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TRAUMA Grapevine

Contents:

Introduction

It has been a frantic time for us all in trauma at Liverpool. I am glad to report that we still have the same complement of staff, despite all the hard work with SWAN, the Public Forum and the Royal Australasian College of Surgeon's Annual Scientific section on Trauma. I would like to thank all who helped to make the meetings so memorable. SWAN in conjunction with the Armed Forces Health Service and the Ambulance Service of NSW had 300 registrants, and 75% rated the meeting as the best they had ever attended. Apologies to those we had to turn away. Our special thanks to our International Faculty Ken Boffard, Ian Civil, Tim Hodgetts, Jorie Klein, Rhondda Paice and Don Trunkey who made such a marvellous contribution to the meeting.

It is amazing to see the interest in trauma education - there is an unquenchable desire to learn more about the care of the injured patient. All these meetings have highlighted that a multidisciplinary approach to trauma is alive and well. The concept of a specific speciality owning trauma is somewhat alien, certainly in Sydney.

Our web site will undergo further updates with the addition of E mail discussion groups and new cases weekly. Our honary fellow from Shanghai Dr Luke Lu will be adding to the Trauma Radiology Library and new MCQs will be generated monthly.
If you wish to submit MCQ questions on trauma, they will be stored and accessed using your E mail address.

The twelfth issue of the Grapevine deals with topical areas of trauma care, focusing on inter-hospital trauma transfers and management of the patient with a fractured pelvis. We have worked hard for many years to try and expedite our inter-hospital transfers and Nadia Nocera our Regional Trauma Co-ordinator, reports on the efficacy of our system. Pelvic fractures are a common clinical challenge in trauma and Dr Ian Harris discusses their management.

If you wish to contribute to the Grapevine please write to me.

Michael Sugrue
Director Trauma Services

Emergency Management of Pelvic Fractures

Dr Ian Harris
Specialist Orthopaedic Surgeon Liverpool Hospital

INTRODUCTION

Pelvic ring disruptions in non-osteoporotic patients are usually the result of a major crush or deceleration event and indicate significant energy transfer. For this reason, there is a high incidence of associated vascular, urogenital, neurologic injury and most of these patients will have extremity fractures. Blood loss remains the leading cause of death in pelvic injuries and most patients with high energy pelvic injuries present with hypovolaemia. 20% of these patients will have haemodynamic instability directly related to blood loss from the pelvic injury. These patients have an increased incidence of respiratory distress syndrome, multi-organ failure and sepsis. The hypovolaemia also aggravates head injuries and lung and visceral injuries.

Early identification of trauma patients with unstable pelvic ring disruptions and haemodynamic instability is important to prevent the mortality and morbidity associated with this condition.

Continued next page

Emergency Management of Pelvic Fractures

Continued

The Nature Of Blood Loss In Pelvic Ring Disruptions

In order to effectively treat this problem, however, we need to first identify the cause of the blood loss associated with pelvic ring disruptions. Cadaver studies, along with surgical and angiography studies, have shown us that the major source of bleeding in pelvic ring disruptions is venous, or from the cancellous bone of the fractures surfaces. The incidence of significant arterial bleeding in these patients is probably less than 20%.

Much has been made of the change in pelvic volume with pelvic fractures. There is evidence from laboratory studies that closing an "open-book" fracture causes a significant decrease in the volume of the pelvis, but the tamponade effect of closing the pelvis in an open-book injury has been questioned, as bleeding from pelvic fractures causes a retro-peritoneal haematoma which is not confined to the pelvis. This haematoma enlarges the retro-peritoneal space along the posterior abdominal wall. There is anecdotal evidence that the peritoneal cavity provides a tamponade effect as a laparotomy can frequently "decompress" a retro-peritoneal haematoma.

Blood loss and mortality from pelvic injuries are related to the degree of instability. It is more likely that ongoing bleeding from pelvic fractures is due to the degree of disruption of pelvic vessels, and poor haemostasis from continued movement in an unstable fracture, than to volume changes in the pelvis.

