

# British Orthopaedic Association

PATRON: H.R.H. THE PRINCE OF WALES



## **THE INITIAL CARE AND TRANSFER OF PATIENTS WITH SPINAL CORD INJURIES**

Published by the British Orthopaedic Association, January 2006

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This booklet has been produced by a Working Party established by the British Orthopaedic Association. Principal authors are Professor C G Greenough MD MChir FRCS, Consultant Spinal Surgeon and Clinical Director, Golden Jubilee Spinal Cord Injuries Centre, The James Cook University Hospital, Marton Road, Middlesbrough TS4 3BW and Mr P Edmond, FRCS, Clinical Advisor, Golden Jubilee Spinal Cord Injuries Centre.

This booklet has been endorsed by the British Association of Spinal Cord Injury Specialists, the British Association of Spinal Surgeons and the British Cervical Spine Society. The BOA is also grateful for the input of individual members of the Society of British Neurological Surgeons.



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## **Introduction**

Few disabilities produce the devastation of a spinal cord injury. The effects extend beyond the individual patient and include the impact on the immediate family and society in general. The financial cost is considerable. It is estimated that the annual incidence of traumatic spinal cord injury is 19 per million. Approximately half of these are cervical injuries. There is a large group of incomplete cord injured patients and the majority of this group can be significantly improved with appropriate care.

People who sustain a spinal cord injury require specialised care and rehabilitation. The initial management of a patient with a suspected spinal cord injury can have major implications for the patient's long-term management<sup>1</sup>. The Regional Spinal Cord Injuries Centre would prefer that all patients with spinal cord deficit should be transferred to the Regional Centre from the Accident & Emergency Department of the receiving hospital if possible. Patients with spinal cord injuries are extremely vulnerable to avoidable complications, particularly pressure sores, urinary difficulties, autonomic problems and joint stiffness. The avoidance of these complications requires a high level of input from a dedicated multi-disciplinary team. Audit of delayed admission to Spinal Cord Injuries Centres demonstrated that approximately 40 percent of such admissions have avoidable complications. Pressure sores were the most frequent and led to delays in rehabilitation of up to 12 weeks on admission to the Centre, negating any benefit of spinal stabilisation.

Patients who are fit for transfer from the receiving Accident & Emergency Department should be transferred to the Regional Cord Injuries Centre. Transfer of a patient with a spinal cord injury from the receiving Accident & Emergency Department to a hospital other than the Spinal Cord Injuries Centre should always be avoided if possible. It is recognised that some patients will not be fit for transfer and on occasion the Regional Spinal Cord Injuries Centre may not be able immediately to accept referral. Under these circumstances admission to the receiving hospital ward or ITU may be required. Some Centres may not be able to undertake all the management of acute trauma in a patient with multiple injuries and in some Centres other services, for example specialised spinal surgery, are not available. If this is the case, the closest collaboration on treatment strategy and day-to-day management should be part of a formalised network which should be subject to the normal governance arrangements.

It is the intention of this booklet to assist health care professionals in Accident and Emergency and in Orthopaedic and Neurosurgical departments in the initial assessment and management of the patient prior to transfer to the Spinal Injuries Centre.

## Advice and Liaison

Advice on the medical, surgical, nursing and therapy aspects of patients with spinal cord injuries may be obtained at any time from the Regional Spinal Cord Injuries Centre. Many Regional Centres have Spinal Nurse Specialists or other liaison workers who are available to visit any hospital in the Region and give advice on the management of any patient with spinal cord deficit. Initial contact should be made with your local regional centre.

### Spinal cord injury centres

#### England

Middlesbrough	Golden Jubilee Regional Spinal Injuries Centre	01642 282641
Oswestry	Midlands Spinal Injuries Centre for SCI	01691 404406
		01691 404413
Pinderfields	The Yorkshire Regional Spinal Injuries Unit	01924 212358
Salisbury	Duke of Cornwall Spinal Treatment Centre	Tamar Ward
		01722 336262 x2445
		Avon Ward
		01722 336262 x 2447
Sheffield	The Princess Royal Spinal Injuries Unit	0114 2715609
Southport	Southport Regional Spinal Injuries Unit	01704 704345
Stanmore	London Spinal Injuries Unit	020 8954 2300 bleep 755
Stoke Mandeville	The National Spinal Injuries Centre	01296 315000
		Bleep Spinal Acting Up

