

TRAUMA SURGERY

**TR001
EVOLUTION OR REVOLUTION?: TRAINING AND FUTURES IN
TRAUMA SURGERY: ORTHOPAEDIC ABILITY**

T. KOSSMANN

Alfred Hospital, Melbourne, Victoria, Australia

Trauma care emerges as one of the biggest challenges of health care delivery in all societies worldwide. Industrialisation, highly mobile populations and increasing leisure activities will continue to contribute to the growing numbers of trauma victims. The World Health Organisation predicts that trauma will be the third highest health burden of mankind diseases by the year 2010.

Trauma registries have shown that about 80% of all injuries in trauma patients need orthopaedic care. In Australia training for trauma orthopaedics is part of the AOA accredited program however only in very few centres trauma is the major focus in the clinical day to day work.

Almost 6 years ago the Alfred hospital, one of two adult major trauma centres in the Victorian State Trauma System, recognised the deficiencies in the trauma orthopaedic set up and appointed the first orthopaedic focussed director of its newly founded trauma department. In the last 6 years the Department of Trauma Surgery has treated 13 000 inpatients with 4200 of these being major trauma patients. The high trauma volume at The Alfred hospital provides excellent training opportunities.

Despite the fact that orthopaedic injuries are the main workload in trauma patients, it must be kept in mind that trauma patients need numerous surgical and non surgical specialities in their treatment course. A multidisciplinary team approach is therefore mandatory, and orthopaedic surgeons must have an understanding of the complex issues in treating trauma patients.

**TR002
TRAINING REQUIREMENTS FOR A MILITARY SURGEON**

P. C. MYERS

Lake Macquarie Private Hospital, Sydney, New South Wales, Australia

Military surgery requires advanced skills in trauma surgery covering all anatomical areas and surgical disciplines. Often there are very limited investigational facilities.

Increasingly, military surgeons are also involved in humanitarian deployments where 'surgery' includes tropical diseases, and emergency obstetrics and paediatric surgery.

Most current training programmes do not adequately provide trainees with the skills to fulfill these requirements.

How might we address these issues?

**TR003
PRIORITISING THE BLAST INJURED PATIENT: PENETRATING,
BLUNT AND BURN INJURIES-WHAT GOES FIRST?**

J. V. ROSENFELD

Alfred Hospital, Melbourne, Victoria, Australia

Bomb blast victims have combinations of penetrating, blunt and burn injuries. The more severely injured patients often arrive with hypotension, active haemorrhage, multiple extremity injuries, torso trauma, respiratory compromise, hypothermia, acidosis and traumatic brain injury. The 'ABCs' must be performed rapidly. Uncontrolled haemorrhage is a major cause of mortality in these patients. Tourniquets are useful for large extremity wounds with brisk haemorrhage. Whilst resuscitation and triage proceed on the multiple patients, priorities need to be determined for radiology, and theatre based on trauma surgeon triage and resources available. The injuries of the individual patient then need to be prioritised based on the urgency and predicted duration of the surgery and how this will affect overall theatre availability. Patients with head and neck trauma should have a CT prior to surgery if possible. Damage control surgery is an essential strategy for all specialities. The most urgent surgery is to stop haemorrhage, and to perform fasciotomy.

There should be a low threshold for tracheostomy. Simultaneous surgery by multiple teams of surgeons is preferable when there are multiple life threatening injuries eg simultaneous craniotomy, laparotomy and vascular/orthopaedic limb repair. Vascular shunts are a valuable limb saving technique until vascular repair can be accomplished. Multiple returns to theatre will be required and must also be accommodated. It is possible with good planning and a prepared hospital staff to restore order from the chaos of bomb blast mass casualties.

**TR004
INITIAL EXPERIENCE WITH SPLENIC ARTERY
EMBOLIZATION AS AN ADJUNCT TO THE NONOPERATIVE
MANAGEMENT OF BLUNT SPLENIC TRAUMA**

**A. J. CHAMBERS, S. M. LYON, C. ATKIN, J. D. WINNETT AND
T. K. KOSSMANN**

Alfred Hospital, Melbourne, Victoria, Australia

Background Angiographic embolization of the splenic artery has been employed in the setting of splenic injury from blunt trauma to reduce the requirement for laparotomy and splenectomy and improve the likelihood of successful non-operative management. Splenic artery embolization has been performed on selected patients with blunt splenic injuries at The Alfred hospital since 2004. The outcomes of patients undergoing splenic artery embolization at this institution were reviewed.

