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TRAUMA Grapevine

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Introduction

Introduction

Over the years we have been faced by many dogmas in trauma care which have been challenged, some remain and some have been discredited. This issue looks at two, one relating to the use of steroids for acute spinal cord injury and the other reviews a recent article from San Diego assessing the role of pre-hospital intubation of patients with a reduced level of consciousness. The performance of prospective studies and the organised approach to practice guideline development are a very positive development in streamlining trauma care. To the forefront of trauma guideline development has been the Eastern Association for Surgery of Trauma who now regularly publish their guidelines in the Journal of Trauma and on their website www.east.org. The Institute of Trauma and Injury Management in New South Wales are currently developing focus groups, looking at a collaborative approach towards practice guidelines. This will be an important advance in the delivery of Australasian Trauma Care.

Pre-hospital and inter-hospital trauma transfers have received much review and critique in the last decade. On the other hand, however, transfer and transport of patients within institutions themselves has received little attention. In this issue we report a brief focussed audit of intra-hospital transfer within a Major Trauma Service. The results are quite surprising and identify the need for us to be vigilant in relation to transfer of patients.

Michael Sugrue

Position Statement:

Methylprednisolone for acute spinal cord injury is not a standard of care; it is only a treatment option

Summary

Confusion persists about the utility of high-dose methylprednisolone infusion for acute spinal cord injury. This treatment was widely adopted following the report of the Second National Acute Spinal Cord Injury Study (NASCIS II) in 1990 and became an implied standard of care.[1] Despite the fact that subsequent clinical studies and critical reviews have challenged the validity of the recommendations that followed the NASCIS studies, failure to administer steroids in acute spinal cord injury has been cited in litigation against physicians.[2-10] A survey of attendees at the First Annual Canadian Spine Society Meeting in Mont Tremblant, Que., on Mar. 23, 2001, revealed that 75% of respondents were using methylprednisolone either "because everyone else does" or out of fear of litigation for failing to do so.

A systematic review of this treatment (see Table 111-18) was conducted at the request of the Canadian Spine Society and the Canadian Neurosurgical Society in order to provide current, evidence-based recommendations about its utility for practising physicians.[19] A committee of neurosurgeons, orthopedic surgeons, and emergency physicians some with a Masters in Clinical Epidemiology reviewed the evidence and concluded the following.

1. There is insufficient evidence to support the use of high-dose methylprednisolone within 8 h following an acute closed spinal cord injury as a treatment **standard** or as a **guideline** for treatment.
2. Methylprednisolone prescribed as a bolus intravenous infusion of 30 mg/kg of body weight over 15 min within 8 h of acute closed spinal cord injury, followed 45 min later by an infusion of 5.4 mg/kg of body weight per hour for 23 h is a treatment **option** for which there is weak clinical evidence (Level II, III).
3. There is insufficient evidence to support extending methylprednisolone infusion beyond 23 h if chosen as a treatment option.[19] These recommendations were then presented to the annual meetings of the two sponsoring societies and adopted.

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An audit of early intrahospital transportation of patients from the resuscitation room by the receiving trauma team

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Introduction:

Following their arrival in the Emergency Department (ED) resuscitation area, transporting critically injured patients within the hospital setting can be fraught with difficulties. Serious trauma represents a burden on the physiological reserves of the individual, and many problems encountered away from the environment of the resuscitation room may result in considerable morbidity and even mortality. Recent audits of critically ill patient transfers involving ICU staff have reported problems and complications in about 60% of transport episodes; many of these could have been avoided with better transfer procedures or equipment[1,2].

Even though the requirements of individual patients will depend on the clinical situation, a guiding principle for all transfers is that neither care of the patient, nor the safety of any person, should be compromised during transportation. The Australian and New Zealand College of Anaesthetists (ANZCA) has published a professional standards document specifically relating to intrahospital transfers[3]. Though these recommendations were written specifically with critically ill patients in mind, many of them apply equally to patients in both serious and non-serious conditions. For example, if delivery of oxygen or fluids is commenced in the resuscitation room, it should continue while the patient is moved; it is not good practice to dispense even with "mundane" treatments for the sake of convenience. All equipment accompanying the patient should be in good working order, with sufficient power reserves for the duration of the transfer. No items should be placed on the patient, since these can cause discomfort and can easily fall, potentially injuring the patient or staff. Unnecessary delays should be avoided. Staff at the destination should be given sufficient handover information. These and other recommendations contained in the ANZCA guidelines constitute good practice whether the patient is in extremis or not, and contribute to smooth, organised, and safe transportation of patients between hospital departments.