#### Northern Ireland

Belfast	Withers Orthopaedic/Spinal Injuries Centre	020 8909 02120
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#### Scotland

Glasgow	The Queen Elizabeth Spinal Injuries Centre	0141 2012533
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#### Wales

Cardiff	Rookwood Spinal Injuries Rehabilitation Centre	029 2031 3831
		029 2031 3832

#### Republic of Ireland

Dublin	National Medical Rehabilitation Centre	00 353 1 2854777
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### The Spinal Injuries Association (SIA)

The SIA has published two books dealing with the essential features of nursing a patient with acute traumatic spinal injury:

The first 48 hours

Managing spinal injuries - critical care

*These are available from the SIA at the web site below.*

<http://www.spinal.co.uk/> Web based general information resource.

## **Patient Assessment**

### **Think Spinal Injury**

Following an injury the potential for a spinal cord injury to exist must be considered. People may present with full movement and sensation of all four limbs; however, they may have a vertebral fracture and, if handled incorrectly, the spinal cord may be damaged and the results could be devastating.

Of 569 patients admitted to a Spinal Cord Injuries Centre, 52 injuries (9%) were missed at presentation and of these 26 had experienced further avoidable deterioration. Only 5 of these missed injuries were at C1/2 or the cervico-thoracic junction. One-third of patients with missed injuries had a significant head injury, 13 required early ventilation, 9 were intoxicated and 7 were thought to be hysterical. X-rays were of poor quality in 18, failed to demonstrate the whole region in 11, 4 were of an uninjured region, there were 10 unrecognised soft tissue swelling and 6 had no vertebral injury<sup>2</sup>.

In general, spinal injuries should be suspected in all casualties who have been involved in:-

- (1) A road traffic accident
  - (2) A fall or jump from a height
  - (3) An accident resulting in impact or crush injuries
  - (4) An accident resulting in multiple trauma
  - (5) An accident resulting in the patient losing consciousness
- and, if
- (6) Following injury, the patient complains of back or neck pain and appears to be guarding their back or neck
  - (7) The patient complains of any sensory changes or loss such as numbness or tingling
  - (8) The patient is unable to pass urine

**Airway, breathing & circulation** are the priority in any initial assessment. However, a suspected spinal injury can be considered concurrently. A full examination of the patient is essential in order to identify and stabilise other possible injuries.

### **Spinal Shock**

Spinal shock occurs in the initial period following injury. It may last from several hours to several weeks depending on the severity. It is seen in patients who have sustained spinal cord damage at T6 or above (as it is the result of interruption of the sympathetic nervous control). The higher the level of injury the more profound the effects.

At this stage there is total, flaccid paralysis of all skeletal muscle and loss of all spinal reflexes below the level of the lesion.

## Airway and Cervical Spine Control

As soon as it is feasible the patient should be placed into the neutral supine position. *If the patient is wearing a helmet, two people are needed for its removal.* The helmet is held by the first rescuer who maintains the neck in the neutral position to the rest of the body. The second rescuer undoes the chin strap then places one hand behind the neck and the other hand is placed around the jaw to support and maintain alignment. The first rescuer then uses lateral force to spread the helmet and gently removes it.

In any injury the airway can become compromised. With a suspected spinal cord injury the patient cannot be placed in the normal first aid recovery position which does not maintain cervical alignment. The spine should be kept in alignment at all times.

### Observation

- Look for evidence of breathing difficulties, obstruction or aspiration
- Listen for noisy breathing, stridor or gurgling – evidence of airway compromise
- Feel for air exchange, deformity or foreign bodies in the mouth or throat

### Action

- Clear airway of any obstruction
- Remove any foreign bodies from the mouth or throat
- Oral suctioning may be necessary
- To protect a threatened airway **do not hyperextend the neck**; use instead the chin lift technique
- Minimise movement of the cervical spine
- Consider naso-pharyngeal or oro-pharyngeal airway
- Anaesthetic consultation may be appropriate
- Consider naso-tracheal intubation (fibre-optic) if needed
- NB *In cervical or high thoracic injuries, during intubation severe bradycardia can occur, leading to cardiac arrest. To minimise this risk consider: pre-oxygenation, hyperventilation with ambubag, use of topical anaesthetic spray. Administration of Atropine 0.3mg/0.6mg may be needed.*