Methods The medical records of patients presenting with splenic injury following blunt trauma who underwent splenic artery embolization were reviewed retrospectively. Details of the outcome after embolization, failure of non-operative management requiring splenectomy and any complications and deaths occurring were recorded.

Results During the first 18 months after introduction of the technique of splenic artery embolization 104 patients were admitted to The Alfred Hospital with blunt splenic injuries. Fourteen patients underwent splenic artery embolization, two of whom failed non-operative management and required splenectomy (14% of total). There were no complications related to the angiographic procedure. Two deaths occurred from complications unrelated to the splenic injury.

Conclusions Splenic artery embolization is a safe and useful adjunct to the non-operative management of blunt splenic injury in selected patients. Careful monitoring post-procedure is required in the event of splenic haemorrhage requiring operative intervention.

**TR005
A PROSPECTIVE REVIEW OF TRAUMA RADIOLOGY
REPORTING AT A MAJOR TRAUMA CENTRE**

**R. S. YOUNG, K. SMITH, E. CALDWELL, M. SUGRUE, G. SCHLAPHOFF AND
R. CRACKNELL**

University of Leeds Medical School, Leeds, West Yorkshire, United Kingdom

Rapid radiology reporting is crucial to optimising trauma patient care and reducing missed injuries. This prospective study reviewed reporting at a major trauma centre to establish the pattern and timeliness of trauma radiology reporting.

Between 22nd August and 5th September 2005 consecutive patients meeting trauma team activation criteria undergoing radiological investigations within 24 hours of admission had their radiology reports analysed at standardised times. The availability and timeliness, nature (verbal or written), author (registrar or consultant), status (provisional or final) and the time to final reporting were recorded.

51 patients (31 males), mean age 35 years (range 1–77) were studied. 21 (41.2%) patients had a full trauma series of plain radiographs (chest, pelvis and lateral cervical spine x-rays), with 45 (88.2%) undergoing at least one of the series. 27 (52.9%) patients underwent CT investigations. Within the first 24 hours of admission of patients undergoing a trauma series plain x-ray, verbal or written radiologist reports were available for 15 (29%) patients. In total 34 CT investigations were performed, of which 27 (79.4%) had a verbal and 17 (50%) a written radiologists report available within 24 hours.

On average it took 2 days to receive a verbal report and 3.3 days for a written report on a trauma series radiograph. To receive a final verbal or written consultant report it took 2.8 and 4.0 days respectively.

This study identified significant delays to trauma radiology reporting and the opportunity to increase early consultant reporting and improve the standard of trauma patient care.

TR006 WHY DO PATIENTS DEVELOP EMPYEMA POST THORACIC TRAUMA?

P. R. BURTON

Alfred Hospital, Melbourne, Victoria, Australia

Background Empyema post chest trauma is a morbid condition requiring operative intervention (decortication). If 'high risk' groups can be identified earlier intervention may reduce morbidity.

Objective To determine what factors predict the development of empyema in patients who have sustained chest trauma. It is hypothesised that patients who have multiple or complicated instrumentations of the pleural cavity are at increased risk.

Methods All patients who underwent operative decortication in the past 24 months were reviewed. Data was collected on demographics, intercostal catheter (ICC) insertion, pre-hospital chest decompression and associated injuries. A matched group of patients who had (ICC) s inserted for chest trauma were used as controls.

Results Fourteen patients had decortications for post traumatic empyemas. Two of three pneumocaths and one ICC were placed within the lung. Five other patients had multiple 'attempts' at ICC insertion. Only two patients had a single uncomplicated ICC inserted initially.

The two groups were well matched in terms of demographics (mean age 39 versus 40, years $P = 0.85$, injury severity score (36.4 versus 35.2, $P = 0.83$), chest, abdominal and multisystem injury. The empyema group had significantly longer hospital stay (18 versus 28 days, $P < 0.05$)

The control group had less initial ICCs inserted (1.4 versus 2.3, $P < 0.03$). Only one patient had a complicated ICC insertion, and 2 uncomplicated pneumocaths were placed.

