Spontaneous Neurological Recovery of Patients with Acute Traumatic Spinal Cord Injuries (ATSCI) without Intervention the Injured Cord”

W.S. El Masri* MBBCh, FRCS Ed, MRCP

Hon. Clinical Professor of Spinal Injuries, Keele University–Keele, Newcastle ST5 5BG, UK

Emeritus Consultant Surgeon in Spinal Injuries, The RJAH Orthopaedic Hospital, Oswestry. Shropshire, UK

Abstracts: Acute traumatic spinal cord injuries (ATSCI) are life threatening and life changing events. With good Active Physiological Conservative Management (APCM) of the injured spine and the systemic effects of cord damage to prevent further mechanical and non-mechanical damage of the cord the majority of patients make some spontaneous neurological recovery (SNR). The magnitude and extent of this recovery depends on the initial degree and topographical sparing of sensory and sensory-motor tracts functions at and below the Zone of Partial Preservation (ZPP)

Keywords: Spontaneous neurological recovery, Acute traumatic spinal cord injury.

INTRODUCTION

Spontaneous neurological recovery (SNR) of patients with TSCI without any intervention on the injured spine continues to be regularly demonstrated for over half a Century. Currently the contribution of this SNR is not acknowledged nor reflected in the published outcomes of surgical interventions on the injured spine in humans. Despite increasing popularity, surgical interventions on the spine including decompression are yet to prove equality or superiority of outcomes over the SNR achieved by Active Physiological Conservative Management (APCM) of the spinal cord injury together with all its systemic effects. The rationale, goals, guidelines in delivery of APCM are discussed. The SNR achieved by APCM irrespective of the radiological features is demonstrated in this manuscript.

Alternative interpretation of the published outcomes of surgical decompression, relevance of the current arguments that rely on the concepts of the “Window of Opportunity” and “Time is Spine” to promote the intervention are beyond the scope of this manuscript.

BRIEF HISTORICAL

Prior to the 2nd world war (WWII) the majority of patients with TSCI died from complications that developed because of poor understanding and poor management of the systemic effects of cord damage and the complexity of the condition (Figure **1**).

Small incidence - Patients with significant multiple major medical & non-medical effects that require simultaneous Active Physiological Conservative Management:

- Multisystem Physiological Impairment
- Multisystem Unstable Malfunction governed by an
  Unstable and Erratic Autonomic System
- Bizarre inter-system effects
- Physiologically unstable spinal cord
- Biomechanically unstable spinal axis
- Sensory Impairment/Loss diagnostic difficulties
- High risk of multiple complications
- Potential for neurological deterioration from further mechanical & non-mechanical damage
- Sudden Emotional Psychological Social Impact
- Requirement of support to patients and family

APCM should be provided by a team of Knowledgeable, Experienced and Skilled health care professionals to clinically adequately manage patients and all the effects of cord damage from the early hours of injury and support them throughout a difficult period of life until they make some recovery, adjust and regain control of their lives. Patients can live healthy, enjoyable, dignified, productive and competitive lives.

Figure 1: Spinal Cord Injuries – Nature of the beast, and Requirements of its Management.

*Address correspondence to this author at the Bellstone, Haughton, West Felton, Shropshire SY11 4HF, UK;
E-mail: bellstonehse@btinternet.com

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During WWII, Ludwig Guttmann in the UK and Donald Munro in the USA took responsibility for the management of these patients.

Guttmann at Stoke Mandeville Hospital **(SMH)** studied all the effects of cord damage and their treatment.

Frankel A: No sensory or motor sparing below the injury
Frankel B: some Sensory but no motor sparing.
Frankel C: sensory & motor sparing but motor sparing is of no functional use to move lower limbs.
Frankel D: sensory-motor sparing with ability to move lower limbs and many patients could walk with or without support.
Frankel E: Normal sensation, motor power and sphincter control.

Frankel Grid

The first letter in the square in bold describes the long tract sparing on admission within 15 days of injury.

The 2nd letter describes outcome

A shift to the left describes neuro-functional deterioration

A shift to the right describes neuro-functional improvement

Figure 2: Guide to definitions of the Frankel Classification.

He observed that some complications can cause further impairment of spinal cord functions, expressed concerns about the outcomes of laminectomy and abandoned the procedure [1, 2]. The risks from laminectomy were subsequently confirmed [3] and some of the mechanisms of neurological deterioration described years later [4].

