Injury, Int. J. Care Injured 46 (2015) 388–391

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Is it safe to use a kinetic therapy bed for care of patients with cervical spine injuries?

Mark L. Prasarn [a,*], MaryBeth Horodyski [b], Caleb Behrend [c], Gianlucca Del Rossi [d], Dewayne Dubose [b], Glenn R. Rechtine [c,e]

[a] Department of Orthopaedics and Rehabilitation, University of Texas, Houston, TX, United States
[b] Department of Orthopaedics and Rehabilitation, University of Florida, Gainesville, FL, United States
[c] Department Of Orthopaedics and Rehabilitation, University of Rochester, Rochester, NY, United States
[d] Department of Orthopaedics and Rehabilitation, University of South Florida, Tampa, FL, United States
[e] Bay Pines Veterans Affairs Hospital, Clearwater, FL, United States

ARTICLE INFO

Article history:
Accepted 14 October 2014

Keywords:
Log-roll
Kinetic therapy
Spine
Cervical
Fracture
Injury
Motion

ABSTRACT

Introduction: Bedrest is often used for temporary management, as well as definitive treatment, for many spinal injuries. Under such circumstances patients cannot remain flat for extended periods due to possible skin breakdown, blood clots, or pulmonary complications. Kinetic therapy beds are often used in the critical care setting, although this is felt to be unsafe for turning patients with spine fractures. We sought to evaluate whether a kinetic therapy bed would cause as much spinal motion at an unstable cervical injury as occurs during manual log-rolling on a standard intensive care unit bed.

Methods: Unstable C5–C6 ligamentous injuries were surgically created in 15 fresh, whole cadavers. Sensors were affixed to C5 and C6 posteriorly and electromagnetic motion tracking analysis performed. In all cases a cervical collar was applied by an orthotist after creation of the injury. The amount of angular motion and linear displacement that occurred at this injured level was measured during manual log-rolling and patient turning using a kinetic therapy bed. For statistical analysis, the range of motion for angles about each axis and displacement in each direction was analyzed by multivariate analysis of variance with repeated measures.

Results: When comparing manual log-rolling and kinetic bed therapy, significantly more angular motion was created by the log-roll manoeuvre in flexion–extension ($p = 0.03$) and lateral bending ($p = 0.01$). There was no significant difference in axial rotation between the two methods ($p = 0.80$). There were no significant differences demonstrated in medial–lateral and anterior–posterior translation. There was almost two times the axial displacement between manual log-rolling and the kinetic therapy bed and this reached statistical significance ($p = 0.05$).

Conclusion: There is less motion at an unstable cervical injury in flexion–extension, lateral bending, and axial displacement when turning a patient using a kinetic therapy bed as opposed to traditional manual log-rolling. It may be preferable to use a kinetic therapy bed rather than manual log-rolling for patients with cervical spine injuries to decrease unwanted spinal motion. In addition, it may be easier and less physically demanding on nursing staff that must regularly turn the patient if manual log-rolling is implemented.

© 2014 Elsevier Ltd. All rights reserved.

Introduction

Patients with unstable spinal injuries must remain immobilised until definite surgical fixation is performed to prevent secondary neurological injury. The inability to immediately operate on such patients can be due to numerous factors. Most commonly, these are polytrauma patients who have other injuries and physiologic conditions that prohibit immediate surgery. In addition, in certain circumstances, there are spine fractures that are treated with prolonged bedrest until healing occurs.

Immobilisation can result in numerous complications including but not limited to pulmonary, haematologic, renal, and integumentary systems [1–3,9]. Kinetic bed therapy has been advocated for the management of respiratory conditions in critically ill

* Corresponding author at: University of Texas, 6400 Fannin Suite 1700, Houston, TX 77030, United States. Tel.: +1 786 514 0226l; fax: +1 713 512 2234.

http://dx.doi.org/10.1016/j.injury.2014.10.049
0020–1383/© 2014 Elsevier Ltd. All rights reserved.

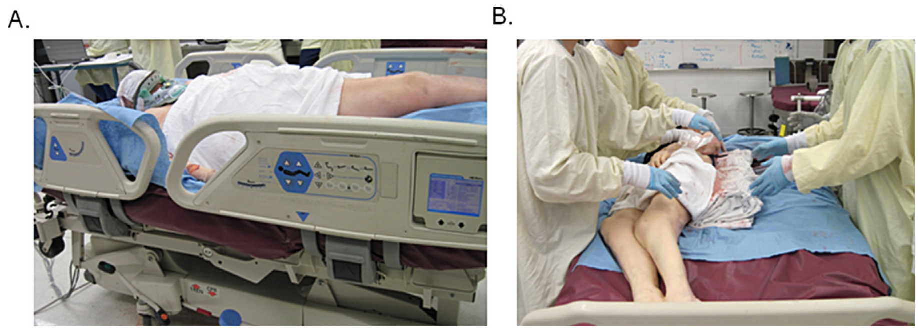

Fig. 1. (A) Photograph of the Sp02RT bed being used for kinetic lateral therapy with pillow placement. (B) Photograph of manual log-rolling with pillow placement.

patients [1,4–10]. When the patient is turned to 40 degrees or greater to one side, the treatment is referred to as kinetic therapy [8,11]. For patients with unstable cervical spinal injuries, movement of the spinal column can potentially cause damage to the spinal cord. Nonetheless, lying supine on a hard surface for extended periods is not acceptable. In most trauma centres patients are manually log-rolled with "spinal precautions" to avoid this.