## Breathing

In cervical and high thoracic injuries the nerves to the intercostals are paralysed, reducing the ability to breathe effectively. In high cervical lesions the diaphragms may also be affected (C3,4,5). In these high lesions the most affected function is coughing. Patients with very high lesions are breathing with the diaphragm only and have no effective cough at all. The risk of deteriorating respiratory function is extremely high due to:-

- Fatigue of innervated muscles
- Chest trauma
- Ascension of the spinal lesion
- Retained secretions
- Abdominal distension splinting diaphragm (see paralytic ileus, p. 11)

### Observation

Look for:-

- Presence, rate & depth of respirations, shallow or abdominal breathing
- Asymmetry of the chest
- Paradoxical breathing in cervical injuries
- The development of respiratory fatigue, i.e. shallow grunting breathing, dropping in SaO<sub>2</sub> despite O<sub>2</sub> supplements
- Initial and serial measurements of vital capacity – a gradual drop in vital capacity is a sign of respiratory deterioration
- Signs of aspiration or consolidation

### Action

- Continuously monitor oxygen saturation levels
- Maintain SaO<sub>2</sub> at 95% or above
- If longer term O<sub>2</sub> is required, it should be humidified
- Monitor blood gases regularly
- **Early, regular and frequent physiotherapy is the mainstay of treatment,** including assisted cough techniques
- Serial chest x-rays
- Elective ventilation may be needed
- Secure the airway if Vital Capacity is less than 1 litre. Tracheostomy avoids excessive neck movements as occur during endo-tracheal intubation
- Tracheal suctioning may be needed

## Circulation

Spinal shock (neurogenic shock) is the body's response to the sudden loss of sympathetic control. It occurs in cervical and high thoracic lesions (above T6). Due to lack of vasomotor control significant hypotension results. Bradycardia occurs as a result of unopposed effects of the vagus nerve. A systolic blood pressure of 90 may be normal in these patients. Monitoring of fluid balance in patients with spinal cord injury is essential. Remember, however, that hypovolaemic shock may be present and other injuries may escape detection in the cord injured patient with sensory deprivation. In the acute phase, if other significant injuries are present, a CVP line may be of assistance.

### Observation

- Hypotension

### Action

- Monitor BP
- Maintain a systolic BP of 90-100mmHg and a urinary output of 30mls or above per hour
- Administer IV fluids
- *NB Do not over-infuse. This may precipitate cardiac failure and pulmonary oedema.*
- In rare instances Inotropes may be necessary to maintain a stable BP.
- A CVP line may be indicated

### Observation

- Bradycardia

### Action

- ECG monitoring
- If heart rate drops below, and remains below, 40 beats per minute Atropine 0.3-0.6mg may be given as IV bolus
- *NB An abnormal vaso-vagal response can occur through stimulation such as rapid changes in body positioning, i.e. logrolling too quickly, tracheal suctioning, passing an N.G. tube etc.*
- In patients with tracheostomy, during suctioning, stimulation of vagal afferents can result in a marked vagal response and hypoxia. Bagging with 100% O<sub>2</sub> pre and post tracheal suction is a useful manoeuvre to minimise these effects
- There is a high incidence of cardiac contusion in thoracic injuries with a potential for arrhythmias

## Neurological Assessment

Careful neurological assessment is critical and absolutely essential for patients with spinal cord injury. In the first hours and days following injury the neurological level may change. An extension of the lesion by one or even two levels may be observed and it is critical that any change is monitored, to prevent any avoidable deterioration of neurological deficit. At the site of cord injury there will be a zone of critical ischaemia. This zone may expand with poor oxygen saturation or poor perfusion. Patients with high lesions have poor autonomic vascular control and postural hypotension may be severe and significant. In the acute phase of the injury such postural hypotension may expand the zone of critical ischaemia. **Acute spinal cord injury must be nursed flat.**

Neurological examination should be undertaken by an experienced member of the medical team and it is extremely helpful to use the standardized examination recording chart published by the American Spinal Injuries Association (ASIA Chart, appendix 1). Performing this can be tedious for the patient and it is better to make one good assessment. The acutely injured patient often finds it easier to report alteration of pin prick than alteration of light touch. Test pin prick on the anterior surface of the body and the perineum. Mark the sensory level on the patient as this is very useful in subsequent review. A change from an accurately recorded level may allow diagnosis of potential complications, e.g. epidural haematoma, over-distraction when using skull traction.