Aims:

To evaluate early intrahospital early intrahospital transportation of trauma patients by the receiving trauma team in the light of better practice guidelines set out by the Australia and New Zealand College of Anaesthetists[3].

Methods:

Liverpool Hospital is the designated major trauma service for South West Sydney, serving a population of 800,000, and five other hospitals. Trauma patients are admitted under the care of general surgeons as well as other surgical specialities as appropriate. Over 90% of surgical specialists, and surgical, intensive care, and ED registrars are trained in Early Management of Severe Trauma. Care is initially provided by the multidisciplinary trauma team in the resuscitation room, and patients are subsequently moved to other hospital departments for investigation and treatment as necessary. Transfers from the resuscitation room remain the responsibility of the trauma team until handover to another department. Once they leave the resuscitation area, common destinations for seriously injured patients include operating theatres, the radiology department, or the intensive care unit; often such transfers take place under severe time pressure since often it is impossible to completely stabilise the patient prior to reaching the transfer destination. Many patients whose condition is stable are moved to the acute area of the ED.

A prospective study was undertaken during January 2003 to monitor and evaluate the intrahospital transfer process of trauma patients who were admitted after activation of Liverpool Hospital's acute trauma team response. A transfer was defined as any transportation of a patient undertaken by staff from the resuscitation room to another department or area within Liverpool Hospital. A single transfer was defined as the total period for which the patient was under the care of the resuscitating trauma team or resuscitation room staff but away from the resuscitation room. Therefore, a trip to the computed tomography (CT) scanner and back to the resuscitation room would be counted as a single transfer since responsibility for the patient remains in the hands of the receiving trauma team for the duration of the investigation. By contrast, a transfer from the resuscitation room to the operating theatre via the CT scanner would be defined as finished once the receiving anaesthetist had taken over the care of the patient (in the CT department or theatres).

Data elements recorded included: mechanism of injury; vital signs pre- and post-transfer; destination; time; and duration of transfer. Six aspects of each transfer were assessed, using a form (appendix 1) based on general categories contained in the Australian and New Zealand College of Anaesthetists' guidelines: equipment, staff, pre-departure procedures, patient status and preparation, in-transit procedures, and arrival procedures (for a full copy of these guidelines, see http://www.anzca.edu.au/publications/profdocs/profstandards/ps39_2000.htm). Adverse transportation events such as delays, equipment failure, and departures from better-practice guidelines (as relevant to the clinical condition of the patient) were recorded, whether or not these impacted on the condition of the patient. Adverse patient events, such as airway problems and haemodynamic problems, were also recorded, whether or not these were attributable to any part of the transfer procedure. The action taken by the staff involved with the transfer and the ultimate outcome were noted. Staff were not informed that any transfer was being audited.

Results:

A total of 15 transfers from the resuscitation room were included in this audit. The average age of the patients was 34 years; 13 patients (87%) were male. Seven transfers were to the ED acute area; six transfers were to CT (of which two went on to operating theatres, three went to the acute area of the ED, one returned to the resuscitation area, and one went on to the operating theatre); one was to the operating theatre; and one was to the ICU. Four patients were ventilated, 11 were being administered oxygen (including ventilated patients), ten patients were undergoing intravenous fluid or blood therapy,

Table 1: Injuries (n=19) in 13 patients studied

Diagnosis (confirmed or suspected at start of transfer).	Number of patients
Closed fracture (limb)	1
Open fracture (limb)	1
Fractured rib(s), sternum, or clavicle	2
Facial fracture	1
Pelvic fracture	1
Laceration/penetrating injury – head/face	1
Laceration/penetrating injury - neck	1
Laceration/penetrating injury – limb	5
Penetrating injury – chest	1
Penetrating injury - abdomen	1
Burns	1
Head injury	3

and four patients were undergoing intravenous drug infusions immediately prior to transfer. Six of the transfers were overseen by a doctor from the trauma team (the airway doctor or team leader). A summary of the main diagnoses is shown in table 1 (patients may have more than one diagnosis).

