Volume 2 Issue 2, June 1997

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Introduction

The production team of the Trauma Grapevine have been working frantically to keep up with editorial dead lines. This issue deals with common clinical challenges, but particularly that of spinal trauma. The challenge we face in trauma care is that often serious injuries are infrequently seen by individual team members and may cause a relative anxiety for those treating the patients. The Grapevine aims to share some of our experiences with you.

Registration forms for SWAN V are available on our web page or may be obtained from Thelma at the Trauma Department 02 9828 3928. The meeting promises an exciting and informative one and a half days of trauma issues, with two international speakers. We regret that registration will be limited.

Over the next few issues Trauma Grapevine will be dealing with evaluation of abdominal trauma, recovery from head injury, clinical pathways and case management.

Michael Sugrue
Director Trauma Services
Liverpool Hospital

Should early spinal decompression be performed following thoracic spinal trauma?

Jonathan Dutt-Gupta
Visiting Trauma Student Liverpool Hospital (University of Birmingham UK).

Owing to the relative stability of the thoracic and thoracolumbar spine, compared with the cervical spine, thoracic cord trauma when it occurs is often more severe, and is more often associated with other serious injuries (particularly blunt chest trauma) since the
forces necessary to disrupt the thoracic spine are greater. The thoracic spinal canal is narrower however and the blood supply is sparsest. In general spinal injury occurs more commonly in the cervical spine (55%); of the remainder of the injuries, 30% are thoracic and 15% lumbar (1).

Clinical Assessment.

A few key clinical issues should be borne in mind when assessing patients with suspected spinal injury.

The diagnosis in an unconscious patient is often difficult- the key is to firstly consider the possibility the diagnosis. Warm peripheries in a shocked patient may provide a clue.

Bradycardia does not usually occur unless the sympathetic nerves are disrupted which requires a fracture at T6 level or above. Spinal shock is seen immediately after complete injury at this level and is associated with flaccid paralysis, retention of urine and a lax anal sphincter.

A number of neurological deficits may be seen in patients with spinal cord injuries, and these include classical paralysis or other syndrome such as central spinal cord syndrome to Brown-Sequard syndrome in penetrating trauma.

Treatment of the trauma patient must obviously be planned with priority to life threatening injuries first remembering that up to 50% of spinal injuries will have a serious head injury. This is particularly important in this group of patients who are likely to have suffered multiple trauma. Blunt chest trauma (leading to pulmonary contusion, rib fractures or pneumo/haemothorax), abdominal trauma (leading to liver, spleen, kidney and diaphragmatic injury) and head injury may co-exist. A high index of suspicion for such trauma is required since the associated physical signs can be hidden by neurological deficits (2).

Surgery Yes or No?

The issues of surgical decompression in cases of spinal injury is controversial. The aim of surgical decompression is to prevent further cellular injury secondary to the initial insult by releasing pressure within the spinal canal and restoring vascular supply. Secondary injury occurs when cells not directly involved in the mechanical impact suffer from changes in their surroundings. These may include persisting bone or haematoma compression, a build up of neurotransmitters and toxic neurochemicals and changes in cyclo-oxygenase mediated pathways (the later potentially being amenable to steroid therapy). Methylprednisolone (30mg/kg IV over 15mins, then 5.4 mg/kg/hr for 23hrs) has been shown to improve long term motor function (3). The earlier this evolutive lesion can be stopped, hopefully the better the degree of neurological recovery.

Studies have been directed at finding whether early decompression enhances neurological recovery. Bohlman from Ohio in 1985 studied 218 patients with thoracic spine paralysis who were treated either conservatively or had surgical decompression performed (4). None of the 184 completely paralysed patients recovered any neurological function, regardless of the treatment. Of those with partial paraplegia (30 followed up) those undergoing operation performed well if they had anterior thoracic decompression, less well if treated non-surgically and badly if subjected to laminectomy without stabilisation or restoration of normal angulation. The authors conclude that early operation should only be performed on patients with partial paraplegia and only the anterior approach should be used. They found that laminectomy actually made the partial paraplegia worse. A more recent study has shown similar findings (5), that early
spinal decompression has no place in complete paraplegia (0 out of 5 improve) yet should be considered in patients with partial paraplegia (4 out of 5 improve).

