

Original Research Article

Early fixation versus delayed fixation in cervical spine trauma patient with absent cough reflex in view of intensive care unit stay and cost effectiveness

Sanjeev Gupta, Mohmmad Sikander Baketh, Maneer Ahmed Mir, Tanveer Ali*

Department of Orthopaedics, GMC Jammu, Jammu and Kashmir, India

Received: 18 June 2020

Accepted: 29 June 2020

***Correspondence:**

Dr. Tanveer Ali,

E-mail: dr.tanvirm90gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: This study was conducted in GMC Jammu to evaluate ICU stay and cost effectiveness in patients with cervical spine trauma undergoing early fixation (within 24-72 hours after trauma) versus late fixation (delayed fixation after applying traction and waiting for return of cough reflex).

Methods: Retrospective and prospective study was done by collecting data from admission register and patient follow-up during 2016-2019. 50 patients were admitted as cervical spine trauma, out of which 38 were operated upon and ten managed conservatively. 15 patients were operated within 72 hours of admission with absent cough reflex and 23 were put on cervical traction and operated upon after return of cough reflex.

Results: Average ICU stay for 15 patients (4 females 11 males) immediately operated ranged from 10 to 15 days along with prolonged mechanical ventilation. Average ICU stay for 23 patients (16 males and 7 females) operated after returning of cough reflex ranged from 3-4 days with considerably decreased requirement of mechanical ventilation.

Conclusions: Delayed fixation of cervical spine after returning of cough reflex shortens post-operative ICU stay and is considerably more cost effective than early fixation.

Keywords: Cervical spine trauma, Cost effectiveness, Cough reflex, Delayed surgery, Early fixation, Intensive care unit stay

INTRODUCTION

In India, the average annual incidence of SCI is 15,000 with a prevalence of 0.15 million.¹ According to the World Health Organization (WHO), the incidence of SCI is increasing in developing countries including India, and the health-care burden due to SCI is expected to be similar to that in the developed world.²

Spinal cord injury presents frequently in the emergency department of GMC Jammu, which serves as the only tertiary care centre for a large number of populations in and around Jammu city. It has a large impact on healthcare in terms of availability of resources, expert

staff trained to handle such cases and as well as expenses to the patient and attendants. This presents a huge dilemma for the orthopedic surgeons. A surgeon has to decide whether to intervene early or to wait for the patient's cough reflex to return keeping in view the limited availability of ventilators and ICU beds in an already overburdened setting and a large patient inflow.

The purpose of this study was to compare duration of ICU stay and cost effectiveness of early surgical intervention and fixation (within 24 to 72 hours of admission) versus late surgical intervention and fixation post application of cervical tongs for traction and waiting for return of cough reflex.

METHODS

Retrospective and prospective analysis was carried out and data was collected using information available in the admission and discharge register. Patients in retrospective analysis were accepted only after availability of information of at least six months to one-year follow-up was confirmed. The inclusion criteria were patients of either sex, age ranging from 25-50 years with an initial GCS >13 and initial AIS grade A-D, cervical spinal cord compression confirmed by MRI or CT myelography with neurological level of injury between C2 and T1 admitted in our hospital from 2016 to 2019.

Patients with penetrating injuries to the neck, pregnant females, pre-injury major neurologic deficits or disease (ischemic stroke, Parkinson's disease etc.), life

threatening injuries which prevent early decompression of the spinal cord and patients arriving >24 hours after injury were excluded from the study.

In this three-year duration, 50 cervical spine injury patients were admitted out of which 2 patients with grade 4 anterolisthesis (2 males) expired without any surgical intervention. 10 patients (3 female 7 males) were managed conservatively as cases of stable cervical spine injuries with minimal or no neurodeficit. 38 patients (12 females 26 males) had unstable spinal injuries with neurodeficit which required fixation and were managed with surgical fixation of cervical spine. Out of the operated, 10 patients had fracture dislocation, 10 had grade II anterolisthesis and 8 had grade III anterolisthesis. All of the operated patients had neurodeficit along with absent or very weak cough reflex (Table 1).

Table 1: Type of cervical spine trauma.

Type of fracture	No. of patients	
Stable fractures with no/minimal neurological deficit	10	
Unstable fractures with neurological deficit	Fracture dislocation	10
	Grade II Antero-listhesis	10
	Grade III Antero-listhesis	8
	Grade IV Antero-listhesis	2

Table 2: Type of management.

Management	No. of patients	
Conservative	10	
Operative	Early	15
	Delayed	23
Deceased	2	

A total 15 patients were optimized early and operated within 48±24 hours of admission without waiting for recovery of cough reflex. In remaining 23 patient's cervical traction was used to stabilize cervical spine and surgical fixation done after patient had regained cough reflex with mean waiting period of 14±4 days (Table 2).

Data was collected on duration of post-operative ICU stay and need for prolonged stay on mechanical ventilation post-surgery.

RESULTS

The 15 cases which were operated early with absent cough reflex needed prolonged intubation and ICU stay averaging 25±5 days and could not be extubated early. Among them, 4 patients developed serious ventilator acquired infections and had to undergo tracheostomy, 8 patients developed minor infections requiring yet again longer ICU stay and mechanical ventilation and 3 patients had minimal infections and were extubated early (Table 3).

In 23 patients which were managed by delayed fixation after they had regained adequate cough reflex average ICU stay was 5±2 days. Patients were extubated early with minimum stay on mechanical ventilation and decreased chance for ventilator acquired infections.

Table 3: ICU course and complications.