Guttmann also demonstrated that with what could be described as simultaneous active physiological conservative management **(APCM)** of the spinal injury and each of the systemic medical effects of cord damage, almost all complications of cord damage can be prevented or their effects minimised and some patients made spontaneous neurological recovery [1, 2]. He also demonstrated that the majority of patients who remain paralysed can survive and lead healthy, successful, dignified, enjoyable, productive and often competitive lives.

SPONTANEOUS NEUROLOGICAL RECOVERY EXPECTED FROM APCM

In 1965 Frankel and his colleagues at SMH studied the neurological presentation and neurological outcomes of 612 patients admitted to Stoke Mandeville Hospital within 15 days of injury [5]. Patients presented with various levels and densities of cord damage and were all treated with APCM. Frankel *et al* made the astute observation that spontaneous motor recovery correlated well with the clinical sparing of sensory and sensory-motor tracts adjacent to and below the level of cord injury. They were surprised to observe that the motor recovery occurred irrespective of the radiological appearances on X-rays, without any intervention and despite failure to realign the spine by closed reduction. Based on these observations they classified the patients expressing each patient's neuro-functional findings on admission and on discharge. They published their findings in 1969 in what became known as the International Frankel Classification. The Frankel classification has since been in use because of its ability to be inclusive of all neurological presentations of patients, its reliability of use in the first few hours of injury and all subsequent stages, [5b, 6-9] the stability of the unchanged definition of each of the Frankel grades, the ease of communication of the neuro-functional status of an individual patient and groups of patients between clinicians and the reproducibility of outcomes of various neurological presentations since its development including following the introduction of CT, MRI scans in the radiological assessment. The neuro-functional outcomes of APCM described by Frankel *et al* and confirmed by subsequent groups can be summarised as follows:

Initial long tract sensory sparing without motor sparing below the injury (Frankel B) was followed by some recovery of motor power in the lower limbs in an average of 60% of patients. The recovered motor power ranged from a flicker of movement in muscles of the lower limbs to strong power that enables patients to walk with or without aids.

On average 75% of patients admitted with sensory sparing and a visible or palpable flicker of motor power below the injury (Frankel C) recovered good motor power to move the lower limbs and many could walk with or without support (Fankel D).

Significantly 38% of patients who presented with sensation and some motor power to initiate some movement of the lower limbs recovered normal sensory and full motor power to regain normal control over sphincter functions.

Fewer patients presenting with clinically complete injuries (FA) *i.e.* no clinical signs of long sensory and motor tract sparing below zone of partial preservation (ZPP) defined as three segments distal to the last clinically normal cord segment recovered by a Frankel grade or two and only 8% recovered to FD suggesting that some long tracts had been spared but were clinically dormant on first presentation of the patient. Many patients with Frankel A presentation on admission however recovered or improved their motor functions spontaneously within the Zone of Partial Preservation. The extent of this recovery was subsequently documented by Katoh and El Masry in 1994 [5b].

Surprisingly this spontaneous recovery was observed to be irrespective of the radiological appearances on admission and irrespective of the success of realignment of the spine.

Some of the significant advantages of the Frankel classification are the ease of assessment and assignment of a Grade to suddenly paralysed and anxious patients in pain, under heavy analgesia and sedation during which it is almost impossible to elicit and document reliably and accurately a subjective baseline numerical score to meaningfully subsequently compare a numerical outcome with or interpret that outcome in neuro-functional terms. Additionally the Frankel Classification can, with minimal modifications be used to test the significance of various radiological presentations and compare between the different methods of management.

Folman & El Masri (y) in 1989 made the further clinical observation that patients who present with preserved pin prick sensation within 72 hours from injury achieved better spontaneous neurological recovery than those who could only feel the pin prick as touch or deep pressure and those with sparing of

TABLE IIIB

Cervical Injuries

AA 81	AB 21	AC 10	AD 11	AE 0
BA 3	BB 9	BC 2	BD 14	BE 5
CA 0	CB 1	CC 4	CD 11	CE 5
DA 0	DB 0	DC 0	DD 30	DE 11
EA 0	EB 0	EC 0	ED 0	EE 0

In each square of the grid are two letters of the alphabet, the first related to the neurological lesion on admission and the second to the neurological lesion on discharge.

