TRAVMA
Grapevine

Contents:
- Recidivism in Trauma
- External fixator in trauma; Does it control haemorrhage?
- Follow-up on Case of the Month
- Meetings

Introduction

In this issue we are pleased to have a review of recidivism and the use of external fixators for control of pelvic haemorrhage in haemodynamically unstable patients. The accompanying editorial and article provide an insight into the lack of strong scientific evidence favouring modalities currently used in haemorrhage control in patients with major pelvic trauma. This indicates the need for a broader generation of clinical practice guidelines for the management of complex life threatening pelvic trauma.

Michael Sugrue

Recidivism - Is it a real problem in an Australian Major Trauma Service?

Elizabeth Anne Cross, Scott D’Amours, Michael Sugrue
Trauma Department, Liverpool Hospital

INTRODUCTION

Trauma recidivists are patients who are admitted on more than one occasion following trauma.

Trauma recidivism is a major problem for some patients, our communities. Characteristics of recidivists presenting to a trauma service have been identified. These can vary dependant on the population demographics as can the incidence of recidivism itself.

It has been postulated that the incidence of recidivism can be reduced by appropriate interventions. Previous evaluation of recidivism at a Major Trauma Service has not been undertaken. The aim of this study was to determine the number and characteristics of recidivists using the trauma service at Liverpool Hospital, NSW.

METHODS

Liverpool Hospital serves a population in excess of 750,000 people and is the designated Major Trauma Service for south-west Sydney. This review was undertaken between September 1994 and March 2001. A trauma registry has been in existence for the last 7 years and provides a record of all trauma admissions. The registry has two core data collection categories, major and minor. The Injury Severity Score (ISS) is not recorded for minor injuries and therefore the average ISS could only be calculated for the admissions in the major injury category.

Recidivists were identified from the registry as patients whose medical record number (MRN) appeared more than once. The age, gender and date of presentation were retrieved from the database, as was the mechanism of injury and the ISS (major presentations only).

Mechanisms of injury were classified under road trauma, interpersonal violence, industrial, recreation, falls and others.

The number of recidivists was compared to the total number of admissions recorded in the registry during its existence. The gender and age distribution of recidivists was analysed. The mechanism of injury at the first presentation was compared to that at the subsequent admission.

Results

This study identified 289 patients, with multiple presentation accounting for 600 admissions, who were admitted to Liverpool Hospital because of trauma between the 1st September, 1994 and 30th March, 2001. This represents 2.3% of all trauma admissions. The mean age at presentation was 43 years and ISS was 10.2 ±8.2

Males accounted for 191 of 289 (66%) and 98 (34%) were female. The age distribution is shown in figure 1. The majority of recidivists presented only twice (94%) with 5% and 1% presenting three and four times respectively.

Continued next page
Recidivism - Is it a real problem in Australian Major Trauma Service?

Continued

The mechanism of injury at each admission was the same in 52% of cases (n = 151). The repeat mechanism involved is illustrated in figure 2. Figure 3 illustrates this data with respect to age group.

Discussion

Trauma recidivists at Liverpool Hospital account for 2.3% of trauma admissions. This is comparable to the incidence found in Nevada but lower than the 6.3% cited for a Californian urban trauma centre. It should be noted that these other studies were more selective with their inclusion criteria. Males accounted for two-thirds of the patients in this series.

The vast majority of recidivists presented only twice (94%) with smaller numbers presenting three or four times. These results suggest that multiple recidivism (greater than two presentations) is not a major problem.

In this study there were two age peaks of recidivists, young males and elderly females. This is in agreement with the findings of other studies that suggest young male adults are at higher risk of recidivism. A second peak in incidence occurs in an older population where 28.7% of recidivists were over age 65 and 72.3% of these patients were female. This data is in accordance with another study that found trauma in the elderly was recurrent.

A fall was the most common repeated mechanism of injury, followed by road accidents and then interpersonal violence. The data was analysed in age-specific groups (figure 3). The vast majority (90.4%) of recidivists over 65 years of age presented with the same mechanism of injury and 98.7% of these were repeated falls. Younger recidivists were more likely to present with a different mechanism of injury second time round.