Sacral segments have great prognostic significance for future bowel and bladder management. Careful examination of anal sensation, tone, and power, together with primitive reflexes is essential.

Spinal surgery may be contemplated (see p. 15). If spinal surgery is undertaken the ASIA chart should be carefully completed prior to surgery and post-operatively.

## **Imaging**

Multiple fractures occur in 5% of cases.

Good quality plain films of the whole spine are essential. CT may be required at the cervico-thoracic junction. Soft tissue swelling must not be overlooked. An MRI scan will help with prognosis, and can identify prolapsed disc, haematoma and other soft tissue lesions.

## **Handling The Patient With a Spinal Cord Injury**

To ensure that total immobilisation of the spine is maintained, to allow the patient to be moved, there are two techniques which can be applied.

- 1. Logroll**
- 2. Spinal Lift** <sup>3,4</sup>

Log rolling is the method normally employed in the acute phase of the spinal cord injury management when the spine has not been stabilised. This requires sufficient nurses to control the head, shoulder girdle, pelvis and legs. The senior nurse should control the head and give the directions.

The neck may be immobilised with a collar or sand bags; skull traction is preferred as it will allow side-to-side tilting more easily.

## **Deep Venous Thrombosis**

Patients with acute spinal cord injury are at very high risk of deep venous thrombosis. Prophylaxis is mandatory. The preferred regime of the Local Spinal Cord Injuries Centre should be followed if possible and this can be obtained from the Regional Spinal Cord Injuries Centre.

## Skin

The risk of developing pressure sores following spinal cord injury is extremely high due to:-

- Lack of sensation – the patient is unaware that there may be a problem
- Lack of muscle activity below the level of injury
- Circulation sluggish – reducing amount of oxygen to the skin

A pressure sore, taking an hour or so to develop, may delay the patient's treatment by weeks and produce a permanently vulnerable scar. A pressure sore is a sign of neglect.

The patient must be turned regularly. Forty degrees side to side is minimum with appropriate pillow supports. Ripple mattresses and other devices are often insufficient for the prevention of skin problems in this vulnerable population. A ripple mattress is ineffective in the prevention of heel sores and the ankles should be supported with small pillow to ensure that the heels are not in contact with the bed.

It is **absolutely contra-indicated** to allow a patient to sit on a pressure sore.

The liaison staff from the Regional Spinal Cord Injuries Centre would be pleased to visit any ward to provide advice and demonstrations of correct skin care.

### Observation

- Check all pressure areas for signs of skin breakdown

### Action

- Heels vulnerable when lying flat on back. If feasible place a small pillow or rolled up towel underneath the ankles to keep heels free from the mattress and pressure free. Ripple mattresses are inadequate for prevention of heel sores
- Subsequent pressure relief must be carried out 2-hourly.
- Side-to-side turning of minimum 40°.

## **Paralytic Ileus**

Paralytic ileus is common in neurogenic shock. There is a risk of vomiting/aspiration. Ileus usually occurs immediately in thoraco-lumbar injuries but can be delayed for anything up to 48 hours in cervical injuries. Abdominal distension may impede breathing by splinting the diaphragms.

### **Observation**

- Listen to abdomen for presence of bowel sounds
- Observe for abdominal distension

### **Action**

- Nil-by-mouth
- Pass naso-gastric tube – free drainage (beware possible bradycardia)
- If abdomen is distending due to the build-up of gas, passing a flatus tube may relieve this and avoid over-distension of the bowel.

## **Stress Ulceration**

Stress ulceration and gastric haemorrhage is common in acute spinal cord injury. Prophylactic use of Ranitidine or other similar preparation is indicated.

## **Bladder**

The bladder is flaccid during spinal shock and therefore it is important to avoid over-distension as this can have an adverse effect on the patient's longer-term management.

Over-distension damages the myo-neurenteric plexus in the bladder wall and this damage can be permanent. All patients should be managed with a urethral catheter on *free drainage initially*. Urinary output should be monitored hourly until the patient is stable. If there is a prolonged delay before admission to the Regional Spinal Cord Injuries Centre can be arranged, further advice on bladder management may be obtained from the Centre.