Conclusion Patients with complex chest injuries in whom difficulties in initial chest drainage are encountered are at increased risk of developing a post traumatic empyema and have a prolonged hospital stay.

TR007 MANAGING HIGH IMPACT FALLS – A THREE-YEAR SINGLE CENTRE EXPERIENCE

A. V. APPASAMY

Tan Tock Seng Hospital, Singapore, Singapore

Purpose To study injury patterns in patients from high impact falls (>2 m) with an Injury Severity Score (ISS) of ≥ 15 and describe our experience in their management.

Methodology This is a retrospective analysis of our trauma database for a three-year period 2003–05. The incidence and distribution of injuries with an Abbreviated Injury Score (AIS) of ≥ 3 , need for surgery and outcome were analysed.

Results A total of 221 high impact fall patients were admitted during the study period. Of these, 132 had ISS ≥ 15 and a total of 605 injuries with AIS of ≥ 3 . Injuries in descending frequencies were head injuries (27%), long bone fractures (23%), thoracic injuries (19%), spinal injuries (11%), pelvis fractures (9%), abdominal injuries (7%) and others (5%). Twenty eight (21%) of them died in the Emergency Department. Of the remaining 104, 87 (83%) patients underwent surgical intervention and 56 (64%) of them survived. Overall mortality was 48%. Average number of severe injuries among those who died was 5.2 and 3.8 among the survivors. Transfer to operating theatre within thirty minutes for continued resuscitation and surgical management was a key factor in keeping the mortality rate below 50%. Commonest surgical procedures carried out were cranial decompression, external fixation of long bone fractures, in-theatre pelvic embolization and damage-control laprotomy. Operations for facial fractures were deferred to a later stage.

Conclusions Patients with high impact falls have multi-regional high grade potentially life threatening injuries. Managing these patients is challenging and requires urgent and coordinated multi-disciplinary approach.

TR008 VIRTUAL DEMONSTRATION TO LEARN CRITICAL MANEUVERS IN TRAUMA PATIENT

F. S. COLLET E SILVA, N. D. MORI, R. S. POGGETTI, C. L. WEN, G. BOHM AND D. BIROLINI

Emergency Surgery – Hospital das Clinicas, Sao Paulo, Brazil

In order to teach students how to acquire knowledge on basic procedures of reanimation of traumatized patients, pre-course was developed to facilitate learning about these maneuvers.

Demonstration of procedures by means of audiovisual methods has been shown to be an efficient and preparatory teaching method for the execution of these procedures using animals for training before their use in patients; because some medical themes and/or surgical procedures are better understood when previously visualized.

The use of videos facilitates the understanding of some medical procedures, demonstrations in patients, cadavers and 3D animation. Videos make it possible for the student to see the procedure while it is being carried out, observing all technical steps. Thus, also the demonstration of errors and complications, without risks, is made possible.

First video, the laryngeal stridor of a patient with airway obstruction may be heard; in the following the respiratory effort can be seen. By means of a 3D animation of a cricothyroid membrane puncture is shown, followed by the surgical steps of a cricothyroidotomy.

Second video, a patient hit by a car, with thoracic depression, subcutaneous emphysema, absence of right vesicular sound, jugular stasis and 80% O₂ saturation. Thoracic drainage is indicated. By means of animation observe all the steps of chest drainage. The thoracic drain is introduced and the path of the drain in the thoracic cavity is observed by 3D animation. Observe the oscillatory movement of the thoracic flask due to respiration.

The student after finishing the module should invited to formal course.

TR009 DOES EARLY COMPUTERISED TOMOGRAPHY EXCLUDE FRACTURE IN 'CLINICAL SCAPHOID FRACTURE'?

