Paraplegia 15 (1977-78) 343-348

Proceedings of the Annual Scientific Meeting of the International Medical Society of Paraplegia held at Stoke Mandeville from 28-30 July 1977

PAIN AND CERVICAL TRACTION VARIATION DURING MANUAL TURNING

By F. X. KEANE, M.B., B.Ch., B.A.O.
Spinal Unit, National Medical Rehabilitation Centre, Dun Laoghaire, Co. Dublin, Ireland

Abstract. An experiment using a dummy with a cervical traction recorder was used in place of a patient. Nurses and orderlies from the Spinal Unit carried out manual lifting and turning techniques, used in the conservative treatment of spinal injury. Variation in manual traction continues throughout a turn. Traction force may be quadrupled or quartered. Inco-ordination between the individuals lifting, causes bending forces in the neck. This, together with sharp variation in traction, elicits pain. Manual traction, lifting, and turning, should be totally avoided, by employing kinetic nursing, provided by the use of the Roto Rest Spinal Bed.

Key words: Spinal injuries; paraplegia; nursing.

Introduction

MANY writers, *e.g.*, Riddoch (1918), Munro (1965), Clay (1968), mention pain associated with spinal cord injury and manual turning. Those turning the patient are aware of the protective rigidity of the subject. Crepitation is often felt by the nurse supporting the fractured cervical spine. The following experiment was the first of a series of investigations, to discover the possible cause of pain in the acute cervical spinal injury during manual turning. While we are all familiar with the Stoke Mandeville conservative method of treatment by traction and postural reduction, no worker, to my knowledge, has described the accuracy or variation in traction, which occurs during manual lifting and turning.

Materials and Methods

A life-size nursing dummy of 126 lb weight was used in place of a patient. The neck of the dummy was severed at the trunk and 1 inch of neck length removed. A flexible elastic reconnection was formed of tube gauze. The head was loaded to weigh 10 lb. A rod was passed through the head between the jaws of an ice-tong skull caliper. This was connected directly to the writing arm of a modified cystometrogram recorder, secured in the body of the dummy. The writing arm was connected to two Salter 56 lb spring balances acting in parallel, which provided skull traction recording from 0-50 lb for a 1 inch extension of the dummy's neck Plain stiff graph cards were used (Fig. 1). The machine was graduated from 0-50 lb in 5-lb steps, by adding weights to a conventional traction assembly with the dummy in the supine horizontal position. From this, a transparent plastic overlay was made, ruled horizontally to give traction value, and vertically: card travel in minutes. This transparent overlay could be placed over a graph card to read off traction