The stability of a pelvic ring disruption is related to the type of lesion and to the degree of displacement of the pelvis. As a guide, disruptions with a posterior lesion and more than 5 mm displacement are considered unstable.

Given the prognostic significance of the stability of the pelvic ring disruption, much of the recent clinical research in this area has been directed at the effect of early stabilisation of the pelvic ring.

Treatment Options

Recent studies have found that early external fixation of pelvic ring disruptions in haemodynamically unstable patients decreases mortality, blood loss and hospital stay. This probably has a dual effect: the initial reduction and stabilisation helps promote haemostasis and probably, to some degree, has a tamponade effect, while the early application of an external fixator also allows early mobilisation of the patient to the head up position thereby improving respiratory function.

The type of initial fixation used for an unstable pelvic fracture depends on the availability of the appropriate equipment and the ability and expertise of the orthopaedic team and the trauma centre. The alternatives range in degrees of simplicity and effectiveness from a vacuum bean bag or a sheet wrapped around the patient's pelvis, to a large C clamp or a full external fixator.

The MAST suit has also been used for initial management of unstable patients with pelvic ring disruptions and has been effective in controlling blood pressure in these patients. However, it does have many drawbacks such as poor access and visualisation of the pelvis and lower extremities, ischaemia of the lower extremities, and an increase in intra-abdominal pressure and is therefore contraindicated in patients with diaphragmatic rupture.

Other measures which have been used to control hypovolaemia in these patients include surgery for ligation of ruptured vessels and angiography for embolisation of active bleeding sites. Surgery has the disadvantage of decreasing any tamponade effect and usually does not result in location of active bleeding sites. Prophylactic ligation of the internal iliac artery is usually ineffective as most bleeding is venous in origin and, in any case, the collateral circulation may ensure continued bleeding of arterial injuries.

Angiography also has the drawback of being unable to control venous bleeding, and is dependent on the proximity and expertise of angiography services.

Management Protocols

Many algorithms have been constructed to guide the management of the haemodynamically unstable patient with a pelvic ring disruption. These can be quite complex and difficult to apply in an emergent situation. The management of these patients should follow the basic principles of managing any trauma patient with hypovolaemia, which is fluid resuscitation, and identification and control of ongoing bleeding. If the patient remains unstable despite adequate initial resuscitation, significant blood loss has probably occurred. This can only occur in one or more, of five sites;

Chest
Intra-peritoneal
Retro-peritoneal
External
Long Bones

These bleeding sources should be investigated and treated systematically. Significant intra-thoracic haemorrhage is usually seen on chest x-ray and can be initially managed with a chest tube. External bleeding should be seen on external examination of the patient and can usually be controlled with local pressure. A tourniquet, or surgical intervention, may sometimes be required. Intra-peritoneal haemorrhage is more difficult to diagnose and, if suspected, requires a CT scan and/or peritoneal lavage.

If the above three causes of bleeding have been excluded or treated and the patient remains haemodynamically unstable, urgent fixation of the pelvic ring should be performed. I believe an external fixator should be applied as this provides the most stable fixation and, also, can be kept as definitive treatment. In a well equipped unit, as the pins are inserted percutaneously, this procedure can be performed in the receiving area. If this service is not available, the patient can either be transferred to theatre for application of the external fixator or a C clamp can be applied in the Emergency Department. If a fixator is not available, some degree of tamponade and stability may be provided by a MAST suit, a vacuum bean bag, or a sheet around the patient's pelvis.

In some circumstances, internal fixation can be performed acutely, for example, a disruption of the pubic symphysis may be plated through an existing laparotomy wound in less time than it would take to apply an external fixator.

If the patient remains unstable after fixation of the pelvic ring, consideration should be given to therapeutic angiography. If the patient remains unstable and angiography has been performed, or is not considered feasible, surgery may be an option. This, however, should only be performed by experienced surgeons in an appropriate unit.

