Journal of Clinical Orthopaedics and Trauma 8 (2017) 116–124

Contents lists available at ScienceDirect

Journal of Clinical Orthopaedics and Trauma

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

Review article

Traumatic spinal cord injuries

Naveen Kumar [a,*], Aheed Osman [a], J.R. Chowdhury [b]

[a] Consultant Surgeon in Spinal Injuries, Midland Centre for Spinal Injuries, RJAH Orthopaedic Hospital NHS Foundation Trust, Oswestry, Shropshire SY10 7AG, UK
[b] Clinical Lead & Consultant Surgeon in Spinal Injuries, Midland Centre for Spinal Injuries, RJAH Orthopaedic Hospital NHS Foundation Trust, Oswestry, Shropshire SY10 7AG, UK

ARTICLE INFO

Article history:
Received 9 May 2017
Received in revised form 7 June 2017
Accepted 10 June 2017

1. Introduction

The management of the traumatic spinal injury has remained controversial since the times of Charles Bell and Astley Cooper. Traumatic spinal injuries in 1920s and 1930s were non-operatively managed. Methods of reduction included hyperextension in the prone position on slings, frames or hammock, as described by Davis and Rogers or hanging (Bohler). Watson-Jones used the two-table method in 1931 and 1934. Dunlop and Parker hyper extended the broken spine in supine position. Magnus renounced methods of forceful reduction and accepted the spinal deformity. He advocated allowing the fractured spine to consolidate by placing the patient flat in bed in supine position with prolonged recumbency for 3–6 months or longer. Such prolonged immobilisation was carried out with often poor attention and poor management of the associated multisystem physiological impairment and malfunction. These methods of management have been strongly condemned (Guttmann, Watson-Jones, Holdsworth and Hardy) as utterly contrary to the principles of rehabilitation of spinal cord injured patients.

2. Spinal cord injury service

In England, on February 1, 1944, Sir Ludwig Guttmann established a spinal unit at Stoke Mandeville, UK and introduced multidisciplinary staffing for the comprehensive treatment and rehabilitation of SCI. Under his leadership, this unit became a world-renowned centre for teaching, research, and clinical care. Guttmann introduced and developed the method of graduated reduction of fractures and fracture dislocations of the injured spine and immobilisation on pillow packs while providing simultaneous detailed attention to the multisystem malfunction together with all medical and non-medical effects of paralysis.

The spinal cord injury (SCI) service in the UK from that time started to improve and increased the number of specialised centres for SCI throughout the country with specialised SCI healthcare services currently provided in eight specialist centres in England, and one each in Wales, Scotland and Northern Ireland, offering support for patients sustaining SCI through the initial period of treatment and rehabilitation and on-going lifelong support. Each of these centres has a specified geographical area's population to cover. The Midland Centre for Spinal Injuries (MCSI) is a part of the famous The Robert Jones and Agnes Hunt Orthopaedic Hospital, at Oswestry. Shropshire and was set up in 1965 by Mr T McSweeny and Dr B. F. Jones. MCSI covers around a 10 million population (Fig. 1).

Sir Ludwig Guttmann demonstrated that almost all of the complications that were believed to be inevitable following a SCI were indeed preventable. He asserted that complications following SCI are attributable to poor management of the patient rather than the neurological impairment or the patient being treated with bed rest. Interestingly although anatomical alignment was rarely achieved, Guttmann demonstrated that with simultaneous attention to all medical and non-medical effects of the SCI a significant number of patients recovered motor and sensory functions to ambulate and the majority were pain free following conservative management.

Based on such evidence the Active Physiological Conservative Management (APCM) of the spinal injury and its effects was described and popularised by Wagih El Masri pupil of Guttmann.

Wagih El Masri demonstrated that with expert, early, simultaneous APCM of the injured spine, spinal cord and all the medical and non-medical effects over 70% of patients with complete motor paralysis but with sparing of pin prick sensation presenting in the first 72 h of injury recover motor power to ambulate without surgical, pharmacological, cellular or biological intervention. Those presenting within 72 h of injury with motor sparing, however minimal the sparing is have an even better chance to walk, also without any intervention. El Masri et al. also demonstrated that the reduction of the period of treatment in recumbence from 12 weeks

* Corresponding author.
E-mail addresses: naveen.kumar@rjah.nhs.uk (N. Kumar), aheed.osman@rjah.nhs.uk (A. Osman), joy.chowdhury@rjah.nhs.uk (J.R. Chowdhury).