Adverse transportation events (problems with transport equipment, procedures, or personnel).

Adverse transportation events or practices were encountered in 12 out of the 15 transfers; the total number of adverse events was 41. Nine patients encountered two or more adverse transfer events, and five patients encountered three adverse events or more. Three patients encountered no adverse events related to the transfer; these patients were all stable patients being moved from the resuscitation room to the acute area of the ED. No patient's condition appeared to have worsened due to transportation problems. A summary of the adverse transportation events encountered is given in tables 2 – 7.

Equipment

The most common equipment-related problem was lack of portable power supply. Two of four (50%) syringe drivers' batteries failed altogether, while low batteries were a source of concern in two of the four (50%) portable ventilators used. Other problems with equipment were due to miscellaneous malfunctions. 10 out of the 15 patients (67%) had at least one item of equipment placed on them at some stage of the transfer. In three cases, these items included a syringe driver (weighing 3.2 kg).

Fluid and blood infusions

Of the five patients who had fluid or blood infusions running immediately before transport, none received these while in transit. Two had their fluid infusions reinstated while in the CT room; but one of these infusions was set to run at the wrong rate.

Delays during transfer

Three patients experienced delays of more than five minutes during transfer; the longest of these was 20 minutes. All three delays were a result of inadequate communication with the receiving team prior to transfer.

Documentation

Although documentation during transfers was not specifically assessed during this study, it became apparent that notekeeping tends to suffer during transfers.

Table 2: Ventilator-related problems during transfers. (Ventilated patients: n = 4)	
Ventilator alarm malfunction	1 (25%)
Ventilator battery low	2 (50%)
Table 3: Oxygen-related problems. (Patients with oxygen running immediately prior to transfer: n = 11)	
Oxygen not used during transfer	5 (45%)
Oxygen supply low	1 (9%)
Oxygen cylinder malfunction	2 (18%)
Table 4: Fluid or blood transfusion-related problems during transfers (n = 10).	
Fluid not running during transfer	7 (70%)
Fluid running at wrong rate	1 (10%)
Table 5: Intravenous drug infusions during transfers (n = 4).	
Syringe driver battery failed	2 (50%)
Other syringe driver malfunction	2 (50%)
Table 6: Items placed on patients during transfers (% of total number of patients).	
Fluid/blood bags	7 (47%)
Syringe driver	3 (27%)
Belongings	1 (9%)
Notes	1 (9%)
Catheter bag	1 (9%)
Table 7: Miscellaneous adverse events or practices during transfers.	
Drugs or equipment unavailable when needed	1 (9%)
Delays during transfer (>5 mins)	3 (27%)
Inadequate handover to receiving staff	1 (9%)

Other aspects of intrahospital transportation:

Personnel, monitoring and patient assessment during transfer

Use of monitoring equipment was excellent for patients who were treated as critically injured. All patients considered unstable were monitored in accordance with ANZCA guidelines, having ECG lead II, blood pressure, heart rate, and pulse oximetry monitors. All ventilated patients had end-tidal CO--2 monitoring. Staff positioned monitors so that they could be seen at all times. Monitoring problems (such as dislodged pulse oximeters) were quickly recognised and dealt with, except in one case when it was not noticed for some minutes that the blood pressure monitor had failed.

Patients with mechanical ventilators, reduced GCS, and potential haemodynamic instability were reassessed frequently during transfers. In addition these patients were always accompanied by at least one senior member of the trauma team (airway doctor or team leader).

Adverse patient events during transfer

Only one patient in this study experienced a deterioration during the course of the transfer – a sinus bradycardia which was quickly recognised and treated. This was not attributable to any specific transfer problem.

Discussion

While this study was of a limited number of patients over a short period, it demonstrated some of the challenges of intra-hospital transport.

Lovell and colleagues reported complications and problems (defined as events with negative affects on patient stability) in 67% of trauma patients during intrahospital transportation1. We have reported departures from ANZCA guidelines in 80% of intrahospital transfers from the resuscitation room by the receiving trauma team; but by contrast, none of the problems encountered during this short audit appeared to have a detrimental effect on the stability of any patient. Recurrent problems highlighted by this audit included items being placed on patients, cessation of fluid and oxygen therapy during transfers, and equipment problems, particularly relating to power failure. It is not difficult to see the potential for harm (immediate and apparent, or longer-term and unquantifiable) in many of these issues.