It has been shown that the early fixation of unstable pelvic ring disruptions positively

All the referring doctors have been from the Emergency Departments. The system has been well received with 90% of referring doctors satisfied and 10% dissatisfied.
The response to the hotline call was immediate in 25 cases, and delayed in 1. The referring doctor had no further phone calls to make in 19/27 cases, and in the other 7 instances a total of 16 further calls were made. A breakdown of these further calls is shown in Table 2. In terms of incoming calls only once was there multiple incoming calls from Liverpool. The level of satisfaction was exceptional in 17/26, satisfied in 5/26 and dissatisfied in 2/26.

Table 2

Breakdown of further calls made from referring hospitals

1. - 5 further calls after initial contact to the Hotline.
Called the physician on call at the referral hospital at Liverpool's request,
called Liverpool a total of three times re: transport issue/update on deterioration of patient/further consultation.

2. - 2 calls made after Hotline contact - one to referring hospital's Surgeon at the request of the Liverpool ICU Reg, and a second call to Liverpool.

3. - 2 calls made at the ICU Regs request - one to Careflight, and another to Liverpool.

4. - 3 calls at Liverpool's request - one to referring hospital's Surgical Reg and Radiologist, and again to Liverpool.

5. - 1 call requested by Liverpool with results of ECHO for this patient.

6. - 2 calls requested by Liverpool - one to the referring hospital's Surgeon, and another to Liverpool

7. - 1 call requested by Liverpool for the ED Reg to be notified by the referring doctor re: possible urgent angiogram.

Some issues were raised during the study period

LENGTH OF TIME FOR ICU REGISTRAR TO ANSWER CALL

This has been addressed by having a message on the Registrar's page actually stating the incoming call is from the Hotline, not just any call from switch. This has greatly improved response time.

SWITCHBOARD OPERATORS ANSWERING HOTLINE

This has been raised as a concern by several referring medical officers. The perception being that the Hotline would be answered by the ICU Reg. For obvious reasons it is answered by switch immediately, then the call is put through to the ICU Reg. As more medical officers are using the Hotline, and explanation is given re: answering the phone during the survey stage, this comment is less frequently encountered. One doctor actually rang the hospital number and received a recorded message stating his call has been placed in a queue and will be answered shortly. Clearly, he had not called the Hotline directly.

PATIENTS TRANSFERRED WITH NO HARDCOLLAR

In all cases where there is suspicion of any C-spine injury, and the injury has not been definitively cleared by a radiologist, the patient should arrive at Liverpool Hospital with a hard collar in situ. To reinforce this all hospitals have a CHECKLIST.

RINGING ED REG IN FIRST INSTANCE

The purpose of the Hotline is to advise the ICU Reg of any patient who may potentially or absolutely require an ICU or HDU bed. In the instances where the ED Reg has been contacted in the first instance the referring doctors have been correctly redirected to use the Hotline.

CONCLUSIONS

In conclusion, the Hotline has been well received by both referring and receiving hospitals, and according to the monitoring system continues to improve. On behalf of the Trauma Department I would like to thank those of you who have used the system and thereby streamlining the transfer of your patients. I would also like to thank those of you who have used the system for your time in the survey and your comments.

NADIA NOCERA

(02) 9828 3000 page 48552
(02) 9828 3038 / (02) 9828 3928

Backchat

We wish Dr Janjua and his family well. He will be leaving the Trauma Fellow position after 2 years and moving to Perth. We will be joined by a Surgeon from Holland Dr Karel Kolkman.

Interhospital Trauma Transfer and a Trauma Hotline System - Does it work?

A prospective study of 98283666.

Nadia Nocera
Regional Trauma Co-ordinator South Western Sydney Area Health Service

Introduction

The nature of the Trauma Hotline is to facilitate a one-call inter-hospital transfer for patients who require transfer to a Major Trauma Service (Liverpool in SWSAHS). It is for patients who might need HDU or ICU admission following injury. It is not meant for isolated injuries (eg finger injuries) which can be arranged directly with the specialty registrar. If there is any possibility that the patient may end up in ICU / HDU, the referring hospital is encouraged NOT to ring the specialty registrar in the first instance, rather ring the Hotline which will transfer you to the ICU registrar.