If appropriate education is aimed at high-risk groups, recidivism can be reduced. The high proportion of patients representing with similar mechanisms of injury suggests that there may be a place for post-trauma education in certain high risk groups, like older women, to reduce the incidence of recidivism. This is especially true in patients where initial mechanism of injury is a fall or if the patient is female and over 65. This study supports the need for aggressive management of falls in the elderly.

REFERENCES

The External Fixator in Pelvic Fractures: Does it Control Haemorrhage?

William J Boxwell (Final-year medical student, University of Manchester, UK), Martin Heetvedl
Michael Sugrue Trauma Unit Liverpool

Introduction
The management of patients with pelvic fracture can be extremely challenging and this can be further compounded by the presence of pelvic haemorrhage. The overall mortality of patients with pelvic fractures is 8-16%.10,11 Pelvic haemorrhage is the leading cause of death in up to 54% of patients with pelvic fractures.6

The source of bleeding in patients with pelvic fractures may be from either the venous plexus, arteries and/or bony surfaces. One postmortem angiography study7 reported that 85% of cases showed extravasation of contrast from the hypogastric artery through the bone ends and damaged soft tissues. A report on a series of patients with pelvic fractures who had undergone arteriography8 reported that 62% had a positive arteriogram (i.e. there was damage to one or more arteries, with extravasation of contrast). However autopsy findings in a further9 report suggest that bleeding from the fracture site may be important as of ten patients who died from haemorrhage, 80% bled from the fracture site.

A number of methods have been advocated for controlling pelvic bleeding. External fixation of the pelvis is commonly used. The aim of this review is to examine the evidence base supporting the use of external fixators to arrest or reduce haemorrhage in patients with pelvic fractures.

Methods and Materials
A literature search was performed using the Medline database, covering the years 1966 until October 2001 and the Embase database, covering the years 1980 until 2001. The keywords used were ‘External Fixators’ and ‘Pelvic Bones’ for the Medline database and ‘External Fixators’ and ‘Pelvis’ for the Embase database. This yielded 89 papers. Of these papers, those in a language other than English were excluded leaving 61 papers to be reviewed. Of those, these that clearly had no relevance to the use of external fixators in the management of pelvic fractures and those solely interested in paediatrics were excluded, leaving 45 papers.

The papers were then analysed further. Those that were letters to the editor, single case reports and general reviews were excluded. The websites of the orthopaedic trauma association12 and trauma.org13 contained reviews of the use of external fixators in the acute management of pelvic fractures. This yielded a further two papers, giving a total of 29 papers. The papers remaining were grouped according to the guidelines of the National Health and Medical Research Council (NHMRC)13.