TABLE IVB

T1-T10 Injuries

AB 114	AB 11	AC 2	AD 7	AE 1
BA 0	BB 6	BC 2	BD 5	BE 2
CA 0	CB 0	CC 1	CD 1	CE 0
DA 0	DB 0	DC 0	DD 4	DE 9
EA 0	EB 0	EC 0	ED 0	EE 1

In each square of the grid are two letters of the alphabet, the first related to the neurological lesion on admission and the second to the neurological lesion on discharge.

TABLE VB

T11, T12, L1 Injuries

AA 102	AB 12	AC 2	AD 10	AE 0
BA 1	BB 4	BC 2	BD 15	BE 2
CA 1	CB 0	CC 4	CD 16	CE 4
DA 0	DB 0	DC 0	DD 18	DE 9
EA 0	EB 0	EC 0	ED 0	EE 3

In each square of the grid are two letters of the alphabet, the first related to the neurological lesion on admission and the second to the neurological lesion on discharge.

TABLE VIB

Lumbar Injuries

AA 4	AB 1	AC 0	AD 4	AE 0
BA 0	BB 0	BC 1	BD 2	BE 0
CA 0	CB 0	CC 1	CD 3	CE 0
DA 0	DB 0	DC 0	DD 2	DE 5
EA 0	EB 0	EC 0	ED 0	EE 0

In each square of the grid are two letters of the alphabet, the first related to the neurological lesion on admission and the second to the neurological lesion on discharge.

Figure 3: Neurological outcomes of patients presenting with various levels and densities of injury, with and without clinical sparing of long tracts Frankel 1969.

posterior column sensation only [7] These observations were subsequently confirmed by other groups [8, 9] following which pin prick sensory sparing became paramount in the initial documentation of the patient.

RATIONALE, AND ARGUMENTS FOR APCM

Because of the range of cellular and cell membrane disturbances, chemical metabolic changes as well as the disruption of the blood brain barrier the injured spinal cord is also physiologically unstable. This Physiological Instability renders the cord vulnerable and unable to defend itself from complications such as Hypoxia, Anaemia, Hypotension, Septicaemia, significant Hypothermia or Electrolyte imbalance [6, 10]. These complications can easily develop and cause further neurological damage manifested by delays or prevention of recovery. In other words if the malfunctioning and physiologically impaired systems of the body are not well managed and complications are allowed to develop the expected spontaneous neurological recovery is unlikely to take place[6, 10-17].

The physiological instability of the injured spinal cord is therefore as threatening if not more threatening to neural functions than a well contained biomechanical instability (BI) of the spinal column. The BI can be easily contained without surgical intervention until natural healing occurs and Biomechanical Stability is restored.

The Conservative school argues that considering that some spontaneous neurological recovery can be predicted, that none of the systemic complications of TSCI that can damage the spinal cord further can be prevented by surgery and considering the potential for added risks of further damage to neural tissues during anaesthesia and/or some surgical mishap and/or post-some operative complications it is advisable to manage patients with APCM until evidence of at least equality if not superiority of outcomes of surgical intervention is demonstrated.

Interestingly bony healing seems to be time related and is not expedited by surgical stabilisation.

Permanent neurological deterioration with APCM is extremely rare.

Although up to 9% of closely and frequently monitored patients can exhibit temporary loss in the first 72 hrs from injury to probably coincide with the development of cord oedema; recovery of this loss to initial level and beyond is the rule and the great majority of patients make significant spontaneous neurological recovery [32].

Some of the added advantages of APCM are: the prevention of further disturbance to nerve endings, soft and bony tissue; the achievement of the shortest fusion that preserves the highest degree of flexibility of the spine and a low incidence of short, medium and long term pain.

With APCM, the required total period of hospitalisation from injury to discharge having achieved the expected optimum neurological and functional recovery, maximum level of independence as well as safe and convenient function of the impaired systems of the body ranges between three to four months for the patient with incomplete cord damage and up to six months for those with complete cord damage. Delays in discharge beyond this period are invariably caused by difficulties in resettlement of the patient in the community.

The APCM School asserts that any claim/s of a potentially useful intervention/s should demonstrate evidence of added value to the neurological and all other relevant outcomes of APCM prior to its introduction as an option of treatment to patients with TSCI.