Current Modus Operandum

A call should be placed to the ICU Registrar via the Hotline as soon as possible after the patient has arrived, preferably within 20 minutes. This should allow the staff enough time to perform a primary and secondary survey. The sooner the ICU Registrar is notified, the sooner necessary procedures for the transfer can be commenced. In the event of the resuscitation overwhelming the resources, the referring hospitals are encouraged to adopt a code red approach-recognising that initial minimal information is followed by more detailed information once the primary survey has been stabilsed.

Checklist Inter-Hospital Trauma Transfer

This checklist offers guidelines to all Medical Officers using the Hotline call system. It is important to recognise these forms aim to guide staff, and do not prescribe treatment and care. It is the staff at the hospital with the patient who know their available resources, and will conduct care accordingly.

Liverpool Hospital will accept all seriously injured trauma patients whether there is a bed or not, except:

SPINAL INJURIES WITH CORD LESIONS

BURNS

Patients with these injuries need to go to specialised units. As for paediatric trauma - we will accept major paediatric trauma for stabilisation, we will then transfer the child to a specialised paediatric unit ourselves as needed and according to age.

Aims

The Hotline system is continually monitored to ensure that a smooth inter-hospital transfer system can function in SWSAHS. All calls are assessed, the efficacy of the one-call system for inter-hospital transfer is reviewed. All issues/concerns raised by any party are addressed.

Methods of Monitoring

The system is monitored by way of telephone interview/questionnaire. Both the referring doctor and receiving doctor are contacted and asked about the transfer. It is during this time that any concerns/issues/comments are raised. This information is tabled, and any problems are fully investigated.

Results

From September 1997 to January 1998 there were 26 calls to the Trauma Hotline - 3 of those calls recognised as having been incorrectly placed: ie Burns patient; post cardiac arrest needing ICU bed; and meningococcal meningitis requiring assessment. There have been 6 transfers which have been recognised as transfers meeting Hotline criteria, but for various reasons, the transfer of those patients did not go through that channel:

Total Hotline Call	26
Incorrect activation of Hotline	3
Incorrect non-activation	6

The frequency of use of the Hotline from September 1997 - January 1998 is as follows:

Bankstown	1
Bowral	5
Camden	6
Campelltown	11
Fairfield	3

The category of injuries that have been transferred are shown in Table 1 . Some categories had more than one patient.

Table 1

Fall leading to SDH	Flexion injury to neck
Fall with head injury	Crush injury pelvis
Fall with multiple fractures	Crush injury to limb from cow
Fall with spinal fracture	Facial injuries from chain saw
Sporting injuries with C-spine #	Stabbings to back
MVA with C-spine fractures	Assault with skull fractures
MVA with multiple trauma	MBA with spinal fractures
MVA with CHI	MBA with crushed leg
MVA with acute abdomen	MBA with CHI

affects the outcome of the patient, regardless of whether they were haemodynamically stable on presentation. In Australia, this is not routinely performed but, I believe, should be considered.