In the acute situation urethral catheterisation should not be attempted in the presence of priapism. Under these circumstances suprapubic catheterisation should be undertaken in the Accident & Emergency Department. A number of devices are available for this purpose. Ultrasound control can be helpful.

## **Bowel**

The spinal cord injury may create two types of problems with bowel control, usually depending on the level of damage to the spinal cord.

- Upper Motor Neurone Damage (Thoracic Level 12 and above) (spastic/reflexic bowel). Reflex activity is maintained, the bowel will contract and empty when stimulated. Anal sphincter tone is maintained
- Lower Motor Neurone Damage (Usually Lumbar Level 1 or below) (flaccid/areflexic bowel). Although peristalsis will return, these movements are quite ineffective without the support of the spinal reflex. Faecal retention and overflow of faecal fluid may occur and the anal sphincter will be flaccid.

### **Action**

- Daily insertion of glycerine suppositories 15 - 30 minutes prior to rectal examination and evacuation if the rectum is full.
- When bowel sounds return, passage of flatus occurs or bowels move then aperients may be started:
  - a. Senna Tablets 7.5mg or Syrup 7.5mg in 5mls (usually 15 mgs on alternate evenings) and
  - b. Lactulose (the patient must have a high fluid oral intake), 15ml b.d.
- If the above regime is not successful consider:
  - Bisacodyl Tablets 10mg (alternate nights)
  - Co-danthramer (two capsules on alternate evenings, for elderly patients only)

### **Upper motor neurone (reflex) bowel**

- Continue rectal examination and digital evacuation daily
- Commence suppositories on mornings after aperient
- Anal digital stimulation to trigger reflex and ensure rectal emptying. CHECK digitally that emptying is complete

### **Lower motor neurone (flaccid) bowel**

- Continue daily rectal examination
- Manual evacuation is essential in these patients

The recent guidance from the National Patient Safety Agency mandates all NHS trusts to develop a policy on manual bowel evacuation. It states that failure to meet this aspect of care could be a breach of the Nursing and Midwifery Council Code of Conduct <sup>5,6</sup>.



## Joint Mobility

After the initial period of spinal shock, patients can develop spasticity to a larger or lesser extent. This can quite rapidly result in joint contracture. Such joint contractures can be very disabling if they prevent proper seating in a wheelchair or if a later partial neurological recovery occurs but the joints involved are too stiff to allow use to be made of the returned muscle power.

Passive movement and positioning is very important. Patients will require daily input from the physiotherapy team.

- **The shoulders** are particularly affected in cervical lesions. The development of frozen shoulder is almost universal and can be prevented by correct passive mobilisation techniques and positioning which must start from the day of admission. Abduction, flexion and external rotation are particularly prone to limitation of movement. Shoulder pain is often a feature of cervical cord injury and can be reduced by appropriate stretching and mobilisation techniques.
- **The elbows** have obvious tendency to fixed flexion deformity and stretching is required.
- In **the hand** flexion deformity of the interphalangeal joints can occur and requires regular passive stretching. On occasion reflex sympathetic dystrophy is seen and this is best addressed early with passive stretching.
- In **the lower limbs** flexion contracture and adduction with internal rotation of the hip can occur. When respiratory function is satisfactory, periods of prone lying can assist.
- Fixed flexion deformity of the knee is also seen but equinus deformity of **the ankle** is very common and requires early and regular stretching.

Passive stretching can, and should, be undertaken by all health care professionals involved with the patient. Nursing staff have a significant role to play in positioning of the arms and shoulders and can also undertake some passive stretching exercises, which should be an integral part of turning regimes, and whilst undertaking other routine nursing care.

## Spinal Surgery

Spinal surgery comprises two components; decompression of the neural tissues and reduction and stabilisation of the spine. Each may be considered separately.

The role of decompression in the management of patients with spinal cord injury has yet to be fully determined. There is no conclusive evidence that decompression of the injured spinal cord improves either the rate or completeness of any neurological recovery<sup>7</sup>. Most incomplete lesions demonstrate significant improvement with time whether treated operatively or conservatively. Patients in the acute phase of spinal cord injury are autonomically damaged and surgery does carry a risk of neurological deterioration if oxygenation and blood pressure are not precisely controlled or if post-operative oedema and swelling creates any further anoxic insult to the injured tissues. This is of particular importance in the cervical spine where the difference between a C5 lesion and a C6 lesion is very substantial in terms of independent living.