Results

<table>
<thead>
<tr>
<th>Authors</th>
<th>Evidence Level</th>
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<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waikakul S et al, 1999</td>
<td>II</td>
<td>112</td>
<td>Patients with unstable fractures (Tile’s classification) randomized into group I (n=40) who received conventional management and group II (n=72) who received external fixation. There was no significant difference between the groups in terms of pulse, BP, types of fracture and presence of other injuries. Group II had significantly less units of blood transfused (4.9 units, compared to 10.7 units, p=0.0001). There was no significant difference in terms of mortality.</td>
</tr>
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<table>
<thead>
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<tbody>
<tr>
<td>Bassam D et al, 1998</td>
<td>II-2</td>
<td>15</td>
<td>Study looked at patients (haemodynamically unstable or ongoing haemorrhage) with pelvic fractures. They were divided into two groups. Group I (n=7) were those with mainly posterior fractures and had immediate angiography and embolization. Group II (n=8) were those with mainly anterior fractures and had immediate external fixation. Mortality was the same in both groups (1 patient in each) and the number of units of blood transfused similar (2 units in group I, 1.5 units in group II). However none of the patients in group I needed a secondary measure to control haemorrhage whereas 50% of those in group II needed angiographic embolization to control haemorrhage.</td>
</tr>
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<thead>
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<th>Comments</th>
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<tr>
<td>Evers BM 1989</td>
<td>III-3</td>
<td>245</td>
<td>Looked at results of patients with pelvic fractures. Compared results of Pneumatic anti-shock garments (PASG) to immediate external fixation. Patients having external fixation had significantly less blood transfused (8 units, compared to 23 units for the PASG group) but the authors commented that the fixator was used on more stable patients, making the results essentially meaningless.</td>
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<th>Authors</th>
<th>Evidence Level</th>
<th>Patients (n)</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Gylling SF et al, 1985</td>
<td>III-3</td>
<td>66</td>
<td>Patients with pelvic fractures involving major posterior elements and at least two breaks were deemed potentially unstable. These were then divided retrospectively into group I (n=26, clinically unstable pelvis) and group II (n=40, clinically stable pelvis). Group I had immediate external fixation and group II were treated with bed rest. There was no significant difference in terms of mortality and blood transfused between the two groups.</td>
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<th>Evidence Level</th>
<th>Patients (n)</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Hupel TM et al, 1998</td>
<td>III-3</td>
<td>42</td>
<td>Patients with rotationally unstable pelvic fractures were divided into obese (n=10) and non-obese (n=32) categories. The study observed that although there was no significant difference in the injury severity score (ISS), obese patients were significantly more likely to have failure of their external fixator. No data were given on blood transfused or mortality rates.</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Authors</th>
<th>Evidence Level</th>
<th>Patients (n)</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>Latenser BA 1991</td>
<td>III-3</td>
<td>37</td>
<td>Patients were split into group I (n=18, pre-protocol for external fixation) and group II (n=19, post-protocol for external fixation). et al. The ISS was not significantly different between the two groups. Hospital stay and units of blood transfused were reduced, but not significantly so. Mortality was reduced significantly from 16.7% in group I to 0% in group II.</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Authors</th>
<th>Evidence Level</th>
<th>Patients (n)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riemer BL et al, 1993</td>
<td>III-3</td>
<td>605</td>
<td>Examined differences in mortality for patients with pelvic fractures in three time periods: 1981 (prior to inclusion of external fixation in the protocol for the management of pelvic injury), 1982 (transitional phase) and 1983-88 (protocol in use). Average ISS remained constant throughout the time periods analyzed. Mortality dropped significantly from 26% to 6% from 1981 to 1983-88. No data on blood transfusion were given.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Authors</th>
<th>Evidence Level</th>
<th>Patients (n)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arazi M et al, 2000</td>
<td>IV</td>
<td>43</td>
<td>Patients with pelvic fractures (24 type B and 17 type C fractures). Two patients died, giving a mortality rate of 5%. Only The only statement on transfusion requirements was that ‘Excessive blood transfusion was not required in any patient’. ‘Excessive’ was not defined and no data were given on transfusion.</td>
</tr>
<tr>
<td>Authors:</td>
<td>Evidence Level:</td>
<td>Patients (n):</td>
<td>Comments:</td>
</tr>
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<tr>
<td>Brooks P et al, 1992**</td>
<td>IV</td>
<td>44</td>
<td>All patients had ‘complex’ (Tile B or C) fractures. In 20 cases an external fixator was used. No data was given on the efficacy of this treatment modality as compared to the others used in this series.</td>
</tr>
<tr>
<td>Ebraheim NA et al, 1994*</td>
<td>IV</td>
<td>19</td>
<td>All patients had type C posterior pelvic fractures. No data was given on the haemodynamic status of the patient prior to the procedure. Intra-procedural blood loss was estimated as less than 25cc. All fractures were described as healed.</td>
</tr>
<tr>
<td>Hammer RRR et al, 1996*</td>
<td>IV</td>
<td>8</td>
<td>Stage I involved the use of a simple external fixator in a peacetime setting for lower limb and pelvic fractures. The same fixator was used in a war setting in stage II. 6 pelvic fractures were treated in stage I, 2 in stage II. No good data was given on the acute management.</td>
</tr>
<tr>
<td>Lindahl J et al, 1999*</td>
<td>IV</td>
<td>110</td>
<td>A review of patients treated with an external fixator. The external fixator was applied early (mean = 39 mins.). There was malunion in 58%. Mortality was 15%. No data were given on any other aspects of acute management.</td>
</tr>
<tr>
<td>Mears DC et al, 1980**</td>
<td>IV</td>
<td>16</td>