A. VO AND J. CRUICKSHANK

Wangaratta Hospital, Wangaratta, Victoria, Australia

Purpose The diagnosis of fractured scaphoid remains notoriously difficult to make because initial plain radiographs of the carpus may not always identify a fracture. As a result of the uncertainty and to reduce the risk of complications such as avascular necrosis, it is well-accepted policy to over-treat these patients in a scaphoid plaster followed by repeat radiological examination at a later date. The present study examines whether an early CT excludes scaphoid fracture and provides a relatively cheap and accessible alternative to the gold standard MRI. This would hopefully safeguard patients against unnecessarily rigid follow-up and protracted plaster immobilisation.

Methodology A prospective observational study was performed on Emergency Department patients presenting to Ballarat Hospital Victoria from October 2004 to September 2005 and fulfilling the inclusion criteria. This includes those with a suspected clinical scaphoid fracture based on mechanism of scaphoid trauma and anatomical snuffbox tenderness, but with normal initial plain radiographs. A CT was performed within 48 hours with the results blinded until the patient was re-evaluated after 10 days of standard plaster immobilisation.

Results 7 of 35 (20%) occult scaphoid fractures were identified by early CT, which also demonstrated a very high negative predictive value of 96.4% for ruling out a scaphoid fracture.

Conclusion The strategy of early computerised tomography can exclude fracture in a patient with a suspected clinical scaphoid fracture at a lower cost than other diagnostic modalities. It should be considered an alternative to the conservative approach of unnecessary plaster immobilisation and 2-week review.

TR010 PENETRATING NECK TRAUMA SAFETY SELECTIVE SURGICAL EXPLORATION

F. TEIXEIRA, L. R. ARAUJO, A. C. ANTUNES, F. S. COLLET E SILVA,
R. S. POGGETTI AND D. BIROLINI

Emergency Surgery – Hospital das Clinicas, Sao Paulo, Brazil

Selective management of Penetrating Neck Trauma (PNT) has been considered standard of care with minimal risks to safety of the patient. In this study, the role of clinical examination and selective diagnostic tests were assessed reviewing our last 5-year experience. A comparison of results between two groups (mandatory surgical exploration versus selective surgical exploration) was made to check safety of selective management according rates of morbidity and mortality.

A retrospective analysis from January 1998 to June 2002 at the Emergency Department of the Hospital das Clinicas-USP was performed consulting charts of trauma registry and 161 Penetrating Neck Trauma victims were identified; 81.6% were stabbed and 18.4% were shot. Stratifying wound entrance by zones was: 32.8% in zone I, 44.1% in zone II and 23.1% in zone III.

Results Of 161 patients, 31 (19.2%) were submitted to immediate surgical exploration with a mean hospital stay of 6 days, a complication rate of 12.9% and a mortality rate of 9.4%. Of 130 patients admitted to selective surgical exploration 34 (26.1%) required operative procedures. Mean hospital stay for selective surgical exploration group was 2 days with a complication rate of 17.6% and was related associate injuries in others bodies segments. Mortality rate was 0%.

Comparing the mortality and complication rates of two groups no statistical significance was observed.

Conclusion Selective surgical exploration is a safe way to manage penetrating neck trauma victims maintaining a policy of careful physical examination and rational indication of diagnostic tests in accordance of the penetrated cervical zone.

TR011 SAFETY IN ACUTE SURGICAL CARE – ROOM FOR IMPROVEMENT?

M. SUGRUE

Liverpool Hospital, Liverpool, New South Wales, Australia

To optimize the delivery of acute surgical care understanding of current care delivery of is essential.

This study evaluated the delivery of care of emergency and trauma surgical admission at a University Hospital.

A prospective study was undertaken between September 2005 and January 2006 of the first 24 hours care of all adults admitted under a single surgeon. Care was compared to current evidence based practice. The team consisted of rotating registrars with an overnight in house specialist. Time of admission, underlying diagnosis, specialty and seniority of attending doctors was noted. Errors in care were categorized into their location, type of error and potential impact.

77 consecutive patients were studied, mean age was 34.8 (range 17–82), Trauma accounted for 33/77, upper GI 25, lower GI 17 and others in 3. 90 errors occurred in 52/77 patients mean 1.6 ± 0.9 , occurring in Emergency in 67/90, Ward 16, Operating room in 2 and others in 5. The specialty associated with error generation was general surgery in 70/90, emergency in 8/90, radiology in 5/90 and other specialties in 7/90. Delay in treatment accounted for 39/90 errors, error in judgment 20/90, error in diagnosis in 11/90, and others in 20/90. 10 errors had no impact, 61 minimal impact, 12 moderate impact and 7 major impact. Specialist involvement corrected 88/90 errors in the first 24 hours.