Benefits of stabilisation surgery are the protection of the neural tissues, reduction of pain, easier patient handling, earlier mobilisation **within physiological restrictions** (see p. 16), reduction of respiratory complications and reduction in late deformity with better posture and balance. There is some evidence to suggest that unreduced fracture dislocations or gross kyphotic deformities may be associated with an increased incidence of post traumatic syringomyelia. Meta analysis of stabilisation indicates that it reduces complications, length of stay and hospital costs <sup>7</sup>.

Spinal surgery in a patient with spinal cord injury is rarely indicated as an emergency. The evacuation of a compressive haematoma or large central disc prolapse requires urgent management. Dislocations with or without fracture demand early reduction but subsequent stabilisation is not urgent. For most patients a period of a few days to allow recovery from spinal shock and restoration of cardio-vascular stability is advisable. If traction is used for stabilisation or reduction of dislocation, **regular neurological assessment** is vital as the injured cord is particularly vulnerable to distraction.

Other than the potential for neurological deterioration complications of surgery include infection, poor wound healing and the complication of mis-placed or inadequate instrumentation. As most of the achievable objectives of spinal surgery are those of stabilisation, the aim of surgery should be to provide sufficient stabilisation to allow a patient to mobilise without external support. There is little value, for example, in cervical spine surgery that still requires the use of a halo vest. These patients represent the most vulnerable patients and only experienced spinal surgeons should undertake stabilisation surgery. The appearance of avoidable general complications such as pressure sores will negate any benefits of spinal stabilisation. It is preferable, if facilities exist, that spinal stabilisation in these patients should be undertaken from a bed in a spinal cord injuries centre.

## Anaesthesia

Anaesthesia in this group of patients is extremely demanding. Autonomic dysfunction produces significant lability of blood pressure and it is preferable that an anaesthetist experienced in the management of spinal cord injured patients should undertake anaesthesia. The treatment of correct fluid balance is difficult and CVP measurements are indicated. Care should be taken when turning the patient from prone to supine (e.g. when coming off the table) as the external pressure on the capacitance vessels is removed and these vessels may have no tone. This can result in a sudden catastrophic fall in the venous return to the heart.

## Mobilisation

In patients with spinal cord injury the most important consideration is the provision of optimal conditions for neurological improvement and the prevention of further deterioration. Any spinal cord injury will have an area of cord tissue at critical levels of ischaemia which surrounds an area of necrosis. Any factor increasing this ischaemia has the potential to cause a deterioration of neurological function and, on occasion, this can be permanent. Patients with high lesions (above T6) will have very significant postural hypotension and this can exacerbate poor perfusion in the critical zone.

Mobilisation requires a graduated and carefully monitored approach. **Simply allowing a patient with an acute cord injury to sit without such a programme is unacceptable.** Mobilisation should initially be undertaken using a tilt table and abdominal binder in the presence of an appropriately qualified practitioner. During gradual tilting, measurements of blood pressure are required together with monitoring of neurological function particularly at the levels adjacent to the injury itself. Significant hypotension or appearance of increasing deficit indicates return to the recumbent position.

Patients vary significantly in the degree of postural hypotension and in any influence on neurological function. In some cases it can be some weeks before elevation to vertical sitting position may be safely achieved.

## **Autonomic Dysreflexia**

Patients with a lesion at or above T6 are prone to autonomic hyper-reflexia (dysreflexia). Common precipitants include blocked catheters or rectal examination, instrumentation and operation – thus a general anaesthetic is still necessary for spinal patients even if they have no apparent sensation.

A stimulus causes reflex sympathetic over-activity below level of cord lesion, leading to vasoconstriction and systemic hypertension. The hypertension stimulates the carotid and aortic baroreceptors leading to increased vagal tone and bradycardia. Peripheral vasodilatation, which would normally relieve the hypertension, cannot occur because of the injured cord.