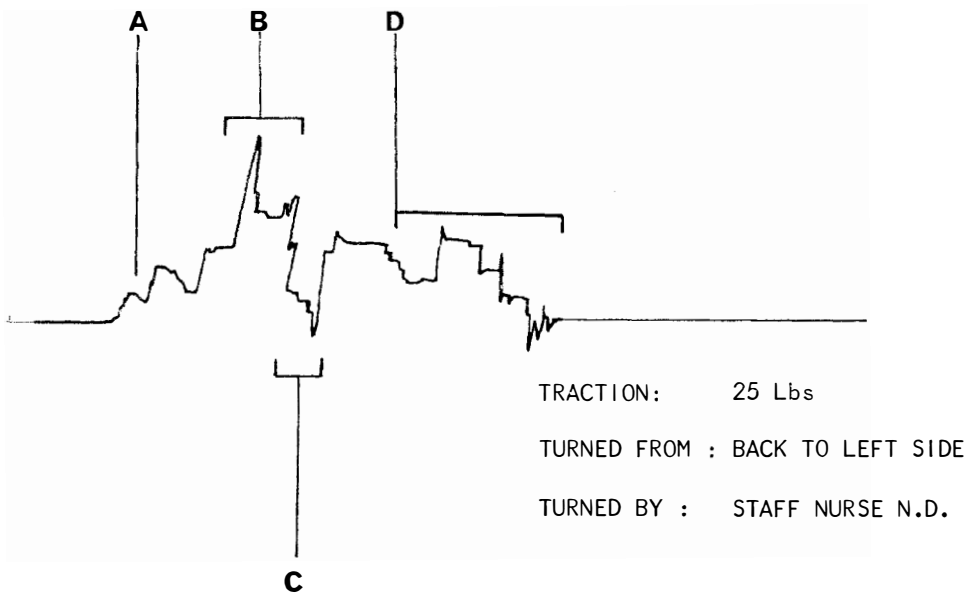
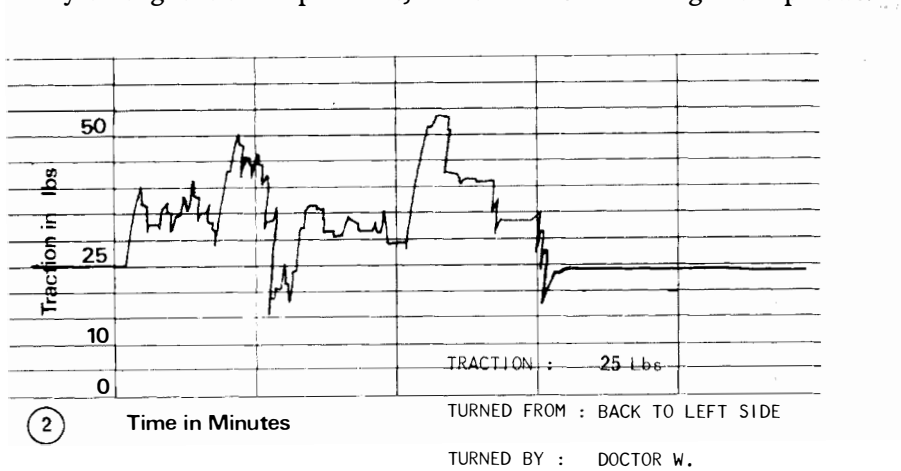


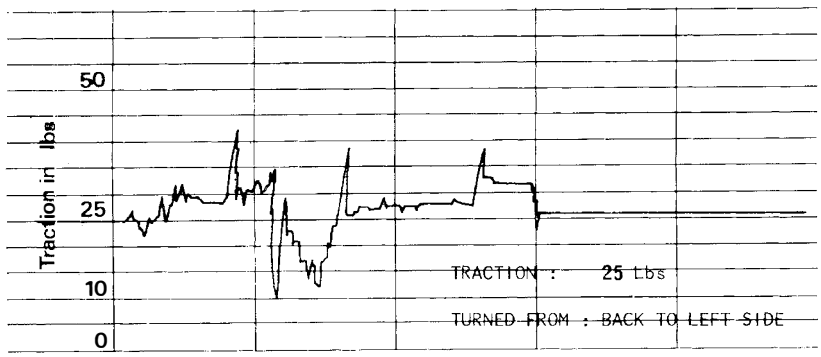
FIG. 1
Plain graph card: cervical traction variation during manual turning.

variation, and time taken to execute a turn of the dummy (Fig. 2). The bed used had a fracture board, double mattresses, and pillows. A conventional cord traction assembly with a single pulley and cast-iron weights provided resting traction.

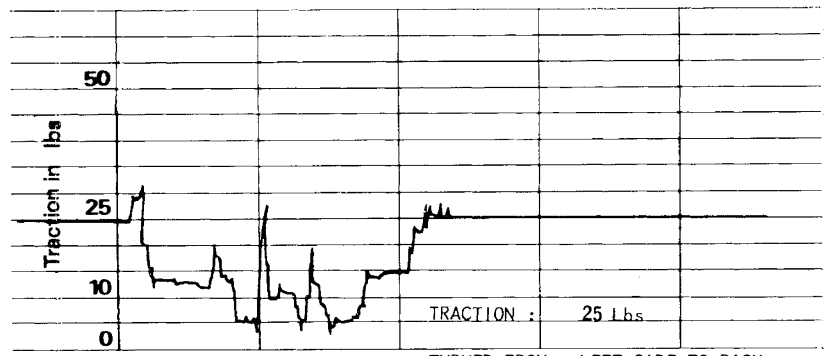
In the experiment, the dummy was lifted and turned from the supine (back) into the left lateral position (left side) (Figs. 1, 2 and 3) and vice versa (Figs. 4, 5 and 6). First, the turns were carried out using 25-lb traction, and then repeated using 10-lb traction. The same team of three orderlies was used to lift and position the dummy throughout the experiment, and one nurse re-arranged the pillows.