In common with Lovell and colleagues, most of the problems we have described relate to equipment, communication, and technical considerations rather than to clinical decision-making, monitoring, or staff expertise.

This study has shown various strong points in Liverpool Hospital's handling of early intrahospital transfers of trauma patients. Strong points include use of monitoring equipment, in-transit assessment of patients, and presence of appropriately-trained personnel. However some basic recurrent problems have been identified which represent potential hazards to trauma patients undergoing intrahospital transfer.

Continued next page

Placing items on patients during transfer

No mishaps occurred involving items placed on patients during this transfer; still, it is bad practice to use patients as tables. Any objects placed on patients are not secure and may cause discomfort or further minor trauma to the patient In particular, placing 3.2 kg syringe drivers on top of patients should be strongly discouraged.

Interruption of oxygen therapy during transfer

Of the 11 patients prescribed oxygen in the resuscitation room, 45% did not receive oxygen therapy during transfer. It is important to distinguish between a clinical decision to discontinue oxygen therapy because it is no longer necessary, and a decision based on convenience during transfer. Equally, since portable oxygen supplies represent a finite resource at any given time, it is important that they are not wasted. A sensible guide (in non-ventilated patients) might be to consider whether the oxygen supply is to be reinstated at the destination, and whether the transfer is likely to take more than a few minutes. Affirmatives to both of these questions make a strong case for continuing oxygen therapy while in transit.

A series of audits in Seattle demonstrated an increase in oxygen usage during non-ICU patient intrahospital transfers from 55% to 100% after a combined approach of sending memoranda to nursing units, posting guidelines for oxygen use on wards, and educational sessions with nursing staff4. Memoranda alone increased the rate of oxygen usage to 80%; therefore we suggest that simple memoranda to the ED nursing unit, combined with signs in the resuscitation area, may increase and guide the use of oxygen during patient transfers.

Fluid therapy during transfer

The universal reason for the cessation of fluid therapy during transfer was positioning of the fluid bag on the trolley (or patient) during transfer. Fluid poles are available for use in transit but were used in only one of the transfers in this study. An algorithm similar to the one we have proposed for the in-transit use of portable oxygen might be a useful decision-making tool regarding fluid therapy. Again, it is important to distinguish between the cessation of unnecessary treatment and decisions based on convenience alone.

Equipment problems

Three out of four (75%) syringe drivers which were used during the transfers either broke down, ran out of power, or both. We recommend in the first instance that a sign should be displayed by the storage shelves, reminding staff to plug syringe drivers into the main power supply to recharge their batteries when not in use.

It may be worthwhile giving responsibility to a particular staff member to check the syringe driver storage shelves at the beginning of each shift.

Two of four (50%) ventilators were used during transfers despite low battery power; and one had a malfunctioning alarm. None of these problems caused any harm to the patients involved, but they highlight the importance of regular checks and servicing of portable life-sustaining equipment.

ANZCA guidelines stress the importance of checking equipment immediately prior to departure. In practice it was extremely difficult for an observer to assess whether this was being done since the intention was to blind the transport team to the audit.

Communication problems and delays

Of the three patients who experienced delays during their transfers, two were destined for the CT scanner and one was destined for the operating theatre. Either the destination was not aware of the time of arrival or the staff at the destination had not been given enough information to receive the patient. These incidents highlight the importance of adequate pre-transfer communication between the transferring and receiving teams; this issue is addressed by the ANZCA guidelines which emphasise the role of pre-departure communication.

Consequences of adverse transfer events and practices

None of the patients in this study appeared to have suffered acute deterioration or because of any problems associated with their intrahospital transport from the resuscitation area. (In fact, one patient probably benefited from the malfunction of his syringe driver while in transit to the operating theatre; the patient's sedation failed to be delivered. He was able to demonstrate an improved Glasgow Coma Score (GCS) than on admission, and escaped having an intracranial pressure monitor inserted.) Larger studies are required to quantify the longer-term adverse consequences of transfer problems such as increased length of stay, disability, and mortality. However this audit has highlighted some recurrent problems encountered during transfers from the resuscitation room, and it is not difficult to see the potential for harm to the patient. In addition, transfer problems can be stressful and demoralising for the personnel involved with the transfer. Regular auditing of patient transfers within the hospital environment (which is, in itself, a recommendation of the ANZCA guidelines) should be carried out after the implementation of the above recommendations.