There is only one other study comparing two different kinetic therapy methods, looking specifically at the manual log-roll versus the RotoRest kinetic treatment table [12]. The TotalCare® Sp02RT bed (Hill-Rom, Inc., Batesville, IN) was designed to do kinetic therapy as well. It does not involve the placement of pads and pillows for immobilisation as does the RotoRest bed, and they are already commonly found in intensive care units. The purpose of the current study is to compare motion generated in the unstable cervical spine when cadavers undergo manual log roll manoeuvres versus TotalCare® bed (Hill-Rom, Inc., Batesville, IN) kinetic therapy. Our hypothesis was that the TotalCare® bed kinetic therapy could result in less motion of a cervical spine injury than manual log rolling.

Materials and methods

Fifteen fresh, whole cadavers were used for the current study. The study was approved by the sponsoring Research and Development Committee. Two fellowship trained orthopaedic spine surgeons created and confirmed the unstable C5–C6 injuries (XXX, YYY). Transection of the supraspinous and interspinous ligaments, the ligamentum flavum, and the facet capsules was performed posteriorly. An anterior approach was then performed and the anterior longitudinal ligament, the intervertebral disc, and the posterior longitudinal ligament transected to create a global instability. Great care was taken to preserve anatomy and not disrupt any unnecessary tissue planes. Prior to creation of the injury, specimens were tested in the intact state and following injury creation to confirm the presence of an unstable injury. An appropriate sized cervical collar was placed by a certified orthotist on the specimens during testing.

An electromagnetic motion analysis device (Liberty device; Polhemus Inc., Colchester, VT) was used to assess the amount of angular and linear motion during the study. Sensors were rigidly anchored posteriorly to the lamina of C5 and C6 with screws. The Liberty device uses electromagnetic fields to establish the three-dimensional position and orientation of its sensors. The Liberty detects angular motions with a precision of 0.3° within its optimal operating range of 10–70 cm. We have used this technology in numerous previous studies to document motion in the spine [12–30].

A repeated measures study design was used with all cadavers being tested three times on a TotalCare® Sp02RT bed (Hill-Rom, Inc., Batesville, IN) using the bed for kinetic therapy and three times under log-roll manoeuvres on a standard hospital bed (Hill-Rom, Inc., Batesville, IN). Testing was randomised for each cadaver. The TotalCare Sp02RT bed was rotated to 40 degrees to both sides and this considered one repetition. The log-roll manoeuvre was performed by four people with previous training of the procedure. Following turning the cadaver, two pillow type bolsters were placed under the cadaver for positioning on each side. Again, the cadaver was turned to one side then the other, and this considered one repetition (Fig. 1). Based on the same technique used by the same study group before, the motion is approximately 40 degrees.

For statistical analysis, the range of motion for angles about each axis and displacement in each direction was analyzed by multivariate analysis of variance with repeated measures. Significance was set at a p-value of 0.05 or less.

Results

There was statistically more motion in all planes when comparing the unstable C5–C6 injury as compared to the intact state ($p < 0.001$) (Table 1). Comparing log rolling and kinetic therapy on the sport bed, significantly more motion was created by the manual log-roll manoeuvre in flexion–extension ($p = 0.03$) and lateral bending ($p = 0.01$). There was no significant difference in axial rotation between the two methods ($p = 0.80$) (Fig. 2). There were no significant differences demonstrated in medial–lateral and anterior–posterior translation. There was almost twice the axial displacement between the manual log-roll and the Sp02RT kinetic therapy bed, and this reached statistical significance ($p = 0.05$) (Fig. 3).

Table 1
Comparison of angular motion occurring at C5–C6 in the intact versus the injured states.

Dependent variable	Instability	Mean	Standard error	Standard deviation	p-Value	n
Flexion–extension	Intact	6.6°	0.877876	3.4	<0.001	15
	Injured	42.4°	2.039771	7.9		15
Axial rotation	Intact	4°	0.464758	1.8	<0.001	15
	Injured	25°	3.124207	12.1		15
Lateral bending	Intact	3.5°	0.335659	1.3	<0.001	15
	Injured	28.3°	1.084435	4.2		15

Download English Version:

https://daneshyari.com/en/article/6083255

Download Persian Version:

https://daneshyari.com/article/6083255

Daneshyari.com