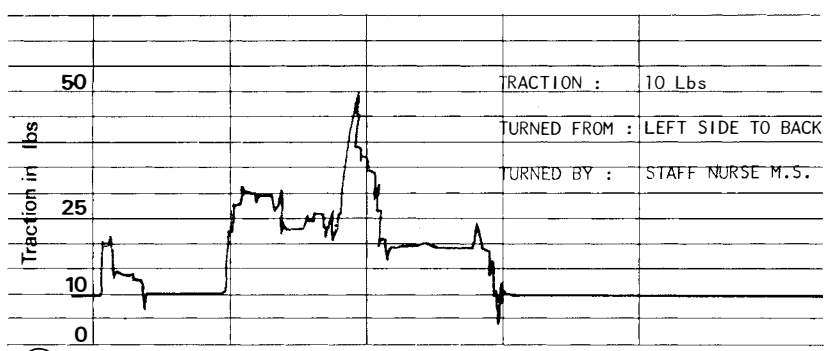
FIGS. 2-6
Sample cervical traction variation graphs produced during manual turning.



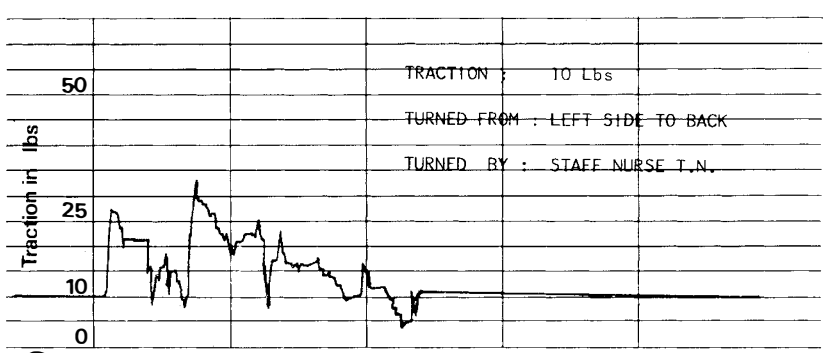
(3) Time in Minutes



(4) Time in Minutes



(5) Time in Minutes



(6) Time in Minutes

Seven trained and experienced staff members: five nurses and two doctors from the Spinal Unit, volunteered to take the head and neck, maintain required traction and conduct the turn. Two orderlies, who formed part of the Unit's turning teams, but who had never taken the head and neck of a patient, also took part in the experiment. Two members of the hospital clerical staff, immediately after a demonstration turn, also executed turns (Fig. 3).

Observations

When observing the manual turning of patients, it appears that acceptable posture of the head and neck in relation to the body is maintained by the turning team. In contrast, during this experiment, movement of the dummy's head in all directions was marked. In practice therefore, we must accept that it is the patient who maintains good posture of his head and neck by voluntary spasm during manual turning, and in fact may have to resist the mal-alignment forces between the multiple individuals lifting him.

Figures 1-6 are examples of the graphs obtained. The experimenter was able to observe graphs as they were recorded. It was interesting that individuals taking part in the experiment, trained or untrained, made similar errors in manual traction throughout a turn. The following is an analysis of traction variation during a turn from the 'back' to the 'left side' (Fig .1):

(*a*) Rise—Manual traction being applied before the orderly had disconnected the traction weights.
(*b*) Rise—Lifting of the dummy into the air, and holding it there while the assisting nurse re-arranged the bed.
(*c*) Fall—A drop in traction while the dummy was being lowered on to the right-hand side of the bed.
(*d*) Fall—Roll-over into the left lateral position and re-connection of the traction weights etc.