Developing local intrahospital transfer protocols

Local guidelines have been set down for the intrahospital transfer of trauma patients within Liverpool Hospital5. This study has permitted the Hospital Trauma Committee to develop policy and procedure for key aspects of intrahospital transfer.

Further reading:

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Acknowledgments

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Review of evidence

Because of the controversy surrounding the use of methylprednisolone in acute spine cord injury, a systematic review of this treatment was conducted at the request of the Canadian Spine Society and the Canadian Neurosurgical Society in order to provide current, evidence-based recommendations about its utility for practising physicians. A committee of neurosurgeons, orthopedic surgeons and emergency physicians (Appendix 1) critically reviewed the available literature and assigned levels of evidence based upon established criteria.

The committee identified serious methodological deficiencies in the NASCIS II and NASCIS III studies as well as Otani and colleagues' study.[12] The committee also concluded that the apparent a priori intent of the original NASCIS protocol to conduct the post hoc analyses that led to the recommendations for methylprednisolone within 8 h of acute spinal cord injury could not be substantiated.[19] Otani and colleagues' study, which reported improved neurological outcome as a consequence of high-dose methylprednisolone administered within 8 h of acute spinal cord injury, is the only clinical study that attempted to replicate the under-8-hour subgroup of patients in the NASCIS II study. Unfortunately, Ortani and colleagues' subjects were not properly randomized, and the investigators were not blinded to the treatments.[12] Furthermore, the recommendations from the subsequent Cochrane review of this treatment (which was written by the principal author of the NASCIS studies) were based on the questionable post hoc analyses described above and on Otani and colleagues' study, which was not properly randomized and blinded.[11]

Patients with acute spinal cord injuries are a desperate group for whom any neurological recovery can have a major impact on their subsequent functional independence. A return of antigravity strength to even a single muscle at or immediately below a zone of injury is particularly significant to a tetraplegic patient, while a return of a flicker of movement to several muscles below a zone of injury is of little functional value unless antigravity strength can be attained.[20] There may be some utility for methylprednisolone in tetraplegics and in incomplete conus injuries, but only if the results from the post hoc analyses of the NASCIS II study and Otani and colleagues' study can be substantiated in future randomized, blinded trials.

A treatment such as high-dose methylprednisolone infusion should only be considered if its potential benefit outweighs the risk of associated complications. In well-designed studies, high-dose methylprednisolone therapy has not caused a statistically significant increase in major complications. However, the trend to a higher incidence of sepsis and hyperglycemia cannot be ignored in the absence of Level I evidence of benefit for this treatment.[21-24]

Physicians should not feel intimidated into prescribing high-dose methylprednisolone for acute spinal cord injuries. The utility of high-dose methylprednisolone infusion within 8 h following acute spinal cord injury has not been adequately tested.

The Trauma Grapevine would like to thank Dr Dan Cass of St Michael's Hospital Toronto and the Canadian Spine Society and Neurosurgical Society for permission to reproduce their article.

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What's New in Trauma

Effect of Paramedic Rapid Sequence Intubation on Outcome in Patients with Severe Traumatic Brain Injury

Daniel P. Davis, and Colleagues J Trauma:2003; 54(3): 444-453San Diego

Their study evaluated the effect of paramedic rapid sequence intubation (RSI) on outcome in patients with severe traumatic brain injury.

Adult major trauma victims were prospectively enrolled over two years using the following inclusion criteria: Glasgow Coma Scale (GCS) 3-8, suspected head injury by mechanism or physical examination, transport time > 10 minutes and inability to intubate without RSI. Midazolam and succinylcholine were administered before laryngoscopy; rocuronium was given after tube placement was confirmed using physical examination, capnometry, syringe aspiration, and pulse oximetry. The Combitube was used as a salvage airway device. For each study patient there was a match to three nonintubated historical controls from the San Diego trauma registry using the following parameters: age, sex, mechanism of injury, trauma center, and AIS score for each body system. Controls were excluded for Head/Neck AIS defined by a c-spine injury or death in the field or in the resuscitation suite within 30 minutes of arrival. É'2, odds ratios, and logistic regression were used to investigate the impact of RSI on the primary outcome measures of mortality and incidence of a "good outcome," defined as discharge to home, rehabilitation, psychiatric facility, jail, or signing out against medical advice.