<td>Analysis of patients with pelvic fractures. Mortality rate was 19% (ascribed to pulmonary complications). No data were given on any other aspects of acute management.</td>
</tr>
<tr>
<td>Moreno C et al, 1998*</td>
<td>IV</td>
<td>538</td>
<td>Study looked at the 92 patients who required greater than 6 units of blood transfusing in the first 24 hours in hospital. Patients receiving external fixation (n=19) had a mortality rate of 5%. Overall mortality was 29% in the patients requiring more than 6 units of blood. However, the indications for the use of the various treatments used were not defined.</td>
</tr>
<tr>
<td>Palmer S et al, 1997*</td>
<td>IV</td>
<td>24</td>
<td>Patients admitted under the care of one consultant admitted to the hospital with pelvic fractures treated with an external fixation, 5 patients died (mortality 20.8%). All other patients survived. Complication rate of external fixation was 47%. No data was given on blood transfusion requirements. The data was from a specialist unit and a number of patients received initial management elsewhere before transfer (mean time to transfer was 9 days.)</td>
</tr>
<tr>
<td>Waikukal S et al, 1998**</td>
<td>IV</td>
<td>50</td>
<td>An account of the development of a new device for ensuring accurate pin placement when performing external fixation of pelvic fractures. Initial results from its use in 50 patients. No data were provided on blood loss or mortality.</td>
</tr>
<tr>
<td>Waikukal S et al, 1998*</td>
<td>IV</td>
<td>36</td>
<td>Description of survey used to show that foot length equals inter anterior superior iliac spine distance. This phenomenon was used as a reference for placing external fixators in patients with unstable pelvic fractures. The only comment on these patients was that they had a ‘good result’. External fixation was used as definitive treatment in 19 out of the 36 patients.</td>
</tr>
<tr>
<td>Williams RP et al, 1992*</td>
<td>IV</td>
<td>12</td>
<td>A cadaveric study on a new design of pelvic external fixator. The cadaveric pelvis’s had a Malgaigne fracture inflicted. The study showed that the new design supported greater failure loads than standard equipment. The equipment was then used in 12 patients with a mixture of pelvic fracture types. No data was given on the situation in which the fixator was used or on transfusion requirements. All patients survived.</td>
</tr>
<tr>
<td>Garcia JM et al, 2000**</td>
<td>IV</td>
<td>N/A</td>
<td>A computer model of the pelvis was constructed and used to analyse external and internal fixations. Two variables were measured, diastasis of pubis and vertical displacement. The study concluded that combined anterior and iliac external fixation worked in type B fractures but that external fixation didn’t provide stability in type C fractures.</td>
</tr>
<tr>
<td>Ghanayem AJ et al, 1995**</td>
<td>IV</td>
<td>N/A</td>
<td>The study used CT scanning to assess how the pelvic volume changed in a fracture when external fixation, the pelvic stabiliser and a pelvic C-clamp were used. The study concluded that all three devices significantly reduced pelvic volume but that there was no significant difference between the three devices.</td>
</tr>
<tr>
<td>Ghanayem AJ et al, 1995**</td>
<td>IV</td>
<td>N/A</td>
<td>The study used CT scanning to assess how pelvic volume changed in a cadaver with a pelvic fracture following laparotomy. The study concluded that the volume change was 15% in a non-stabilized injury, against 3% in a stabilized injury.</td>
</tr>
<tr>
<td>Grimm MR et al, 1998**</td>
<td>IV</td>
<td>N/A</td>
<td>Water was pumped into the pelvis to simulate a patient haemorrhaging. The pressures and volumes of water were noted in an intact pelvis, a fractured pelvis and a fractured pelvis with an external fixator in place. The study concluded that external fixation may control venous haemorrhage by the tamponade effect (but only if large volumes of fluid are lost into the retroperitoneum first) and that external fixation has no effect in controlling arterial haemorrhage.</td>
</tr>
<tr>
<td>Kim et al, 1999**</td>
<td>IV</td>
<td>N/A</td>
<td>A Tile B1 fracture was inflicted on 5 cadavers and an external fixator applied. The study then looked at the amount of motion for different pin positions. It concluded that anteroinferior placement was superior to anterosuperior placement in terms of mediolateral displacement. Type C fractures were then simulated and the same experiment carried out, with the same results.</td>
</tr>
<tr>
<td>Moss et al, 1996*</td>
<td>IV</td>
<td>N/A</td>
<td>A model of the bony pelvis was constructed to allow the authors to measure the increase in pelvic volume that occurs with pelvic fractures. The study showed that for every 1cm displacement at the sacroiliac joints there was a 3.1% increase in pelvic volume. The study concluded that the increase in pelvic volume in pelvic fractures was much less than previously thought.</td>
</tr>
<tr>
<td>Norbeen Mh et al, 1993**</td>
<td>IV</td>
<td>N/A</td>
<td>A cadaver study looking at placing external fixator pins between superior and inferior anterior iliac spines rather than on the superior iliac crest. Weight was added until the pin-bone interface failed. It was found that there was no significant difference between the two sites in terms of maximal weight-bearing. The data in this study are more related to stability of the fixation rather than haemorrhage control.</td>
</tr>
<tr>
<td>Rupp RE et al, 1994**</td>
<td>IV</td>
<td>N/A</td>
<td>Cadaver study looking at the best site for pin placement with regard to minimising the complications for external fixation. No useful data regarding whether external fixation actually works in controlling haemorrhage and reducing mortality.</td>
</tr>
<tr>
<td>Simonian PT et al, 1998**</td>
<td>IV</td>
<td>N/A</td>
<td>The study looked at the amount of motion at the pubic rami and at the sacroiliac joints allowed by the Ganz clamp and anterior external fixation. The study concluded that the Ganz clamp allowed more anterior motion and the external fixator more posterior motion but that there was no overall difference in the amount of motion allowed between the two devices.</td>
</tr>
<tr>
<td>Vrahass et al, 1998**</td>
<td>IV</td>
<td>N/A</td>
<td>Cadaver study looking at different techniques for external and internal fixation to find out which method provides the greatest degree of stability. Pelvic cadavers were filled with a non-distensible bag into which fluid could be added. 6 methods of fixation were tested, both internal and external. When the specimen was fixed, fluid was added and pressures recorded. Combined anteroposterior fixation was the most effective method. There were no significant differences between other types of fixation.</td>
</tr>
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</table>