In conclusion patients who have undergone thoracic cord trauma should first be managed to exclude other more life threatening injuries and three main criteria should be used in deciding whether early surgery should be undertaken existence of (a) residual spinal compression (b) the degree of neurological impairment and (c) the presence of other system injuries.

References


Editorial Comment

Dr Martin McGee Collett Director of Neurosurgery Liverpool Hospital

Early surgery is only indicated when fracture or subluxation is extremely unstable in association with a fluctuating neurological status. Such situation are very rare.

The study of methylprednisolone reported by Braken and colleagues was unfortunately poorly designed and despite its results, consensus on the efficacy of methylprednisolone has not been reached internationally.

It is important to consider the diagnosis of spinal injury in the first instance, especially in an unconscious patient.

Cycling Injuries

A note of warning from Dr Keith Gunning

To follow are 2 case reports from Middlesbrough Hospital which might be of interest to your readers.

CASE 1

A 14 year old male was admitted to the Emergency Department four hours after being knocked to the ground by a cyclist on the footpath. The bicycle handlebars had struck his upper abdomen. He had required assistance to get up and walk, and his pain had
gradually worsened. On examination he was apyrexial, with a pulse of 73, BP 145/85 and respiratory rate of 18/min. There was a small bruise just inferior to the umbilicus, and the abdomen was generally tender, with rigidity and rebound tenderness. Abdominal and erect chest radiographs were normal. A surgical referral was made and urgent laparotomy was performed. At operation there was soiling of the peritoneal cavity with bile-stained small bowel contents, and the proximal jejunum was found to be completely transected, presumably due to a ‘closed loop’ injury. The traumatised bowel was resected and a primary anastomosis fashioned. The patient made a complete recovery, complicated only by a chest infection.

CASE 2

A 13 year old male attended the Emergency Department after falling from his bicycle and landing across the handlebars. He was complaining of pain in the abdomen, but on examination he was apyrexial, his pulse and blood pressure were normal and he was only minimally tender in the right upper quadrant. He was discharged, but re-attended twenty four hours later with worsening pain.

Abdominal ultrasound indicated free fluid within the peritoneal cavity and suggested splenic rupture, so he was transferred to the Surgical Department for observation. Unfortunately within two hours he had become tachycardic, pyrexial and his tenderness had become more extensive.

Urgent laparotomy revealed 1,000ml of heavily blood stained fluid within the peritoneum and a rupture of the spleen extending into the hilum. It was considered unsafe to attempt to salvage the organ, so splenectomy with implantation of splenic fragments into the greater omentum was performed. The patient made an uneventful recovery, but unfortunately recovery of his splenic function has not yet been demonstrated.

The cases illustrate potential pitfalls in trauma care.

1) Potentially life-threatening injuries may be sustained in an individual not fulfilling any criteria for Trauma Team activation, and with a history of an apparently trivial, low-speed impact. Handlebar impact injuries are particularly dangerous. A recent study of 813 children injured in bicycle-related accidents showed that 41 had sustained non-penetrating abdominal trauma (1). Of these, 21 were injured by handlebars, and 10 of these had a life-threatening injury.

2) Small bowel usually lies behind the greater omentum. If rupture occurs, the bowel contents may be contained by the omentum, and the gas will not appear below the diaphragm on erect chest x-ray. Traumatic disruption of the small bowel is often difficult to diagnose, but may be indicated by an Alkaline Phosphatase level of greater than 10iu/L (2).

3) Blood is an isotonic fluid therefore may not produce the signs of peritonitis in up to 40% of patients with significant haemoperitoneum (3).