POSSIBLE MECHANISMS THAT CAN POTENTIALLY FURTHER DAMAGE THE PHYSIOLOGICALLY UNSTABLE SPINAL CORD DURING SURGERY:

Significant hypotension or Hypoxia during anaesthesia.

Clamping of a major spinal feeder to achieve haemostasis

Reduction of Cord Perfusion Pressure during Decompression (49)

Clumsy porter, sleepy assistant, inexperienced surgeon

Post-operative epidural or subdural bleed

Early post-operative failure of implant prior to achieving Biomechanical Stability

Post-operative sepsis

Early mobilisation during the stage of spinal and neurogenic shock which can result in significant hypotension, poor cord perfusion, significant reduction of vital capacity leading to hypoxia or both

GOALS OF ACTIVE PHYSIOLOGICAL CONSERVATIVE MANAGEMENT (APCM) IN THE ACUTE STAGE

The goals of holistic APCM from the first hours or days after injury are:

- Containment of the Biomechanical Instability (BI) of the spinal axis until natural healing at the fracture site occurs & the shortest fusion that helps maintain biomechanical stability, a pain free and flexible spine with an excellent range of movement.
- Mitigation of the need for admission of patients with cord injury below C4 to Intensive Care unless they have associated life threatening injuries or have a past history of chronic respiratory disease.
- Prevention of further damage to skin , muscles and soft tissue as well as nerve endings by a surgical intervention
- Protection of the physiologically unstable injured cord from systemic complications as well as per-operative and post-operative surgical complications.
- Prevention of systemic complications or their early detection and treatment in order to prevent morbidity, delays in active physical rehabilitation or limitation of its benefits and prolonged hospitalisation.
- Achievement of maximum spontaneous neurological and functional recovery
- Achievement of maximum level of independence depending on level and density of the injury
- Ensuring safe and convenient functioning of the various systems of the body in the short, medium and long term.
- Ensuring adequate psychological and emotional support to patients and family members to minimise impact and maximise cooperation of the patients , enhance their ability to cope with a demanding physical rehabilitation program as well as regain confidence in their ability to return to their community, contribute and compete whenever challenged.
- Ensuring adequate education of patients and prospective carers in methods of prevention of complications in order to reduce need and frequency of post discharge readmissions.

GUIDELINES TO DELIVERY OF APCM

An attempt at closed reduction is made in the first 24-36 hours of injury but not beyond due to the relative reduction of the size of the spinal canal by cord oedema. This usually results in sudden minimisation of pain at the site of the spinal injury.

Patients are treated in recumbence with restriction of active movement of the spine for the first four to six weeks of injury and until both the neurogenic and spinal shock have recovered. Throughout the period of recumbence attention is given to each of the multi-system physiological impairment and malfunction in order to prevent complications and ensure maximum possible neurological recovery. This includes, monitoring of vital signs , administration of analgesia and sedation, four hourly pressure relief by log rolling patients to prevent pressure sores, four hourly intermittent catheterisation to empty the bladder and prevent over distension and infections, regular and frequent deep breathing exercises and assisted coughing every 2 to 4 hours to prevent accumulation of bronchial secretions and infections, passive movements of paralysed muscles to prevent contractures of muscles and limitation of range of movement of the joints , active movement of weak muscles to strengthen these muscles, bowel care, emotional and psycho-social issues are addressed, support from the staff as well as supervised peer support from successful patients is organised and monitored, education of patients and their prospective carers are all commenced and continued during the period of recumbence and beyond. The details and pitfalls of management have been previously described [1, 2, 13-17].

Prior to verticalisation/mobilisation, the patient undergoes dynamic flexion and extension Xrays of the spine as well as tilt table studies. These include monitoring of the blood pressure, vital capacity, oximetry and neurology at each 10-20 degrees of head up incline. Immediate return to recumbence is ensured if the patient exhibit any early signs of neurological deterioration. Once patients are able to sit up to about 80o without any change in neurology, they should be able to mobilise safely in a wheelchair and actively engage in a demanding physical rehabilitation program while each of the multisystem malfunctions continues to be attended to.

A brace is worn by the patient in the first six weeks of commencing mobilisation. At the end of six weeks the greatest majority of patients with vertebral bony fractures with and without bony ligamentous injuries will have established bony fusion and stability at the site of the fracture demonstrated radiologically.

