operative treatment not only improves functional outcomes and recovery rates but also reduces the risk of complications and mortality in people with spinal cord injuries.

The results of the study indicate that operative treatment offers superior benefits over conservative treatment for individuals with spinal cord injuries. The operative group demonstrated better functional outcomes, faster recovery rates, and lower incidences of complications and mortality. These findings support the recommendation for operative intervention in suitable patients to optimize recovery and reduce adverse outcomes. The comprehensive data analysis underscores the importance of individualized treatment planning, taking into consideration the severity of the injury and the overall health status of the patient.

A prospective case-control study compared conservative and operative treatments for SCI. They found that operative management had better radiological outcomes for deformity correction, but similar sensory, motor, and bladder/bowel control outcomes compared to conservative treatment. Operative management was more compliant but had similar comorbidity rates. Conservative treatment was preferred in rural areas due to lower costs and fewer complications [6].

Another study compared postoperative clinical outcomes in patients with SCI in the thoracic, thoracolumbar, and lumbar regions. Patients who underwent surgery showed substantial improvements in quality of life, as measured by SF-36, ODI, and VAS scores, indicating that surgical intervention can lead to substantial recovery [7]. A study evaluated early surgical treatment (<24 hours) versus conservative treatment in patients with incomplete cervical SCI and pre-existing cervical spinal stenosis. Early surgery resulted in better neurological outcomes, with higher rates of ASIA-grade improvement compared to conservative treatment [8].

A study examined short-term neurological and functional outcomes in patients with SCI treated surgically. The study found that surgery led to significant neurological recovery and favorable functional outcomes in most patients, indicating the effectiveness of operative management in improving patient outcomes [9]. A systematic review compared early (within 24 hours) and late surgical intervention for acute SCI. Early surgery was associated with better neurological improvement, shorter

hospital stays, lower costs, and fewer complications compared to late surgery [10].

A meta-analysis was conducted on surgical versus conservative treatment for cervical spinal cord injury without fracture and dislocation (CSCIWFD). Surgical treatment showed superior outcomes in effective rates and JOA scores compared to conservative treatment, indicating that surgery significantly improves spinal cord function [11]. A study investigated the role of conservative management in traumatic extradural hematoma (EDH). They found that conservative management was effective in many cases, but close monitoring was essential to detect any deterioration requiring surgical intervention [12].

Generalizability

The generalizability of this study is limited by its sample size of 300 participants and the lack of demographic diversity reported. The findings may be most applicable to patients with spinal cord injuries who meet the criteria defined by the thoracolumbar injury severity score (TLISS) and those who fit the demographic characteristics of the study population. To increase external validity, further research involving larger, more diverse populations in terms of age, gender, race, and severity of injury is necessary to determine whether the results can be broadly applied across different patient groups and healthcare settings.

CONCLUSION

This study demonstrates that operative treatment for spinal cord injuries provides superior benefits compared to conservative treatment. Patients receiving operative care showed better functional outcomes, faster recovery rates, and lower incidences of complications and mortality. These findings advocate for the use of operative interventions in appropriate cases of spinal cord injuries to enhance patient recovery and minimize adverse outcomes. Further research is recommended to confirm these results and to refine treatment guidelines for SCI management.

Limitations

The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of a comparison group also poses a limitation for this study's findings.

Recommendation

It is advised to conduct more studies with bigger sample sizes and a wider range of demographics to confirm these results and create thorough protocols for the treatment of spinal cord injuries.

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List of abbreviations

SCI - Spinal Cord Injuries
TLISS - Thoracolumbar Injury Severity Score
ASIA - American Spinal Injury Association
EDH - Extradural Hematoma
JOA - Japanese Orthopaedic Association
VAS - Visual Analogue Scale
ODI - Oswestry Disability Index
CSCIWFD - Cervical Spinal Cord Injury Without Fracture and Dislocation

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Conflict of interest

The authors have no competing interests to declare.

REFERENCES

1. Wyndaele M, Wyndaele JJ. Incidence, prevalence, and epidemiology of spinal cord injury: what learns a worldwide literature survey? *Spinal Cord*. 2016;54(5):309-21.
2. Fehlings MG, Tetreault LA, Wilson JR, Kwon BK, Burns AS, Martin AR, et al. A clinical practice guideline for the management of patients with acute spinal cord injury: recommendations on the type and timing of rehabilitation. *Global Spine J*. 2017;7(3_suppl):231S-238S.
3. Liu JM, Long XH, Zhou Y, Peng HW, Liu ZL, Huang SH, et al. Surgical versus non-surgical treatment for thoracolumbar burst fractures without neurological deficit: a systematic review and meta-analysis. *Eur Spine J*. 2018;27(6):1471-86.
4. Wilson JR, Singh A, Craven C, Verrier MC, Drew B, Ahn H, et al. Early versus late surgery for traumatic spinal cord injury: the results of a prospective Canadian cohort study. *Spine*. 2019;44(6):411-8.
5. Badhiwala JH, Wilson JR, Witiw CD, Harrop JS, Vaccaro AR, Aarabi B, et al. The influence of timing of surgical decompression for acute spinal cord injury: a pooled analysis of individual patient data. *Lancet Neurol*. 2020;19(4):289-98.
6. Kumar R, Ranjan R, Prakash O. 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. *Indian J Orthop Surg*. 2021;7:207-212.
7. Siregar BA, Kadar PD, Ketaren ASP. Comparison of Post-Operative Clinical Outcome of Patients with Posterior Instrumentation After Spinal Cord Injury in Thoracic, Thoracolumbar, and Lumbar Region at Haji Adam Malik General Hospital, Medan from 2016 to 2018. *Int J PharmTech Res*. 2020;13:20-25.
8. Lee S, Kim C, Ha JK, Jung SK, Park JH. Comparison of Early Surgical Treatment With Conservative Treatment of Incomplete Cervical Spinal Cord Injury Without Major Fracture or Dislocation in Patients With Pre-existing Cervical Spinal Stenosis. *Clin Spine Surg*. 2020.
9. Purkayastha T, Debnath AK, Debroy S, Debbarma S. Short-term neurological and functional outcome of surgical intervention in spinal cord injuries: a single center prospective observational study. *Pan Afr Med J*. 2023;45:138.
10. Qiu Y, Chen Y, Ying X, Xie H, Dong J. Comparative analysis of the efficacy of early and late surgical intervention for acute spinal cord injury: A systematic review and meta-analysis based on 16 studies. *Int J Surg*. 2021.
11. Chen D, Chen H, Huang F. Efficacy of surgical treatment and conservative treatment for cervical spinal cord injury without fracture and dislocation in adults: A meta-analysis. *Medicine*. 2023;102.
12. Kumar S, Singh S, Nayan SK, Singh S. Role of non-operative management of extradural hematoma and reasons for conversion in patients admitted in tertiary care hospital in Bihar. *Int J Health Sci*. 2022.

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