Time of management	No. of patients	Complications	No. of patients	Duration of ICU stay
Early	15	Ventilator acquired infections requiring tracheostomy	4	25±5 days
		Minor infections	8	
		Min infection with early extubation	3	
Delayed	23	-		5±2 days

DISCUSSION

There still is not a consensus on the definite management of cervical spine trauma. The dispute is not limited to surgical or conservative management, but also to early or late decompression. The definitions of early and late surgeries are also not clear cut. Early surgery has been defined as being as early as 8 hours after the injury up to 4 days after SCI. However, most of the studies have defined a 24-hour limit for early surgery.³

Cervical traction had been considered for spontaneous neurological improvement in subjects undergoing conservative management.⁴ However, it has an estimated risk of about 10% of neurological deterioration in patients with incomplete cervical SCI.⁵ The surgical approach should be selected on the basis of the type of fracture, the age of the patient and the surgeon's experience. Whereas the biomechanical data suggests greater efficacy of the posterior approach, the anterior approach is usually preferred because it avoids prone positioning of a traumatized spine and allows direct decompression at the anterior site.⁶

In the acute phase of injury, 36% to 83% of spinal cord injury patients experience serious respiratory complications and, even in the chronic phase of recovery from spinal cord injury, respiratory complications are among the leading causes of death.⁷⁻⁹ Cough is a protective reflex that facilitates the expulsion of mucus from the airways. The proposed mechanism of cough involves stimulation of sensory receptors within the respiratory tract, whose afferent impulses to the brainstem activate a putative cough center.¹⁰ Expiratory muscles, which create elevated intrathoracic pressures, are essential for the production of an effective cough. Since these muscles receive their innervation from the first thoracic segment and below, transection of the cervical spinal cord renders expiratory function, and hence cough, severely compromised. As a result, inability to clear secretions, mucus plugging, atelectasis, and respiratory infections are common pulmonary complications among subjects with cervical spinal cord injury.¹¹

This study comprised of 48 patients, out of which 10 were managed conservatively, 15 underwent decompression surgery within 72 hours of trauma and 23 were managed surgically after they had regained cough reflex.

Out of the 15 patients who underwent early decompression surgery, 4 developed serious ventilator associated infections and required prolonged ventilation. So, they were tracheostomized. Further 8 patients developed infections and increased their stay in ICU. Remaining three patients were extubated early. The mean duration of stay of these patients in ICU was 25±5 days. The 23 patients who underwent delayed decompression

surgery had an uneventful recovery and their mean duration of ICU stay was 5±2 days.

So, from this study authors conclude that the patients who have impaired cough reflex associated with cervical spine trauma benefit from conservative cervical traction till the return of cough reflex followed by surgical decompression. This helps in shorter duration of post-operative ICU stay and mechanical ventilation requirements imparting lesser economic impact.

The limitation of this study was that there are only a few studies available to us regarding the outcome of patients in terms of ICU stay and cost effectiveness. So, authors could not compare this result with other studies.

CONCLUSION

The study conducted reveals that duration of ICU stay along with ICU related complications and cost to patient is higher when patient is operated and fixed early in cervical trauma as compared to delayed fixation after the return of cough reflex.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Rehabilitation Council of India. Spinal Cord Injury. Available at: <http://www.rehabcouncil.nic.in/writereaddata/spinal.pdf>. Accessed on 12th May 2020
2. Woolf AD, Pflieger B. Burden of major musculoskeletal conditions. Bull World Health Organ. 2003;81:646-56.
3. Fehlings MG, Vaccaro A, Wilson JR, Singh A, Cadotte DW, Harrop JS, et al. Early versus delayed decompression for traumatic cervical spinal cord injury: results of the surgical timing in acute spinal cord injury study (STASCIS). PloS One. 2012;7(2):e32037.
4. Andrews DF. Neurological recovery, mortality and length of stay after acute spinal cord injury associated with changes in management. Paraplegia. 1995;33:254-62.
5. Katoh S, El Masry WS, Jaffray D, McCall IW, Eisenstein SM, Pringle RG, et al. Neurologic outcome in conservatively treated patients with incomplete closed traumatic cervical spinal cord injuries. Spine. 1996;21(20):2345-51.
6. La Rosa G, Conti A, Cardali S, Cacciola F, Tomasello F. Does early decompression improve neurological outcome of spinal cord injured patients? Appraisal of the literature using a meta-analytical approach. Spinal Cord. 2004;42:503-12.

7. Berly M, Shem K. Respiratory management during the first five days after spinal cord injury. *J Spinal Cord Med.* 2007;30(4):309-18.
8. Claxton AR, Wong DT, Chung F, Fehlings MG. Predictors of hospital mortality and mechanical ventilation in patients with cervical spinal cord injury. *Can J Anaesth.* 1998;45(2):144-9.
9. Garshick E, Kelley A, Cohen SA, Garrison A, Tun CG, Gagnon D, et al. A prospective assessment of mortality in chronic spinal cord injury. *Spinal Cord.* 2005;43(7):408-16.
10. Widdicombe JG. Neurophysiology of the cough reflex. *Eur Respir J.* 1995;8:1193-202.
11. Mansel JK, Norman JR. Respiratory complications and management of spinal cord injuries. *Chest.* 1990;97:1446-52.

Cite this article as: Gupta S, Baketh MS, Mir MH, Ali T. Early fixation versus delayed fixation in cervical spine trauma patient with absent cough reflex in view of intensive care unit stay and cost effectiveness. *Int J Res Med Sci* 2020;8:2767-70.