http://dx.doi.org/10.1016/j.jcot.2017.06.022

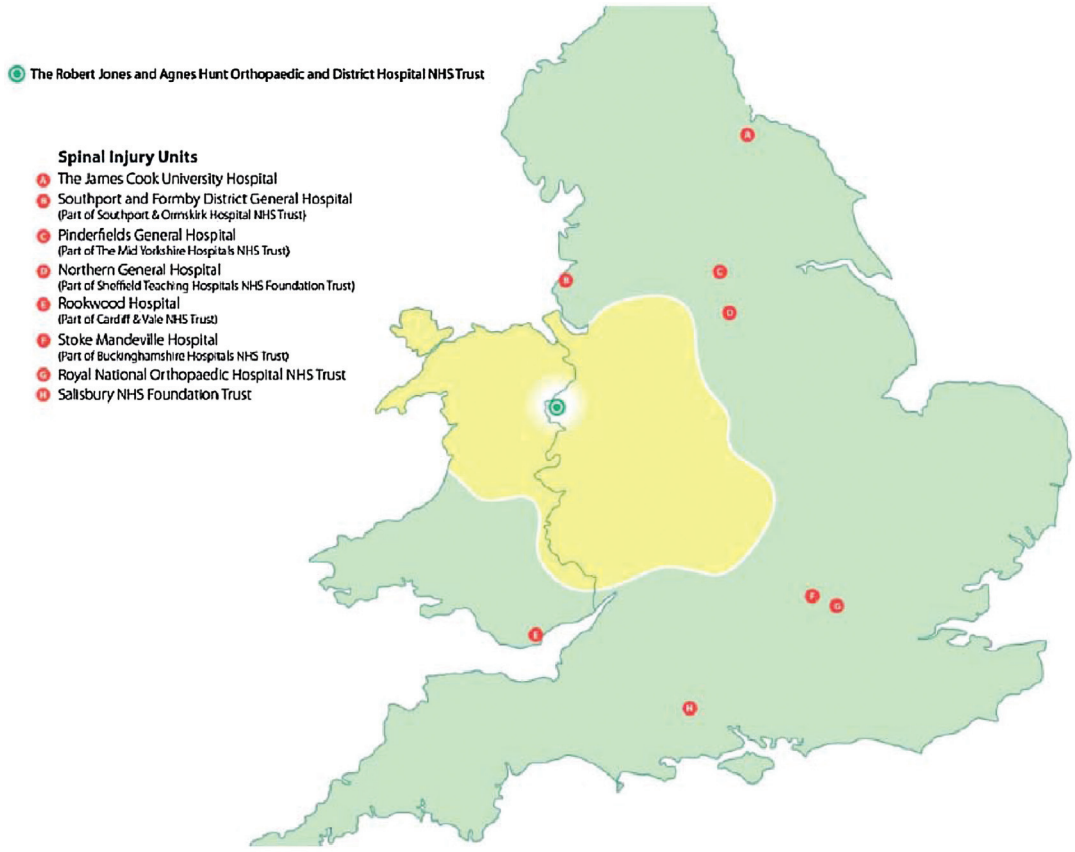

Fig. 1. Location of the UK spinal injury centres. The catchment area for the Midland Centre for Spinal Injuries is shown in yellow.

to between 4 and 6 weeks was safe both in the short and long term. They also demonstrated that with APCM the impact on the patient and family members can be minimised in both the short and long term. Patients who do not recover ambulation can with APCM and ongoing expert monitoring, care and support lead dignified, healthy, fulfilling, productive and often competitive lives.

Active Physiological Conservative Management, from the early hours of injury requires simultaneous scrupulous care of: the injured spine, the multisystem neurogenic effects of the spinal cord injury on the respiratory, cardiovascular, urinary, gastrointestinal, dermatological, sexual and reproductive functions, the management of the associated psychological effects of paralysis, the physical rehabilitation and the modification of the environment. By definition APCM requires between 4 and 6 weeks of treatment in recumbence. This is in order to rest injured tissue, prevent significant postural hypotension or significant reduction of vital capacity during the stage of spinal shock, minimise the risk of ischial and sacral pressure sores during the vulnerable period of poor skin perfusion due to spinal shock, facilitate intermittent catheterisation, facilitate bowel care and facilitate nursing care during the first few weeks of paralysis. It also allows for some recovery of the sympathetic nervous system reflexes which are paramount for the active cooperation of the patient with the demands of physical rehabilitation.

3. Care of the injured spine – vertebral column stabilisation

Although almost every patient in our institution is given informed choice between conservative and surgical management the majority of patients with SCI chose APCM. APCM method of management begins with active early vertebral column stabilisation. Most injuries of the vertebral column do not result in spinal cord damage, but traumatic spinal instability places the patient at risk for neurologic injury if the injured spinal segments are not protected. All trauma victims, especially those complaining of neck or back pain, are properly immobilised as quickly as possible. The most commonly used devices are adequate for emergency use but may not be appropriate for long-term stabilisation. Because of this, alternate forms of spinal immobilisation for patients judged to have marked spinal instability are employed soon after intensive care unit admission.

Patients with traumatic spinal injuries are kept supine and carefully moved, using a log-rolling technique to avoid flexion or extension of the spine. They are immobilised in standard beds, rotating beds, or turning frames. Turning frames require considerable nursing expertise for safe and effective use. The use of turning frames by inexperienced personnel is likely to result in inadequate spinal stabilisation.

Guttmann introduced, with the co-operation of Egerton Engineering Ltd, an electrically-controlled turning and tilting bed, which proved very satisfactory in reducing the broken spine and preventing sores not only in traumatic paraplegics but, by adding a special head traction unit, also in tetraplegics. Since 1960s this is specialised turning and tilting bed has been widely utilised in managing victims with injuries of the vertebral column at Oswestry.

The facts however are those in recumbence and with some careful handling of the patient, neurological deterioration is very rare even in the most biomechanically unstable injuries. Similarly vertebral misalignment, canal encroachment and cord compression do not prevent neurological recovery and are rarely, individually or in combination the cause of neurological deterioration when patients are adequately managed with APCM.[24–30]