Considering that surgery does not mitigate the multiple systemic effects of the cord damage nor any of the wide range of complications that may or may not damage the injured cord further, APCM of the systemic effects of SCI must be ensured irrespective of the level and density of cord damage and irrespective of the method of management of the injured spine being conservative or surgically.

CONTROVERSY ABOUT INTERVENTIONAL AND CONSERVATIVE MANAGEMENT

The revival of the two hundred years' debate between surgical [18] and conservative [19] management of the injured spine has been re-invigorated in the last half century by a number of influences. The longer survival of patients, ability of clinicians involved to reliably classify patients and predict the neuro-functional outcomes using the Frankel classification, increased interest in the basic sciences of spinal injury, improved understanding of the mechanisms of injury, better identification of the secondary changes in the cord following trauma, [20] better radiological visualisation of the injury, the introduction of neurophysiological assessment, increased safety of anaesthesia, wider options of surgical approaches and range of instrumentation to choose from; all lead to genuine attempts being made by clinicians and scientists to explore the possibility of further benefit from surgical and non-surgical interventions on the spine [1, 22-30].

IMPACT OF COMPUTARISED TOMOGRAPHY AND MAGNETIC RESONANCE IMAGING

The development of the CT and MRI SCAN have had a significant impact on approach to the management of the patients with TSCI.

The improved radiological visualisation reinforced belief and encouraged some interventionists to hypothesise, conceptualise and implement findings from the cadaveric specimen and from experimental laboratory animal to humans with some promoting surgical stabilisation and others carried on with surgical decompression. The latter is based on the assumption that the cord changes in response to injury represent a secondary injury that could be minimised in humans by decompressing the cord within a window of opportunity (WOO) which in the laboratory animal has been shown to be four hours from injury [23-27].

ROLE OF THE ROBERT JONES & AGNES HUNT ORTHOPAEDIC HOSPITAL (RJAH)

By the mid-eighties increasing claims of benefits from surgical intervention were being made based on the radiological findings revealed by CT & MRI scanning. These claims were gaining rapidly increasing popularity

We had to choose between continuing to manage patients by APCM (a method of known & predictable outcomes) while testing the significance of the radiological presentations on CT & MRI scans or changing from APCM to surgical intervention on the injured spine based on the CT and MRI findings.

The institution had the advantage of having on site excellent internationally acknowledged spinal surgeons and a team of health care professionals trained in the management of patients with TSCI treated conservatively and surgically when indicated. We were encouraged by the published findings of many in the field (6) including Bedbrook in 1982 [38] and Tator *et al*'s in 1986 [28] of a lack of difference in neurological outcomes between patients conservatively and surgically treated [28]. An early report of remodelling of the spinal canal was also encouraging [43].

Considering the lack of evidence of any superiority of outcome from either APCM or Surgery at that time, the fact that the radiological findings could on the balance of probabilities have been present but not that well demonstrated by Xrays as they would have been on CT &MRI and their presence did not hinder neurological recovery; we decided it would be paramount to study the significance of the radiological features seen on the CT and MRI scans by continuing to treat with APCM.

We decided to initially treat 51 patients admitted within one week of injury with APCM and closely monitor their neuro-functional progress and correlate it with the radiological features, irrespective of the degree of malalignment and biomechanical instability, canal encroachment and cord compression. We had the benefit of being able to monitor our patients at all stages following injury as well annually or on alternate years for life.

We regularly published our findings since 1992 [6, 13-17, 29-32] and demonstrated consistent lack of correlation between the radiological presentations on CT & MRI and the neurological presentation and neurological recovery [6, 13-17, 29-32]. Similar results were confirmed by other groups [33-42].

Indications for Surgery at the (RJAH):

- Neurologically Intact Patients with Biomechanical Instability
- Pure Ligamentous Injuries with no bony injury of the vertebrae or posterior elements of the spine
- Mentally Challenged Patients
- Patients with Uncontrolled Epilepsy
- Patients incapable of complying with conservative treatment and who make an informed consent to have surgery with full knowledge of the lack of evidence that surgery yields better outcomes than APCM as well as full knowledge of the potential risks associated with a surgical and para-surgical intervention.

All patients with TSCI are offered an informed choice between APCM & Surgical management with full knowledge of the benefits, limitations, hazards and outcomes of both methods of treatment.