This study identified that errors in acute surgical care are common and can be mitigated by an in-house specialist surgeon. Strategies to improve safety are needed.

TR012 FUNCTIONAL OUTCOMES FOLLOWING SURGERY FOR DISRUPTIONS OF THE PELVIC RING

I. FREDMAN, J. BALAKUMAR, R. PRICE, M. ESSER AND M. FOGARTY

Alfred Hospital, Melbourne, Victoria, Australia

Disruptions of the pelvic ring occur via high energy trauma and can cause enduring disability. To reduce this, some surgeons have advocated early definitive surgery for managing pelvic injuries. As there are no published reports from Australia on functional outcomes following surgery for unstable pelvic fractures we assessed the experience at a major trauma hospital in Melbourne.

All patients with pelvic ring disruptions treated at The Alfred between 05/1997 and 05/2001 were identified. Indications for surgical stabilisation were Tile B or C unstable ring disruptions; displaced fractures involving the ilium, sacroiliac joint and combinations thereof; pubic symphysis diastasis >2.5 cm; secondary fixation following earlier external fixateur; and multiply injured patients with displaced pelvic ring disruptions. Functional outcomes were assessed with the Iowa Pelvic Score.

Results 34 patients with mean ISS of 28.68 (10–54) were assessed at average follow-up of 28 months. Most patients (29) were young males, with motor vehicle and motorbike accidents the predominant (21) mechanisms of injury. All patients reported IPS functional outcome scores >70 (good), with mean of 79.8 (70–98). Six patients reported excellent scores. All except 2 patients returned to regular work.

Conclusion Pelvic ring disruptions have previously been reported to cause significant long-term functional impairment. However, everyone in this series achieved good to excellent function. Appropriate stabilisation and timely internal fixation allowed these patients early rehabilitation and the majority returned to work. Internal fixation may facilitate better functional outcomes than was previously expected in these patients.

TR013 ANAESTHETIC NIGHTMARE

R. K. KERRIDGE

John Hunter Hospital, Newcastle, New South Wales, Australia

The speaker is an Anaesthetist who previously worked as a medical officer for 'Careflight', a Sydney aeromedical service. In this role he was being winched into a helicopter when an equipment malfunction cut the winch cable, dropping him 12 metres to the ground and resulting in multiple critical injuries and six months in hospital. While he has 'recovered' and returned to a full professional career, there have been many fascinating experiences, challenges and hurdles along the way.

The 'highlights' of this journey have included:

- The experience (and recall) of contemplating the ground from a rapidly reducing altitude;
- The sensations of the immediate resuscitation phase;
- The various strange experiences of being treated in Intensive Care;
- Dealing with the challenges of prolonged hospitalisation;
- The emotional devastation wrought on families and relationships;
- Curious insights into the strange things that happen in hospitals;
- The 'toxic' character of the rehabilitation and litigation process.

This presentation aims to stimulate new insights into some aspects of patient care, to confront some of the deficiencies of the current systems of patient care, and to entertain with some funny stories and unexpected lessons from a unique experience.

TR014 FRONTIERS IN TRAUMA SPINE SURGERY

T. KOSSMANN

Alfred Hospital, Melbourne, Victoria, Australia

The management of cervical and thoracolumbar fractures have been the subject of a significant transition within the last two decades. The availability of modern fixation systems, material for vertebral replacement and minimal invasive access routes are the cornerstones of this revolutionary approach to patients with traumatic spine injuries. Conservative treatment can require

hospitalisation of several weeks or months, whereas operative treatment, in particular minimal invasive surgery, has extensively reduced access morbidity, intra operative blood loss, in-hospital stay, rehabilitation time and treatment costs.

The aim of operative management of patients with spine fractures is pain free, early return to walking, no neurologic compromise and no brace. Novel spinal implants, new concepts like vertebraloplasty and bioactive substances like bone morphogenic proteins are introduced into the clinic on a daily basis. Despite spectacular individual results, large multicentre trials are warranted to demonstrate the advantages of the operative versus the conservative management. Furthermore long term results over several decades will determine the exact value of the operative approach to the traumatic spine.