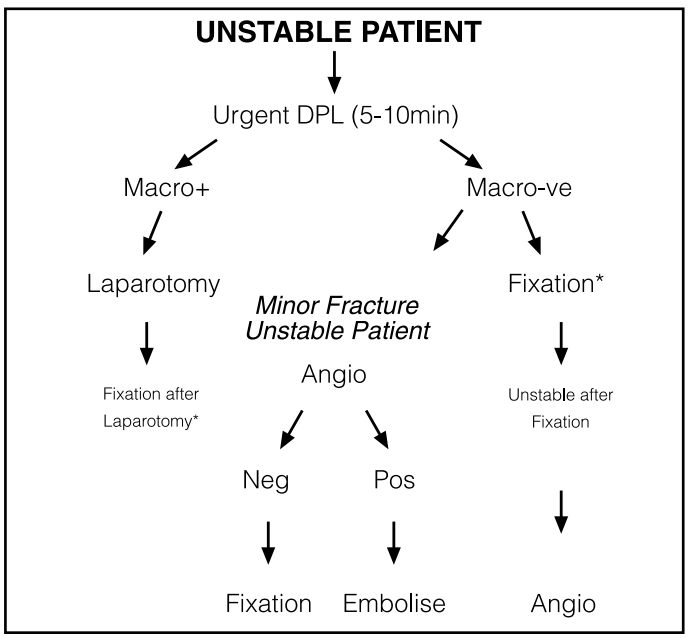
Summary

The management of the trauma patient with an unstable pelvic ring disruption should follow the principles of resuscitation of any trauma patient. Ongoing blood loss from an external source or into the chest or abdomen should be excluded or treated. Probably all patients with unstable pelvic ring disruptions and, certainly those who are haemodynamically unstable, should have stabilization of the pelvis in the acute setting. Those that remain unstable may be considered for angiography and/or surgery.

Dr Ian Harris Specialist Orthopaedic Surgeon Liverpool Hospital

COMMENT

From a general surgical viewpoint in view of Ian Harris's article the following is a good practical approach.



** Fixation is urgently required with an open book pelvis and also with a vertically unstable pelvis with displacement*

The general surgeon needs to determine early if there is significant intra-peritoneal bleeding and this can be achieved by a DPL in the first 10 minutes of the resuscitation. The approach should be umbilical and the return should be frankly positive with frank blood before a laparotomy is undertaken. It should be remembered that most patient with pelvic fractures are haemodynamically stable and require minimal intervention. Approximately 1-3% of patients with pelvic fractures will require angiographic embolisation. Some centres may prefer embolisation to external fixation to control massive haemorrhage. In general we would use arteriography where fixation has failed or in that smaller subgroup where there is little displacement of the fracture, where fixation is not practical. The reported success of embolization is 85-100%. However this is not my personal experience. The most important point to remember is that if you are going to angio the patient, do it early as after 3 hours post injury the mortality increases by a factor of 6 to almost 70%. (1). The expected yield from arteriography is around 50%, higher as the instability increases(2). Remember don't send your patient to angiography until you are sure there is no free intra-peritoneal blood.

In a stable patient imaging of the pelvis is a priority. In the unstable patient imaging may result in death of the patient.

The unstable patient with a pelvic fracture remains a challenge. Coordination between the general surgeon, orthopaedic surgeon and radiologist is vital. The most important rule in the management of unstable patient's with pelvic fractures is, early recognition of the need for fixation or arteriography.

Michael Sugrue (editor)

References:
(1) Arterial embolizatoin is a rapid and effective technique for controlling pelvic fracture haemorrhage Agolin S F et al J Trauma 1997:43:395-399
(2) Pelvic fracture haemorrhage: priorities in management Surg Annu 1995:27:107 Evers BM et al

MEETINGS

Trauma Education Evening

with cheese and wine will take place on July 23rd at the Education Centre in Liverpool Hospital from 4.00pm to 22.30 pm and the evening has again been sponsored by Photosphere. Admission is free and open to all to attend.

SWAN 7

SWAN 7 will be held on August 6th and 7th 1999 at Liverpool. It will be an exciting meeting focusing on Best Practice in Trauma Care. Confirmed International speakers so far are Dr Bill Schwab who heads the Philadelphia Trauma Unit and Dr Margaret Knudson who is a Trauma Surgeon from San Franscico General. Registration forms will be available in July of this year.

Controversies in Civilian and Military Trauma

Controversies in Civilian and Military Trauma 15-16 May 1999 in Brisbane Contact 07 33955743 for further information

EMST and ATS Trauma Meeting

EMST in Conjunction with the Australasian Trauma Society will hold a three day meeting in August 27-30 at the Gold Coast Contact 61 2 94397477

Australian Association of Emergency Nurses

Inaugural National Conference Australian Association of Emergency Nurses August 24-26th Brisbane Contact 07 32407557

Case of the Month

A 51 year old male was the driver of a car.