References: see page 15
Discussion
There is a paucity of prospective trials looking at the use of external fixators in the acute management of pelvic fractures. The majority of the data used is retrospective, with the inherent dangers of bias that is present in analyzing data collected in this manner.

Of the prospective studies, the paper by Waukulak et al 13 (level II evidence) gives evidence that suggests that early use of the external fixator is beneficial in reducing the need for blood transfusion but suggests that there is no difference in terms of mortality rates. The other prospective study by Bassam et al 14 (level III-2 evidence) is less promising in terms of recommending the use of external fixation. There was no significant difference in mortality rates or transfusion requirements between the angiography and external fixation groups.

The case series (level IV evidence) 6, give poor quality evidence regarding the use of external fixation. They are mostly a summary of results from a single collection and are not being compared to another group of patients receiving a treatment other than external fixation. This makes it difficult to draw many conclusions from them as the data can only be viewed in isolation.

The final group of papers are those that are cadaver or other non-clinical experiments. These suggest that external pelvic fixation may control any expansion in volume from pelvic fracture.

However, they also suggest that external fixation is no better than any other technique, such as the Ganz clamp. Indeed, the paper by Grimm et al 32 suggests that although external fixation may control pelvic volume, it has no effect on controlling bleeding in the pelvis as the pressure it generates is not sufficient to produce a tamponade effect.

Most of the data found in this literature review is retrospective or in the form of experiments on cadavers. With only two prospective trials present in the literature it is hard to recommend the use of external fixators as a means to control haemorrhage from the data available. It is obvious however that some form of pelvic stabilization is required to avoid bony movement and achieve pain relief.
An evaluation of a new direct information transfer system from pre-hospital to resuscitation room

Chris Bleakley, Ciara Brennan, University of Belfast, Greg Hanson, Ambulance Service NSW, Marj Salter, Emergency Liverpool, Scott D’Amours, Michael Sugrue, Trauma Liverpool.

INTRODUCTION

Trauma systems and guidelines improve outcomes of injured patients. Good communication with the trauma team is vital and it has been shown that the presence and implementation of a specialist trauma team improves patients’ outcomes.1 Direct and appropriate information transfer from pre-hospital caregivers to resuscitation room medical personnel is essential in improving care and reducing errors in trauma care.2

In early 2000, Liverpool Hospital introduced a direct radio link to ambulance officers in the field. In 1997;43(5):831-9. Victoria, Australia. Consultative Committee on Road Traffic Fatalities in Victoria.1

The purpose of this audit was to evaluate the completeness of pre-hospital information provided to the trauma team using the hospital radio system. The hypothesis is that radio transmitted information is complete and worked well in our system.