REFERENCES


lavage fluid as a predictor of hollow visceral injury. J Trauma 1993; 34(6):829-33


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WHAT'S NEW FROM AROUND THE WORLD

PELVIC TRAUMA IMAGING - A BLINDED COMPARISON OF COMPUTED TOMOGRAPHY AND ROENTGENOGRAMS

(Berg E, Chebuhar C, Bell R - Journal of Trauma 1996, Volume 41 Pages 994-998)

The authors undertook a retrospective study to test the hypothesis that the vast majority of diagnosis of pelvic injury can be made correctly using radiographs in the AP projection alone. To determine the sensitivity for detecting pelvic pathology and instability, x-rays and CT scans from 59 patients with pelvic injuries admitted to a Level 1 Trauma Centre, were reviewed blindly by an orthopaedic surgeon. They included normal x-rays and CT scans to decrease observer bias. They found that AP x-rays of the pelvis detected 66% of all pelvic injuries, 78% of those involving the anterior ring and 53% of those involving the posterior ring. The trauma CT scan, using 10mm cuts detected 88% of all pelvic injuries and 78% of those for the anterior ring and 93% of the posterior ring. The sensitivity for detecting pelvic instability from one plain AP film in the Resuscitation Room was 74%. Inlet and outlet views were 75% sensitive. Trauma CT scans were 93% sensitive. When combined the AP pelvic x-ray and trauma CT scans identified 96% of injured structures and were 100% sensitive in determining the injury force and patterns of instability.

They concluded that good quality AP x-rays, in conjunction with a complete trauma CT of the abdomen and pelvis, should identify both the mechanism of injury, fractures and pelvic instability with a high degree of sensitivity.

EARLY FRACTURE FIXATION MAY BE DELETERIOUS AFTER HEAD INJURY

(Jaicks R, Cohn S, Moller B. - Journal of Trauma 1997 Volume 42, Pages 1-6)

The authors undertook a retrospective case review of 33 blunt trauma patients with significant closed head injuries requiring operative fracture fixation for orthopaedic injuries. They hypothesised that early fracture fixation may contribute to secondary brain injury and have a negative impact on neurological outcome.

Patients were studied from January 1991 to April 1995. Neurological negative outcomes were defined as a worsening neurological examination, a worsening head CT scan, a rise in intracranial pressure of >20mmHg, a decrease in the GCS of 2 or >, or seizure activity after the first 24 hours. The early fracture fixation group found they received significantly more fluids in the first 48 hours. (14.00 10.2 vs 8.7 Õ 3.5 litres, p <0.05). The early fracture fixation group found they received significantly more fluids in the first 48 hours. The early fracture fixation group found they received significantly more fluids in the first 48 hours. The early fracture fixation group found they received significantly more fluids in the first 48 hours. (14.00 10.2 vs 8.7 Õ 3.5 litres, p <0.05). The early group trended towards a higher rate of intra-operative hypotension (systolic blood pressure 90mmHg, 16% vs 7%) and intra-operative hypoxia (02 Saturation 90,11% vs 7%). The neurologic complication rate was similar in the two groups (early FF
= 16% vs late FF = 21%), but the average discharge GCS score was lower in the early group (13.5 ± 3.7) when compared with the late FF patient group (15.0 ± 0.0). They concluded that hypoxia, hypertension and risk factors for secondary brain injury may have contributed to the poorer neurological outcome seen after early fracture fixation.

USE OF ABDOMINAL ULTRASONOGRAPHY TO ASSESS PEDIATRIC SPLENIC TRAUMA POTENTIAL PITFALLS IN THE DIAGNOSIS.

Krupnick A, Teitelbaum D, Geiger JD, Strouse PJ, Cox CS, Blane CE and Polley TZ.

Ann Surg 1997;225:408-414

This prospective study of 32 children who sustained blunt injury to abdomen was undertaken between July 1992 and September 1995. All patients had a documented splenic laceration. 12(38%) of the 32 splenic injuries found on CT were missed completely on the initial CT. The study found US to have a low level of sensitivity (62% to 78%) in detecting splenic injury and down-grades the injury in a majority of cases. The authors comment that reliance on free intra-peritoneal fluid may be inaccurate because not all patients with splenic injury have free intra-abdominal fluid. They concluded that ultrasound was not reliable in the initial assessment, management and follow-up of paediatric patients.

Editorial Comment

At Liverpool we have had little experience in US as a diagnostic modality. It is becoming increasingly apparent that different units have a diagnostic modality that suits their institution. We favour CT and we are keen to ensure that the NG tube is pulled back into the oesophagus to ensure the scatter is reduced, that the arms are above the head and that the patient receives IV and PO contrast.