### **Blood Pressure continues to rise until cause removed. Danger – can result in intracranial haemorrhage**

General causes:

- Bladder distension
- Bowel distension
- Pressure sores
- Ingrown toenails
- Childbirth
- Fissure in ano

Symptoms:

- Pounding headache/fullness in head
- Profuse sweating
- Tightness in chest

Signs:

Hypertension and bradycardia. (Occasionally cardiac dysrhythmia)

- Above lesion
  - Pallor initially, then flushing and/or blotching
  - Sweating in area above and around the lesion
  - Pupillary dilatation
- Below lesion
  - Cold peripheries
  - Pilo erection
  - Contraction of bladder and large bowel
  - Penile erection and seminal fluid emission

Treatment:

1. Tilt bed head up
2. Sublingual Nifedipine 10 mg bitten or GTN sublingual
3. Remove cause
4. DO NOT USE ASPIRIN OR NSAID for analgesia afterwards. Use Paracetamol/Co-proxamol

## **Steroid Therapy**

For many years there has been considerable controversy over the use of high dose steroids in the immediate management of acute spinal cord injured patients. The NASCIS trials in the United States appeared to demonstrate some positive benefit although this was restricted to a post-hoc sub-group analysis in only one of these trials (NASCIS II). Actual differences between the groups were small (between 5 and 12 points). These findings, however, were not replicated in other randomised control trials performed in France and Japan.

A recent review paper from the Midlands Centre for Spinal Cord Injuries has carefully reviewed all the evidence concerning the administration of high dose steroids in acute spinal cord injuries <sup>8</sup>. Some methodological weakness in the post-hoc analysis of the NASCIS II data were highlighted, including the fact that the biggest difference in outcome actually occurred between the two placebo groups (before 8 hours and after 8 hours). The question of steroid administration has been debated by the British Association of Spinal Cord Injuries Specialists who concluded that the use of high dose steroid in the management of acute spinal cord injury could not be recommended or supported on the current evidence.

## **Pre-existing cord injury**

Patients with existing spinal cord deficits may present with subsequent injuries or for elective orthopaedic procedures. In addition to their presenting complaint, the management of the cord deficit will need to continue. These patients remain extremely vulnerable and strict attention to management of skin, bladder and bowel is essential. It should be remembered that these are “expert patients” in the true sense of the word and will be very knowledgeable on the management of their condition. It is important that all staff listen to these patients when they give advice on their own management. The Regional Centre will be pleased to offer advice and may also be able to arrange a visit from an outreach worker. Specific areas to consider are:

- Medication – established spinal cord injured patients frequently are on significant numbers of medications including aperients, anti-spasmodics, bladder agents, pain management drugs etc. In some of these, for example Baclofen and Gabapentin, sudden cessation can lead to dangerous side effects. Interference with normal aperient regime can give rise to major problems with bowel management.
- Intrathecal Baclofen Pumps, anterior root stimulators and other intra-canal devices. Care will need to be taken when considering MRI scanning and during surgery. For example, it is prudent to switch off Baclofen pumps.
- Patients with lesions above T6 will be at risk of autonomic dysreflexia (See Page 17)
- Of all the avoidable complications which occur during admission, pressure sores are the most frequent and the most disabling. Regular turning is essential at all times and it is never acceptable to allow the patient to rest weight on a pressure sore.
- When using plaster cast immobilisation for fractures in insensate limbs, there is a high risk of skin break-down. Any external splintage must be extremely well padded and removable. The skin must be inspected daily.
- The skeleton in the paralysed area will be grossly osteoporotic and this should inform any plans for internal or external fixation.
- Spasm may be a major obstacle and management may need to be addressed. This may be done on a local basis for example with Botox or by manipulation of systemic anti-spasmodics.

- **Pre-operative action plan.**

Bladder and bowel care. Distension must be prevented to avoid autonomic dysreflexia. Ensure free urinary drainage by catheterisation if necessary. Check bowel programme and confirm empty rectum prior to theatre.

Respiratory care. Measure vital capacity and blood gases.

Thermoregulation is impaired: monitor rectal temperature.

Avoid overtransfusion

### **Transfer to the Spinal Centre**

Decisions to transfer and planning for it should take place between senior staff in the transferring and receiving units.

Travel time should be estimated; battery reserve of monitors and infusion pumps and capacity of oxygen cylinders driving pneumatic ventilators should be calculated and skin care be planned for the duration of the journey.

A police escort is usually advisable. Recent advice suggests that a properly immobilised spinal injured patient can be transferred at normal speeds appropriate for the road. Sudden acceleration and deceleration should be avoided.