CONTROVERSY ABOUT TIMING OF SURGERY AND "TIME IS SPINE"

Despite the fact that the window of opportunity could not be met in humans, great efforts were made by scientists and clinician to improve outcomes of TSCI further. Unfortunately all what could be demonstrated clinically in humans is that surgical decompression carried out within 24 hours of injury resulted in better outcomes than later decompression [44-46] and some benefit may also occur with decompression up to 36 hours of injury [46].

Concerns were expressed [47, 48] about the design of the Surgical Timing in Acute Spinal Cord Injury Study STASCIS study as well as the effect of decompression of the cord on the CSF pressure with possible reduction of perfusion pressure [49]. Unexpressed concerns about assessment, analysis of results interpretation of outcomes and conclusions of the STASCIS and similar studies are beyond the scope of this manuscript.

Although it is plausible that surgical decompression prior to the development of oedema and secondary changes in the cord could give better results than later decompression, surgical decompression however has yet to demonstrate equality or superiority of outcomes to those of APCM in patients with traumatic spinal cord injuries.

Considering the combined potential added risks of further injury to the cord during anaesthesia, surgery or post-operatively, the lack of correlation between the radiological and neurological presentations and outcomes, the probable alternative interpretations of the difference in outcomes between early over late decompression, the lack of evidence of equality or superiority of outcomes of surgical interventions over APCM; radiological manifestations of the spinal injury and the concept of "Time is Spine" should not be used to influence never mind pressurised patients into accepting surgery. Patients should be made aware of the potential for spontaneous neurological recovery with APCM, the potential risks of surgery and should be encouraged to make an informed choice of treatment.

CONTROVERSY ABOUT SURGICAL STABILISATION & EARLY MOBILISATION

Surgical stabilisation aiming at early and safe mobilisation of neurologically intact patients is undoubtedly beneficial to these patients. If uneventful Surgical stabilisation will enable early safe mobilisation of neurologically intact patients, minimise the period of recumbence by containing the biomechanical instability without adverse effect on a physiologically intact spinal cord and enabling the commencement of a limited period of gait monitoring and limiting the period of hospitalisation to two or three post-operative days.

Claims of equal benefits from surgical stabilisation of the patient with impaired cord functions have been made in good faith but with little familiarity of the differences between the neurologically intact and neurologically impaired patient and the systemic effects of early mobilisation on the physiologically impaired spinal cord and patient and neurologically impaired patient.

The potentially detrimental effects of Early Mobilisation during the stage of spinal & neurogenic shock seem to have been missed, ignored or dismissed.

Early mobilisation of patients with cord damage can result in : profound hypotension [50-53] resulting in reduced cord perfusion; reduced lung volumes and flow rates, reduced forced vital capacity and forced expiratory volume [54-57] inability to initiate postural drainage; further reduction in the ability of the patient to cough, difficulty in ensuring adequate cough assistance when the patient is sitting in a wheelchair further aggravated by the effect of gravity resulting in inadequate clearance of bronchial secretions; increased risk of hypoxia. Individually, or in combination, these respiratory and vascular pathophysiological mechanisms can potentially cause further impairment of cord functions. Moreover loading of the patient's sitting weight over the ischial and sacral bony prominences during the period of vaso-motor areflexia and reduced skin perfusion together with the added difficulty of a paralysed or paretic patient to relieve pressure result in a significantly increased risk of pressure sores over these bony prominences. Furthermore gravity adds to the increase in pooling of the blood in the lower limbs during the stage of neurogenic shock, vaso-motor inactivity and spinal shock and an with increased risk of deep vein thrombosis in the lower limbs with early mobilisation of the patient.

Difficulties in catheterising patients intermittently or clearing some urinary and/or bowel incontinence while the patient is in a wheelchair does not make nursing easier but further increase the burden of patient care for health care professionals [6, 13-15].

To date there is no evidence to suggest that surgical stabilisation adds value in: saving days spent in Intensive Care Units, achieving uneventful early mobilisation, reducing the incidence of complications (pressure sores, respiratory infections, urinary infections etc…) reducing total bed days in recumbence throughout the first admission, achieving equal neurological outcome to APCM on discharge , reducing the time from injury to completion of equivalent end points of rehabilitation, reducing the period of total hospitalisation from injury to first discharge, reducing the incidence of chronic back pain, maintaining the flexibility of the spine or reducing the frequency of post discharge readmission to hospital during the first five years following first discharge to treat complications [15].