They studied 209 trial patients and 627 controls. The groups were similar with regard to all matching parameters, admission vital signs, frequency of specific head injury diagnoses, and incidence of invasive procedures. Mortality was significantly increased in the trial cohort versus controls for all patients (33.0% versus 24.2%, $p < 0.05$) and in those with Head/Neck AIS scores of 3 or greater (41.1% versus 30.3%, $p < 0.05$). The incidence of a "good outcome" was lower in the trial cohort versus controls (45.5% versus 57.9%, $p < 0.01$). Factors that may have contributed to the increase in mortality include transient hypoxia, inadvertent hyperventilation, and longer scene times associated with the RSI procedure.

Paramedic RSI protocols to facilitate intubation of head-injured patients were associated with an increase in mortality and decrease in good outcomes versus matched historical controls

Comments by Zsolt Balogh

David Sloane Trauma Fellow Liverpool

Excellent paper from San Diego with very meticulous study design of 209 trial patients who had prehospital rapid sequence intubation (RSI) compared to 627 hand-selected historical controls who had no intubation. The authors emphasized the need to prevent any bias, which could originate from the inequity between the trial and control patients. They matched age, gender, mechanism, trauma center and AIS score for each body region. Surprisingly the mortality significantly increased in the trial cohort versus the controls (33% versus 24%) especially among those where the head and neck AIS was greater than 3 (41% versus 30%). The incidence of good outcome (discharge to home, jail etc…) was significantly lower in the trial cohort (45% versus 58%). The methodology dissolves any scepticism, which can be raised in a thorough reader: the groups had the same blood pressure, blood alcohol level and intracranial injury pattern. The RSI patients spent more time on the scene (23 versus 16 minutes), had higher pO2 values (315 versus 216 mmHg) and lower pCO2 values (35 versus 38 mmHg) and were more frequently inadvertently hyperventilated (15% versus 8%). If the author's results can be validated in other trauma service regions it will have a profound effect on the present standard of care.

External Fixation or Arteriogram in Bleeding Pelvic Fracture: Initial Therapy Guided by Markers of Arterial Haemorrhage

Preston R. Miller et al J Trauma:2003; 54(3):437-443
Department of General Surgery, Wake Forest University, North Carolina

Bleeding pelvic fractures carry mortality as high as 60%, yet controversy remains over optimal initial management. Some clinicians base initial intervention on fracture pattern, with immediate external fixation (EX FIX) in amenable fractures aimed at controlling venous bleeding. However ongoing hemodynamic instability indicates arterial bleeding, and some prefer early angiography before EX-FIX. Miller and colleagues evaluated markers of arterial bleeding in patients with bleeding pelvic fractures, thus identifying patients requiring early angiography regardless of fracture pattern. They undertook a retrospective review of pelvis fracture patients from a Level I trauma center registry over a 7-year period. From this group, two subsets were analyzed: those with initial hypotension related to pelvic fracture, and those without hypotension who underwent pelvic angiography. Data included hemodynamics, response to resuscitation, presence of contrast blush on CT, fracture treatment and outcome. Adequate response to initial resuscitation (R) was defined as a sustained (>2 hours) improvement of systolic blood pressure to >90 mm Hg systolic after the administration of _2 units packed red blood cells. Those with repeated episodes of hypotension despite resuscitation were classified as non-responders (NR) . From 1/94-1/01, 1171 patients were admitted with pelvic ring fracture. Thirty-five (0.3%) had hypotension attributable to pelvis fracture. 28 fell into the NR group, and 26 of these underwent angiography. Nineteen (73%) showed arterial bleeding while 3 resuscitation response patients underwent angiography with none demonstrating bleeding ($p = 0.03$). Sensitivity and specificity of inadequate response to initial resuscitation for predicting the presence of arterial bleeding on angiography were 100% and 30% respectively while negative and positive predictive value were 100% and 73%. In patients with fractures amenable to external fixation (n = 16), 44% had arterial bleeding on angiography, and all were in the NR group. An additional 17 patients without hypotension also underwent angiography. Contrast blush on admission CT was seen in 4, 3 of which had arterial bleeding seen on angiography (75%). Sensitivity and specificity for contrast blush in predicting bleeding on angiography were 60% and 92% with positive and negative predictive value being 75% and 85%. In patients with hypotension and pelvic fracture, therapy selection based on initial response to resuscitation in bleeding pelvic fractures yields a 73% positive angiography rate in NR patients. Delay in angiography for EX FIX in patients with amenable fractures would have delayed embolization in the face of ongoing arterial bleeding in 44% of patients. In stable patients with pelvic fracture, contrast blush also indicates a high likelihood of arterial injury and angiography is indicated. Not surprisingly Miller and colleagues recommended that optimal therapy in the face of bleeding pelvic fractures requires early determination of the presence of arterial bleeding so that angiography can be rapidly obtained, and response to initial resuscitation as well as the presence of contrast blush aid in this decision.