### **Personnel**

As a minimum, an experienced nurse and doctor, preferably an anaesthetist for cervical patients, should escort the patient. A paramedic crew is preferable.

## TRANSFER CHECKLIST

*Prior to transfer, ensure mechanical and physiological stabilisation:*

- Immobilisation of the spine is adequate and secure
- Long bone fracture immobilisation
- Airway is clear and can be maintained during transfer (intubate if PaCO<sub>2</sub> is >5.5 KPa or if respiratory failure is likely to develop during a prolonged transfer)
- Supplemental oxygen is being administered and ventilation is adequate whether spontaneous or assisted
- Voluntary vital capacity should exceed > 15 ml/kg: elective ventilation if incipient or frank respiratory failure
- Chest drainage if pneumothorax or haemothorax before transfer
- IV is patent and infusing at desired rate
- Naso-gastric tube is in situ, draining freely, and connected to low-suction
- Indwelling foley catheter is in situ and draining freely
- Skin is protected from injury and apparatus or debris which may cause pressure sores is cleared away
- Level of Spinal Cord Injury is documented
- Records and x-rays accompany the individual
- Other injuries – thorax, abdomen, pelvis etc. – are documented and stabilised
- Any head injury documented and monitored
- **Notify time of departure to Regional Centre**



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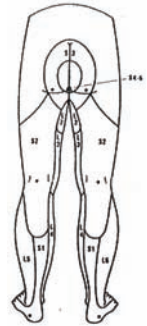
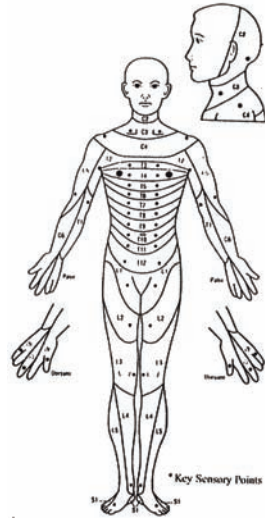
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Name:  
DOB:

Date of Onset:  
Neurological Level:

Hosp. No:  
Bony Level:  
*NEUROLOGY Chart*

Date							
Time	Motor		Touch		Pain		
	R	L	R	L	R	L	
<b>MOTOR</b>							
Shoulder Elevators C3, 4							C2
Abductors C5, 6							C3
Adductors C5-T1							C4
<b>Elbow Flexors C5,6</b>							C5
<b>Extensors C7, 8,T1</b>							C6
Wrist Flexors C6,7,8							C7
<b>Wrist Extensors C6, 7,8</b>							C8
<b>Finger Flexors C7, 8,T1</b>							
Finger Extensors C7,8							T1
Hand Intrinsic C8,T1							T2
Thumb Flexors C7,8,T1							T3
Thumb Extensors C7,8							T4
<b>ABD. DIG. MIN C8,T1</b>							T5
Abdominal Muscles: Upper							T6
Lower							T7
<b>Hip Flexors L2, 3</b>							T8
Extensors L5,S1,2							T9
Abduct. L4,5,S1							T10
Adduct. L3,4							T11
Knee Flexors L4,5,S1,2							T12
<b>Knee Extensors L2, 3,4</b>							
<b>Ankle DF L4, 5,S1</b>							L1
<b>PF S1,2</b>							L2
Toe Flexors L5, S1,2							L3
<b>Extensors L4,5,S1</b>							L4
<b>REFLEXES</b>							L5
BICEPS							
TRICEPS							S1
SUPINATOR							S2
ABDOMINAL							S3
KNEE							S4-5
ANKLE							
PLANTARS							Vibration
BC REFLEX							Joint Position
ANAL							
ASIA SCORE							(56) Max each
Total ASIA score		/100		/112		/112	



**Motor Score**  
 0= total Paralysis  
 1= palpable or visible contraction  
 2= active movement, gravity eliminated  
 3= active movement, against gravity  
 4= active movement, against some resistance  
 5= active movement against full resistance

**Sensory Score**  
 \* Note that a blunt sensation to pin prick is calculated as = 0  
 \* Dark Grey areas are ASIA Groups of muscles calculated in the score

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British Orthopaedic Association  
35-43 Lincoln's Inn Fields  
London WC2A 3PE  
Tel: 020 7405 6507  
Fax: 020 7831 2676  
secretary@boa.ac.uk  
www.boa.ac.uk