Results

From the graphs obtained (see examples Figs. 1-6) the following was observed:

(1) It is impossible to maintain the correct traction tension when lifting and turning a patient manually.
(2) Many sharp rises and falls, often as much as 20 lb occur during a turn. The rapidity of rise and fall is so great that it is equivalent to jerking of the patient's neck.
(3) Traction variation continues throughout a turn, but the greatest variation in traction occurred during step (*b*): Lifting of the dummy off the bed, and step (*c*): Lowering the dummy back on to the bed (Fig. 1).
(4) Traction force may be quadrupled or quartered during a turn (Figs. 4 and 5).
(5) The average variation in traction, when trying to maintain 25 lb, was 26·6 lb. The average variation, when trying to maintain 10 lb, was 23·4 lb. Therefore error was almost the same when lifting a patient on a high or low-traction value.
(6) In the maintenance of required traction, experience and training provides no discernible advantage (compare Figs. 2 and 3.)
(7) The average number of rises and falls, or traction variation during a turn was 33.
(8) Similar gross errors in traction are made by different individuals throughout a manual turn.
(9) The average time required to carry out turns was 2·8 minutes.

Discussion

We have shown the marked variation in traction which occurs during the manual turning of cervical injuries. Why this occurs is simply that it is humanly impossible to apply a required traction on demand. Even if it were possible, the nurse taking the head and neck of a patient is unable to concentrate on the maintenance of traction, because her attention is divided between several other apsects of lifting: *e.g.* (i) maintaining posture of the head and neck; (ii) remembering into what position a particular patient is to be placed for the next three hours; (iii) instructing the orderlies of the moment of lift; (iv) instructing the patient to relax, etc.

In lifting and lowering a patient, all individuals increase and decrease traction automatically, and the greatest error in traction occurs during these steps. This experiment revealed that, in fact, co-ordination between the multiple individuals lifting a patient is not adequate. The pain which patients experience during manual turning is due to traction variation, which is of a particularly sharp nature. Pain is also elicited by the neck-bending force created by the inco-ordination between the individuals lifting the patient. The subject responds by voluntary protective spasm, maintaining better alignment of his head and neck, which conveys to an observer that maintenance of posture is satisfactory. Patients state that some individuals cause more neck pain than others when lifting them. Such individuals were not identified in the present experiment.

What part the facts revealed play in causing further damage at the site of injury, remains a speculation. To quote Burke (1973), 'Pain is part of a withdrawal response to limit the damage caused by a noxious stimulus'. This fact is sufficient to indicate that a method of treatment should be used which totally avoids manual lifting, and turning. It verifies the advice of Guttmann (1965), that traction should never be disconnected.

Therefore a special head traction unit designed by Guttmann for tetraplegics, was incorporated in the Egerton-Stoke Mandeville electricity controlled turning and tilting bed. The Stryker Frame achieves this, but I do not believe that an acute case should be subjected to the further distress of the prone position. Consequently, I designed the Roto Rest Spinal Bed (Keane 1967).

Résumé

Une expérience a été faite au moyen mannequin et d'un enregistruer de traction cervicale. Des infirmières et leurs assistants au Service Spinal ont effectué les mouvements manuels de levage et de changement de position que l'on utilise normalment pour le traitement des blessures a la colonne vertébrale. La variation dans la traction manuelle continue sur un tour complet. La force de traction peut être quadruplé ou divisé par quatre. Un manque de coordination entre les levages séparés forcera le cou à se plier à plusierus reprises ce qui avec une variation brutale de la traction va causer de la douleur. La traction manuelle, le levage et le changement de position devront être totalement évités grace à l'utilisation du 'Kinetic Nursing' avec le lit vertébral Roto-Rest.

Zusammenfassung

Ein Experiment, bei dem eine Puppe mit einem Nackenzugschreiber (cervical traction recorder) anstelle eines Patienten benutzt wurde. Krankenschwestern und Pfleger der Spinalabteilung führten manuelle Hebe-und Wendetechniken aus, die bei der konservativen Behandlung von Rückgratverletzungen angewandt werden. Variation des manuellen Zugs dauert während einer Wendung fort. Zugkraft kann vervierfacht oder verteilt in halb

werden. Ungleiche Anordnung des Hebens durch die einzelnen Personen verursacht Beugewirkung im Nacken. Dies, zusammen mit heftiger Variation beim Zug, führt zu Schmerzen. Zug, Heben und Wenden mit der Hand sollten durch Benutzung von Kinetic Nursing total vermieden werden, das der Gebrauch des Roto-Rest Spinal Betts verschafft.

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