Pre-Hospital Information

Mechanism	(M)	Driver of car
Injury	(I)	Head, Chest, Limbs
Signs	(S)	P120, BP 140, RR 28, GCS 11
Treatment	(T)	Oxygen, C Collar, Haemaccel 500mls, Splint R Leg

Pre Hospital Scene Time 14 min

Resus Room

Primary Survey and Early Management

Airway	-	Intact
Breathing	-	Good SaO2 99%,
Circulation	-	Pulse 110 per minute rising to 140/m BP 140 systolic falling to 70 over first five minutes
Disability	-	GCS 12

Treatment Analgesia Morphine 5mg IV. Standard 3 series X-rays were done with fractured ribs 5-7 on the right. C Spine and Pelvic X-rays were normal.

Over a period of 20 minutes 3L of Haemaccel and 3 units of blood were given to maintain the blood pressure at 120mmHg. Whilst there was a fractured right femur there was no obvious haematoma and no external bleeding.

As there was no obvious thoracic bleeding it was assumed that the patient was bleeding into the abdomen.

Secondary Survey

This was undertaken mainly to assess potential sites of bleeding. There was a deep frontal laceration, tenderness in the right upper quadrant, a compound tibial fracture and a fractured femur with no external blood loss.

The priority at this stage was DPL, followed by head CT. In view of increasing agitation the patient was intubated.

A DPL was performed which was red stained but considered macroscopically negative by the surgeon. It was sent for laboratory analysis and the RBC count was 0.099 x 102, which along with WCC and enzymes was negative.

In CT he again became hypotensive. A decision was made for urgent laparotomy in spite of the borderline negative DPL. At laparotomy there was some blood in the peritoneal cavity, approximately 50 mls and some haematoma around the short gastric vessels. No therapeutic invention was required and there was no retroperitoneal haematoma.
The long bone fractures were fixed. At all times during surgery oxygenation was easily maintained, but circulation remained a challenge with large fluid volumes required.

On arrival in ICU the patient required 60% O2 with an increasing acidosis pH 7.03 and BE-20 requiring adrenaline 5ml/hr to maintain BP. There was a decreased urinary output with a K of 6.3.
A review of the ECG revealed sinus tachycardia and low voltage. In view of the persistent acidosis and large fluid requirement a cardiac tamponade was considered.

At 24 hours the patient was intubated on 50% O2. Inotrohic support was required to maintain a BP 120-150mmHg systolic.
The patient began to swell and the patients CVP was 35 cm H2o

The fluids administered were as follows:

ED	4L total	3 L Haemaccel and 3 units of blood
OT	11L total	2.5L Haemaccel 8.5L of crystalloid/colloid
ICU	8.5L total	3L Haemaccel 1.5 Albumin 6 Units of FFP

Total fluid intake in 20 hours 23.5 L. The patient x-ray is shown in Figure 1.

A transthoracic echo undertaken at 02.00 showed a small pericardial effusion, good left ventricular and right ventricular function and no signs of tamponade.

Where do you go from here? The patient has been commenced on dialysis along with frusemide and bicarbonate infusion. If you wish to enter an interactive case discussion you may do so on our web site (www.swsahs.nsw.gov.au/livtrauma). The outcome for our driver will be delivered next month.

Figure 1.

Recommendations from the *Trauma Audit*

Here are a brief synopsis of some of the issues raised in last month's trauma audit meetings.

Penetrating gunshot wounds to leg
The initial assessment of patients with penetrating limb injuries from gunshot is vital. Clinical examination should assess the pulses, the colour, neurological function (once you are happy with the ABCD of course!). Clear documentation should occur of the entry and exit wounds or the lack of exit wounds. The entry and exit wounds should be clearly marked on the skin with a radioopaque marker prior to Xray.

Issue for discussion
When should an angiography be undertaken in a gunshot wound to the limb?

In general an angiography is undertaken to assess vessel injury and we need to assess the potential of bullet embolization in shotgun injuries. In the first instance there should be no delay in patients with compromised circulation of the limb and patients with absent pulses. These compromised patients in general should not proceed to the radiology department for angiography unless the service can be offered in under fifteen minutes from arrival by experienced radiologists. The reason for this is that angiography can take one to two hours resulting in prolongation of the warm ischaemia time of the limb.