Comments by Zsolt Balogh

David Sloane Trauma Fellow Liverpool

This 7-year retrospective study from North Carolina, found that 0.3% of pelvic fractures present with haemodynamic instability attributable to pelvic fractures. The major message of the paper is that 80% of the patients with haemodynamic instability attributable to pelvic fractures did not respond to initial resuscitation 76% of them had positive pelvic angiography compared to those who responded to resuscitation of whom none had positive angiography. After other sources were excluded, the non-responding status of haemodynamic instability has 100% sensitivity and 30% specificity in predicting arterial bleeding. The presence of contrast blush on the CT scan has 60% sensitivity and 92% specificity in predicting arterial bleeding. Based on this study the need and the place of the pelvic fracture fixation cannot be judged. A retrospective review when every orthopaedic procedure is collected under the term of "EX-FIX" is not suitable to answer the question in the title. I think the present status of acute management of haemodynamically unstable pelvic fractures are better described by angiogram AND orthopaedic stabilisation together. The real question is the timing, the sequencing and the choice of the right minimally invasive anterior and posterior pelvic stabilisation method (not necessarily simply EX-FIX). This study is very important since gives us the incidence of the haemodynamic instability and arterial bleeding attributable to pelvic fractures. It clearly points out the priority of the arterial bleeding control, which should be presumed from the haemodynamic instability and more importantly from the unresponsiveness to the resuscitation. The contrast blush visible on the CT scan can be highly accurate to predict arterial bleeding but is dangerous in patients with marginal response to resuscitation.

LETTER TO THE EDITOR

Tension Pneumothorax-old baloney ?

Dear Editor,
I enjoyed the recent edition (Volume 3, No. 6) of the Trauma Grapevine. In it you discussed the role of laparoscopy in diaphragmatic injury. I make the oft-repeated comment "remember there is a risk of tension pneumothorax from abdominal gas insufflation and ideally a chest tube should be inserted before gas insufflation is undertaken." To put it bluntly, I think this is a lot of old baloney. The sierra 2 is going in at a very controlled pressure (ideally no greater than 12 millimetres); this pressure is well tolerated and completely controlled. If, and it is difficult to imagine how this could happen, by some circumstance, the patient became embarrassed by the presence of gas in the chest, it is a simple matter to cease the inflow; the CO2 will be reabsorbed within minutes.

It is not only a theoretical issue. During the conduct of elective laparoscopic Nissen fundoplications, a pneumothorax is not that infrequent and, for reasons that I have outlined, completely benign.

I guess to be scientific, some animal work should really be done. An idea for the future?

Kind regards,
Robert Linacre FRACS
General Surgeon Hobart

Table 1: Probability of tension pneumothorax developing during laparoscopy in patients with diaphragmatic injury: summary of the literature.