The author recommends that prior to definitive mobilisation of patients with cord injury, monitoring of Blood Pressure, Vital Capacity, Oxymetry and Neurology of the patient at 10-20^{o} of tilt until the patient reaches verticalisation of 80-90^{o} in the wheelchair with no deterioration of neural functions.

CONCLUSION

To date there is no evidence to suggest that correcting malalignment, clearing the spinal canal, decompressing the spinal cord or surgically stabilising the spine positively influence the neurological [15] and other non-neurological outcomes of TSCI in humans.

Based on available evidence to date what seems to determine the neurological outcome is the force of the impact that damages the spinal cord at the time of the injury, the degree and topographical extent of sparing of the sensory and sensory-motor tract functions as well as the adequacy of protection of the injured cord from further mechanical and non-mechanical damage. The success of this protection is determined by the quality of the simultaneous management of the injured spine and the multi-system physiological impairment and malfunctions to prevent complications.

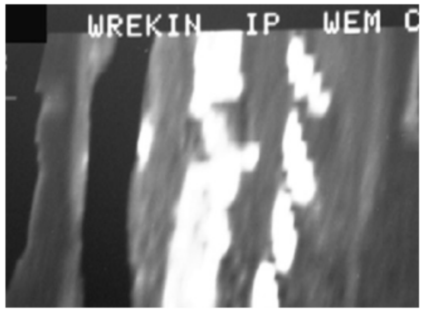
The author asserts there is an urgent need for adequately designed collaborative studies comparing all relevant outcomes of both APCM of the patient including the injured spine and the various interventions that claim added benefits. There is an equally paramount need to use a relevant, all inclusive stable and clinically useful neuro-functional classification supplemented by a numerical value of motor power and sensation for the expression of the initial neurological presentation and the outcomes of management in a uniform clinically, numerically and statistically assessable representation.

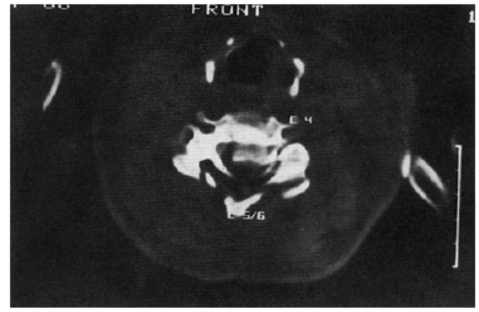
Failure to scientifically explore the best method of management of the injured spine and the patient with Acute Traumatic Spinal Cord Injuries will only perpetuate a false sense of security to the clinician that responsibility has been discharged by carrying out an intervention which based on less than adequate evidence is believed to be useful. Such is unlikely to be in the best interest of this group of patients nor the advancement of knowledge in this field of medicine.

CASE REPORT REPRESENTING THE EXPECTED SIGNIFICANT SNR OF PATIENTS WITH INCOMPLETE CORD DAMAGE DESPITE SIGNIFICANT RADIOLOGICAL CHANGES AND MISSING THE “WINDOW OF OPPORTUNITY”

This 41 years old lady was admitted the same day of injury following an RTA as a front seat passenger in 1988. She presented with C5/6 cervical fractures malalignment, significant canal encroachment, cord compression, an incomplete Frankel C dense tetraparesis with a Brown Sequard configuration and motor score of 47/100.

She was treated with APCM, the alleged concept of the “window of opportunity” for surgical intervention was not followed. She recovered significant motor power and was discharged 10 weeks after the injury with a motor score of 67/100. Her motor score at one year follow up was 95/100 and regained normal sphincter control. She had residual moderate weakness in the left hand which she used functionally. She maintained her ability to walk without support, a painless good range of movement of her spine and





sphincter control for over 33 years following the injury. She started using one stick for balance when she reached 72 years of age. She has sensation and control of urine during the day but has recently experienced some frequency of urine and occasional leakage at night.

Similar cases demonstrating spontaneous neurological recovery irrespective of radiological presentations can also be found in a number of our previous publications including one of our latest freely accessible publication from the following website address:

http://journals.sagepub.com/eprint/V9qda2SDWRT7fEMYttqF/full

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