TR015 THE EPIDEMIOLOGY OF TRAUMATIC DEATHS: THE AUSTRALIAN ASSESSMENT

Z. BALOGH, J. EVANS, T. LYONS, D. MCDUGALL AND K. KING

John Hunter Hospital, University of Newcastle, Newcastle, New South Wales, Australia

Background The epidemiology of traumatic deaths was described during the development of the American trauma system in 1977 and 1992. To date no comprehensive prospective study evaluated the Australian system. Recognising the impact of the landmark American studies, the purpose of this study was to describe the post-injury mortality pattern in Australia.

Methods All pre and in-hospital trauma deaths occurred in a major Trauma Service Area (400 admissions ISS >15/year) during 2005 had autopsy and were prospectively evaluated. Low energy trauma, hanging and drowning were excluded. Deaths were categorised based on mechanism, timeframes (Prehospital, <48 hrs, 2–7 days and >7 days) and causes [central nervous system (CNS), exsanguination, CNS+exsanguination, airway, multiple organ failure (MOF)]. Data are presented as % or Mean+/-SD.

Results There were 103 post-injury fatalities (Age = 43+/-24, ISS = 49+/-21, Male 63%). The predominant mechanisms were road and motor vehicle related (72%), falls (4%), gunshots (8%), stabs (6%) and burns (5%). Prehospitally died 66% of the patients, 27% <48 hours in hospital, 5% between 3–7 days and 2% later than 7 days. CNS (33%) and exsanguination (33%) were the most common causes of deaths followed by CNS+exsanguination (17%), airway compromise 8%, MOF was only 3%. 6% of the deaths were undetermined.

Conclusion Compared to the American experience the injury mechanisms, timeframes and causes are different. The classic trimodal death distribution in Australia is much more skewed to early deaths and the % of exsanguinations is higher, while MOF hardly exists. Quality Australian epidemiological data should be used for Australian trauma system design and injury prevention.

TR016 AIRWAY MANAGEMENT ERRORS IN A TRAUMA DEATH AUDIT REVIEW

E. M. CALDWELL, M. SUGRUE, S. D'AMOURS, M. PARR, P. WYLLIE AND M. SHERIDAN

Liverpool Health Service, Liverpool, New South Wales, Australia

Optimal management of the compromised airway in trauma patients is critical. This study evaluated errors in airway management in trauma patients dying at a major trauma centre.

A retrospective peer review of trauma deaths between 1996 and 2003 was undertaken. A seven member multidisciplinary panel of specialists determined if and where errors occurred and assessed their nature, location and impact on outcome. Airway interventions included oropharyngeal, and nasopharyngeal airway use, tracheal intubation and surgical airway.

There were 307 patient deaths and airway intervention occurred in 239 patients. 118 patients were intubated in the resuscitation room and 84 patients were intubated pre-hospital. Pre-hospital intubation was by paramedic (72) or physician (12). A further 70 patients had breathing supported with bag and mask and 16 patients with nasal or oropharyngeal airway and oxygen. 119 errors in airway management occurred in 85 (35.6%) of the 239.

Of these, 86 related to intubation, five to aspiration, four to drug dosage errors and one was a dislodged tube. 41 errors occurred pre-hospital, 39 in resuscitation room, 15 at referring hospital, 13 in ICU and seven in theatre. Errors were classified as: delays to secure airway (40), error in technique (42), error in judgement (27), complication (nine), or delay in diagnosis (one). Impact on outcome of each error was judged to be: no impact (16), minimal (69), moderate (27), or major (seven).

This study identified that airway management errors are common in trauma fatalities. Airway management training should address safety and competency to reduce these errors.

TR017 A 'BEFORE AND AFTER' EVALUATION OF AN INTEGRATED TRAUMA CARE SYSTEM IN VICTORIA, AUSTRALIA

F. T. McDERMOTT

Consultative Committee on Road Traffic Fatalities, Melbourne, Victoria, Australia

Purpose The Consultative Committees findings that preventable/potentially preventable (p/pp) death rates of road crash fatalities receiving treatment were unaltered between 1992 and 1998 led to a Ministerial Taskforce on Trauma and the gradual introduction of a new Victorian Trauma Care System. The present study compares outcomes before (1997–1998) and after (2002–2004) the new system.