It is essential that the patient be transported to the theatre for exploration of the relevant area with proximal control if necessary and undergo on-table angiography. This can be undertaken using image intensification or conventional plain x-ray and standard contrast.

Conclusion Never delay with an ischaemic leg. It should be in your operating theatre within 30 minutes of arrival in your hospital.

Issue for discussion
When should fasciotomy be undertaken. Fasciotomy in general should be undertaken once it's thought about. Delays in fasciotomy can result in loss of limb function and tissue necrosis.

Investigation of potential small bowel injury
In general terms at Liverpool Hospital diagnostic peritoneal lavage is the preferred investigation in patients with potential small bowel injury. In general patients with safety belt marks who on examination have tenderness only over the area of the marks rather than throughout the abdomen can be observed. In stable patient it may be helpful to leave the DPL for 30 minutes or so as it may increase your sensitivity. Remember always send the DPL effluent for WCC, alkaline phosphatase (n<20iu), amylase (n<20iu) as positive results are specific for small bowel injury.

The radiology of the trauma patient

Issue for discussion When and what do you x-ray in the initial assessment of the trauma patient?

As part of the primary survey in general, all seriously injured trauma patients require a lateral C spine, supine chest (erect if fully conscious) and pelvic x-ray. This should be done in a sequence determined by the team leader often a chest x-ray as to a preferred initial x-ray followed by the cervical spine and pelvis. It is unacceptable to send a patient to the CT Scanner for cervical CT without having done a plain lateral cervical x-ray.

Investigation of an unconscious patient in terms of potential abdominal trauma

Issue for discussion When do you evaluate the abdomen?

While patients may be haemodynamically stable with isolated head injuries unless there is an absolutely clear history such as baseball bat injury to the head, abdominal evaluation should be considered. This can either be DPL or CT scanning. In stable ventilated patients the abdominal assessment in general should be done after the head CT.

LETTER TO THE EDITOR

Dear Michael,
Congratulations on another useful and interesting edition. I was pleased to see the discussion about analgesia in head trauma - it is time to discard the concept of IM analgesia in major trauma. Titrated IV narcotics are effective and safe in this setting.
However, I felt the short commentary on airway burns and bronchoscopy required a couple of points of clarification.
Firstly, there is a need to distinguish airway thermal burns from smoke inhalation (without heat), which presents a problem of carbon monoxide poisoning rather than airway inflammation. Inhalation of toxic gases is another pathological entity again, which may involve upper airway corrosion or lower small airway inflammation/oedema, depending on the particle size and degree of exposure. While carbon monoxide poisoning is an immediate problem, lower airway inflammation can develop gradually. It is important to distinguish whether or not thermal injury is co-existent (from history and clinical signs).
I would also question the opening statement that "Severe inhalational injuries can remain completely asymptomatic for between 24 and 72 hours...". Does the quoted reference contain specific examples of this? In my experience, this type of delay of any symptoms in severe inhalational injuries is extremely unlikely. Severe inhalational injuries are generally evident by the time the patient arrives in the Emergency Department. For less severe injuries, symptoms may gradually develop over a number of hours, often with a greater lag in Xray changes. If a patient were completely asymptomatic for 24 hours, one would question whether an inhalational injury had actually occurred, and whether any further close vigilance or bronchoscopy would be warranted in an asymptomatic patient.
Certainly, the point about being alert for the possibility of inhalational injury and the early use of bronchoscopy is well and appropriately made.

Sue Ieraci, FACEM, Director Emergency Medicine, Liverpool Hospital

Reply,
I would agree with Sue Ieraci that if the inhalational injury is severe, you will see signs and symptoms of it on arrival in Emergency. We had a patient recently though, who was known to have airway oedema secondary to fire, who was intubated and ventilated and developed ARDS on day 3 from a previously unsuspected inhalational injury.

Dr Gill Bishop Director ICU