RECOMMENDATIONS FROM THE TRAUMA AUDIT:

Multi system trauma with entrapment.

If it is anticipated that the patient is going to have entrapment at the scene for longer than 30 minutes the Medical retrieval team should be called. This primary retrieval is important to provide additional airway, breathing and circulation back-up. The new helipad at Liverpool will now provide rapid access to the Resuscitation Room and will expedite definitive care.

Radiology of Serious Trauma

Occasionally there is delay in getting CXR, because the cassette is not placed before the patient arrives. It is vital that the team leader is always one to two steps ahead of the team and the patient’s condition. In a patient with chest trauma it is usually preferable to do CXR prior to the C-Spine.

In general, insertion of a chest tube is not indicated prior to CXR except in the case of tension pneumothorax which does not usually occur without alteration in saturation (<94%) or hypotension and initial tachycardia. A bradycardia is an indication of impending arrest secondary to cardiac ischaemia.
Place your CXR cassette before the patient arrives and have your airway doctor and nurse lead gowned along with the rest of the team.

**The patient is "stable".**

In elderly patients this must be one to the most dangerous things to say. Elderly patients are often hypertensive and a blood pressure of 120/80 usually represents hypovolaemia. Failure to recognise this will lead to prolonged hypoperfusion and increased morbidity and mortality. Be very aggressive in your treatment and evaluation of elderly patients as their mortality is significantly greater than the younger population.

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**GENERAL ANNOUNCEMENTS**

**SWAN V TRAUMA SYMPOSIUM**

Already there has been a great interest in SWAN V. The program will deal with neurotrauma, paediatric trauma and controversies and outcomes in trauma care. Please remember to send your registrations early as registration is limited. The program will run over a day and a half.

**REGISTRY UPDATE:**

The two year registry report is available from Erica Caldwell, Data manager in Trauma. If you wish to have a copy of this 80 page document please enclose $15 payable to Department of Surgery.

**TRAUMA EDUCATION:**

In conjunction with the Federal Office of Road Safety and the Council of Remote Australian Nurses Association, we have produced a video on rural trauma education. This is available from Federal Office of Road Safety in Canberra or from us.

**WEB PAGE:** [http://www.med.unsw.edu.au/livtrauma](http://www.med.unsw.edu.au/livtrauma)

You have not lived if you have not visited LIVTRAUMA the mother of all Trauma Sites. Jon Ryan is continually updating it. Your feedback is welcome.

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**LETTERS TO THE EDITOR**

May 22, 1997

Att: Dr Michael Sugrue, Editor, Trauma Grapevine

Dear Michael

The article on traction-splinting of long-bone fractures by John Crozier, featured in your last issue, makes some very pertinent points. The relatively simple manoeuvre of splinting can be very useful in controlling pain, apart from improving the neurovascular
status.

Lack of familiarity with splinting devices is common to staff of many disciplines, as was demonstrated recently when one of our Emergency Dept educators had to assist Dr Crozier himself when he was having difficulty demonstrating a device at a recent trauma review meeting.

As trauma care becomes more complex and structured, and appropriately focuses on minimal resuscitation, there is a tendency for some other clinical skills to be lost. General surgical staff involved in the initial assessment of patients sometimes neglect what is considered to be “orthopaedic territory” in their secondary survey. While it is generally the role of Emergency Dept staff to retain an interest in all the “bits” and coordinate the care, it is important that all the team members consider all aspects of the patient and retain a broad focus.

Anyone who is routinely involved in the management of major trauma should be proficient in splinting, controlling acute blood loss and reducing fractures and dislocations where there is acute neurovascular impairment. If these skills are not acquired in more junior training, they should be routinely taught to all trauma team members.

Yours sincerely,

Sue Ieraci, Director, Emergency Medicine, Liverpool Hospital

RIGHT OF REPLY

Dear Michael,

I thank Dr Ieraci for her letter reinforcing the requirement for all staff involved in Trauma care to be familiar with the principles of fracture splinting, and proficient in the use of traction devices available to them.