Paper	*Level of evidence*	*Incidence of tension pneumothorax*	*Recommendations*
Zantut et al. (1997)[5]	*III-3*	*4/84 (4.8%)*	*Chest drain not necessary*
Fabian et al. (1993)[1]	*III-3*	*1/24 (4%)*	*Close monitoring and awareness*
Ivatury et al. (1992)[6]	*III-3*	*1/17 (5.8%)*	*Close monitoring and awareness*
Sosa et al (1995)[7]	*III-3*	*0/13 (0%)*	*Use of open Hasson technique to induce pneumoperitoneum – allows visualisation of the diaphragm under low pressure*

Dear Dr Linacre,
Thank you for your letter querying the insertion of chest drains in penetrating trauma to the thoracoabdominal region.
Penetrating trauma to the thoracoabdominal region (bounded by nipples, scapulae tips and the costal margin) has a high risk of diaphragmatic injury. Previous studies have shown this risk to be between 11 and 20%[1,2]. During diagnostic laparoscopy, gas insufflation of the abdomen can result in a tension pneumothorax as a result of carbon dioxide gas passing across the lacerations in the diaphragm. This situation can be life threatening if not rapidly recognized and treated appropriately. It is for this reason that it was previously suggested that a chest drain be inserted prior to the initiation of laparoscopy[3,4]. As a result of the questions raised in your letter, a literature review was undertaken to assess the value of pre-laparoscopic chest tube placement in trauma patients. Specifically, patients who had proven diaphragmatic injury (found during laparoscopy) were studied with respect to the incidence of tension pneumothorax during gas insufflation, and any adverse outcomes that resulted from this complication were noted.
There are four key human clinical trials that have been completed on the subject, as summarised in table 1. They report a mean incidence of tension pneumothorax of 3.65% (range 0 – 5.8%) in a collective cohort of 138 patients with diaphragmatic injury. In all cases the tension pneumothoraces were successfully reversed with a chest tube, and there were no subsequent complications.
Given that chest tubes themselves have a complication rate of 6% (when performed by a surgeon)[8], it would therefore be prudent to concur with the evidence at hand. With an awareness of the possibility of a tension pneumothorax forming, and very close monitoring of the patient at all times during laparoscopy, any adverse outcomes should be averted. If a tension pneumothorax does form, a chest drain should be placed without delay.
In conclusion, from the evidence found, it is not necessary for chest drains to be placed pre-laparoscopy, however awareness of the risk should be high.

Annette Roberts
Michael Sugrue

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Meetings

Definitive Surgical Trauma Care Course (DSTC)
Liverpool: 30st and 31st July 2003
Contact: Michael Sugrue or Charmaine Miranda (61 2) 9828 3928
Email:
charmaine.miranda@swsahs.nsw.gov.au

For the Melbourne Course: August and November
Contact: Peter Danne or Judy Forsyth (61 3) 9342 7232
Email: Judy.Forsyth.org.au

Remember if you are not a member of Australasian Trauma Society - you could be!
Contact: (08) 8222 4408 phone
(08) 8222 4970 fax
Email: bmitchel@mail.rah.sa.gov.au
http://www.atsoc.com.au
ATS Scientific Meeting Adelaide 23 and 24th October 2003. Contact Louise Pittney confact@confernceaction.com.au

SWAN 11
SWAN 11 will be held on the 1st and 2nd of August, 2003, bringing to you a nine of world leaders in trauma care from overseas. Registration is limited, so get in early!
Contact: Thelma Allen
Email:
thelma.allen@swsahs.nsw.gov.au
Phone: (61 2) 9828 3927
http://www.swsahs.nsw.gov.au/livtrauma

World Congress on Abdominal Compartment Syndrome
December 6-8th
Noosa Queensland 2004
Contact: Michael Sugrue or Charmaine Miranda (61 2) 9828 3928
Email:
charmaine.miranda@swsahs.nsw.gov.au

The winner of the 2002 Trauma Christmas Pelvic Quiz was Major Jo Ollerton.

BACKCHAT

We welcome Major Jo Ollerton as Honorary Trauma Fellow, currently with the British Military, who will spend a year at Liverpool Hospital.
Also we are joined by Joan Lynch as Better Practice Guideline Manager and her secretarial support, Sandra Berkhout.
Two previous Honorary Fellows who have worked at Liverpool Hospital are now engaging in military medicine in the Middle East, Dr Robert Russell and Professor Tim Hodgetts.

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Liverpool Hospital
Elizabeth Street, Liverpool
Att: Dr Sugrue

At the main entrance of Liverpool Hospital (corner of Elizabeth and Golbourn Sts), you will see a pair of plastic clear doors on your right -
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• you will see a sign for Radiology
• Turn RIGHT here, then turn LEFT
• Straight ahead you will see FIRE DOORS - walk through and you're there.
Thelma will sign for the delivery.