METHODS

Liverpool Hospital is a 500 bed principal university teaching hospital and the designated Major Trauma Service for the South-Western Sydney Area Health Service, servicing a multi-cultural population of 750,000 people. It receives pre-arrival notification of impending trauma through the ambulance control via a dedicated telephone information transfer system.

A three week prospective audit of radio calls was undertaken of all patients transferred by the ambulance service to Liverpool Hospital who met the Ambulance Service of New South Wales (NSW) Protocol 4 criteria for transfer to a Major Trauma Service between November 8th and November 20th, 2000. Transfer of such patients requires pre-hospital communication between the ambulance officers and the hospital.

When a patient is seen by ambulance service personnel, their clinical condition is rapidly assessed by ambulance officers prior to hospital transfer. If the patient qualifies for bypass to a Major Trauma Service, the ambulance personnel radio the Emergency Department with pertinent information. An emergency department nurse or registrar answers the radio call; the radio used is set to use the New South Wales Government Radio Network (GRN) which is a radio communications network for government agencies covering the most populated areas of NSW.3

For the purpose of this audit, a standard tape recorder was secured near the radio in the Emergency Department resuscitation room and was used to record the radio operators’ conversations. At the start of the conversation the radio operator activated the tape recorder and stopped it when the conversation had been completed. On answering the radio, the radio operator stated the sentence “this call will be recorded” and otherwise standard procedure was followed. Existing ambulance policy requires recording of all communication to the emergency department at ambulance service headquarters. At the end of each day recordings were reviewed and content was scored using a standard marking scheme (Figure 1).

Existing ambulance policy requires recording of all communication to the emergency department at ambulance service headquarters. At the end of each day recordings were reviewed and content was scored using a standard marking scheme (Figure 1).

<table>
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<th>Criteria</th>
<th>Total</th>
<th>Overall</th>
<th>Injuries</th>
<th>Mechanism</th>
<th>Signs</th>
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</table>

**Table 1** Table showing scores achieved for transfer of pre-hospital information

Information transferred was the “MIST” (mechanism, injury, signs and treatment) methods of information transfer.1 An arbitrary scoring system was designed based on clinically perceived importance of each variable.

<table>
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<tr>
<th>Categories</th>
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<td>Signs</td>
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<td>Treatment</td>
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<tr>
<td>Overall</td>
<td>7</td>
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</tr>
</tbody>
</table>

**Figure 1**

REFERENCES


### Case History Reviewed

**52 year old train passenger**

**M -** Hit by train from behind

**I -** Large laceration extending from left lower flank to left buttock

- Pain in lower back and left arm
- Large blood loss observed at the scene

**S -** P 80bpm. BP 100 systolic. GCS 15

**T -** Hard collar, MAST suit, 20mg morphine and 1l Gelofusin

**Primary Survey**

- **A -** Patient maintained. Hard collar in situ
- **B -** Breathing spontaneously. AE L=R. Chest clear
- **C -** P 66bpm. BP 114/73
- **D -** GCS 15. PERL.

**Definitive Surgical Trauma Care Course (DSTC)**

**Liverpool:** 31st July and 1st August, 2002

**Contact:** Michael Sugrue or Charmaine Miranda  
(61 2) 9828 3928

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**Melbourne:** 11th & 12th November, 2002

**Contact:** Peter Danne or Judy Forsyth  
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**Email:** Judy.Forsyth@mh.org.au

**Secondary Survey**

- Pelvic / left iliac fossa tenderness. No blood at urethral meatus.
- Deep laceration of perineum and left buttock extending anterocranially.
- Reduced anal tone.
- Left leg 3cm shorter than right but neurovascularly intact.

The patient was subsequently transferred to Liverpool Hospital. The MAST suit had been removed and a sheet tied around his pelvis

**Subsequently**

He went to laparotomy where he had a defunctioning colostomy and rectal washout. His perineum was debrided and his pelvis was fixed initially externally and then internally. He made a slow recovery after 2 month and 2 perianal reconstructions was discharged. He will be having his colostomy closed in 3 months.

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**References:**


The Premium Gelatin Colloid
PBS General Benefit: 500ml x 3 bottles

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