As an Early Management of Severe Trauma instructor, I teach frequently on both the Hare traction splint and the Donway splint. These are the two traction devices commonly available in Australia for treatment of lower limb fractures. To ensure optimal teaching before any lesson, the integrity and function of the training device is always checked.

On the occasion which Dr Ieraci cites in her second paragraph, as a teaching aid during an extemporaneous talk on femoral shaft fractures, I had requested prior to my presentation a Donway splint. This was delivered from the Emergency Department of a tertiary referral hospital during the course of my introductory remarks to the audience without the opportunity for me to check its completeness.

The difficulty attaching the splint related to an absence of one of the foot straps and to the mal position of another strap on the foot piece - deficiencies which had not been identified previously.

Recently a multiply traumatised patient managed in the same Emergency Department required a femoral shaft fracture to be stabilized. The Donway splint that was available had faulty pneumatic seals that prevented effective use of the hand pump to generate the necessary extension of the device.

These two examples highlight the requirement for routine checking of the ancillary equipment used in the management of traumatised patients. The same rigour with which
Immediate resuscitation equipment is checked should be applied to the less commonly used ancillary equipment. The time to identify equipment deficiencies or training inadequacies, is before the requirement to use the devices arises, not in the heat of acute resuscitation.

I thank the Editors for the opportunity of reply and again commend Dr Leraci for highlighting the utility of traction devices for improving the vascular and neurological status of limbs compromised by long bone fracture and for relief of pain.

Yours sincerely

John Crozier FRACS, Vascular Surgeon, Lecturer in Surgery, Liverpool Hospital

Editorial Comment

The points raised by the above correspondence are very practical, so to make sure that no-one was pulling our leg I headed off to our resus room with Adam our final year trauma student (surrogate fracture tibia) and called our trauma fellow and trauma coordinator. Dr Janjua was asked to find and apply a Donway splint. This he did in 3min 52secs, with a score of 9.7, losing 0.3 of a mark for putting on the lock prior to pumping. I would suggest this would be a pace setting time!

UPDATE ON LAST MONTH’S CASE OF THE MONTH:

A 37 year old male was involved in a high speed motor vehicle accident on Newbridge Road at 1703 when he hit a tree at high speed. At the scene he was in distress from a breathing and circulation status. This had improved with IV fluids and Oxygen.

To recap in resuscitation room:

Primary Survey:

Airway - intact

Breathing - RR 24/m, decreased air entry left base

Circulation - Pulse 110 / min, SBP130 mmHg

Disability - GCS 15 - patient alert

Secondary survey:

In view of the respiratory distress and reduced air entry it was decided to proceed with stabilisation of breathing prior to secondary survey. A chest x-ray was obtained and simultaneous with the chest x-ray a chest tube was inserted into the left chest using an open technique under local anaesthetic. At the time of insertion of the chest tube the patient’s trachea was deviated to the right and his saturation was 90%. A detailed secondary survey revealed some facial laceration, bruising left chest, tenderness with guarding throughout the abdomen and a clinically fractured left ankle.
What would you do next?

Should the patient be intubated in resus room?

His chest Xray showed a ruptured diaphragm and one has to balance between the potential benefit of positive pressure ventilation in reducing the diaphragmatic hernia versus the potential of anaesthesia to drop his blood pressure.

I would hold off until the patient was transported to the theatre, unless his saturation remained below 90%.

Should the patient have an abdominal CT scan DPL?

The patient has the classical contra-indication for either- There is a definite indication for a laparotomy and this should be the urgent priority (along with airway and breathing monitoring of course).

What are the other potential injuries that this patient may have?

With this high speed mechanism of injury a traumatic rupture of the aortic arch can occur and the patient should proceed to angiography. This is best achieved after laparotomy.

What basic set of x-rays would be most appropriate?

CXR, Cspine lateral (remember this will NOT clear the Cspine) and pelvis

Outcome

The patient had a diaphragmatic injury repaired and a splenorrhaphy. On the morning of surgery an arch aortogram was performed and his rupture diagnosis. He had an interposition graft and is now at home.