Methodology The management of 245 consecutive fatalities in the 'before' period and 193 in the 'after' period was assessed by the Committee's multidisciplinary panels using the complete hospital, ambulance and autopsy findings.

Results Emergency department admissions to expanded Major Trauma Services (MTS) increased from 34% to 62% ($P < 0.05$). More patients were attended by ATLS paramedics ($P < 0.05$) and scene times increased ($P < 0.05$). Patients admitted within one hour decreased from 70% to 46% ($P < 0.05$). The mean number of deficiencies per patient including those contributing to death was decreased ($P < 0.05$). The combined p/pp death rates (survival prospects >25%) decreased from 36% to 28% ($P < 0.1$). The p/pp death rates for MTS, Metropolitan Trauma Services, Rural Trauma Services and Urgent Care Centres for 2002–2004 were 26%, 38%, 50%, 80% respectively and did not differ significantly from those of 1997–1998. The p/pp death rates in MTS were less than those of the other hospital groups.

Conclusions The New Victorian Trauma Care System has resulted in a significant decrease in deficiencies including those contributing to death and a decrease in preventable/potentially preventable deaths rates. The improvement has been largely consequent to a marked increase in admissions to MTS.

TR018 TRAUMA CARE: MAKE IT BETTER! 'PUSHING THE ENVELOPE' AT THE ALFRED

T. KOSSMANN

Alfred Hospital, Melbourne, Victoria, Australia

The Alfred Hospital has Australia's biggest and busiest trauma department treating per year approximately 4500 trauma patients of which 850 are major trauma patients. The organisational set up over the last decade and preparedness for unconventional innovations has guaranteed that the Alfred Hospital has an innovative trauma department aiming to use the newest technology to improve patient care. To foster further this approach, the multidisciplinary National Trauma Research Institute was founded in 2004 in which the key groups of clinicians and basic researchers now have a platform to carry out cutting edge research ultimately to further improve trauma care.

Examples of 'pushing the envelope further' are projects dealing with soft tissue injuries, computer assisted navigation, minimal invasive orthopaedic interventions and a new approach in the treatment of severe head injuries. These activities are the main topics for channelling funding into trauma research and have helped in 2005 that the Victorian government has announced the Victorian Neurotrauma Initiative investing a volume of \$63 million over the next 5 years into research and clinical application of new therapy approaches in patients with head and spinal injuries.

TR019
**MASTERCLASS: TRAUMA SURGERY: THE DYING PATIENT:
 MASSIVE PELVIC HAEMORRHAGE**

T. KOSSMANN

Alfred Hospital, Melbourne, Victoria, Australia

A fractured pelvis can be life threatening injury leading to exsanguination. The treatment protocol for patients with unstable pelvic ring fractures differs between haemodynamically unstable (HU) and the haemodynamically stable (HS) patient.

In HU patients the primary intervention/s must concentrate on immediate control of the internal haemorrhage from pelvic fracture and surrounding tissue. After reduction, stabilisation of the pelvic fracture can be achieved by simple methods like pelvic binders or with external fixators from anterior and/or posterior. If the patient remains HU immediate surgical haemostasis must be achieved, considering intraabdominal packing. Angiography and embolisation is recommended if substantial blood loss persists. In most cases the packs can be removed after 24–48 hours. The further treatment of the pelvic fracture depends on the fracture type and additional injuries.

In the HS patient a full diagnostic work up can be undertaken, after which the appropriate stabilisation technique can be employed.

TR020
MASSIVE FACIAL BLEEDING HOW I STOP IT

M. SUGRUE AND K. SMITH

Liverpool Hospital, Liverpool, New South Wales, Australia

Massive facial bleeding is uncommon trauma presentation. This paper will explore the options in management, diagnosis and treatment.

Life threatening haemorrhage is reported to occur in 1.3–11% of patient depending on the series. However this is not truly representative and at Liverpool Hospital between 1995 and 2004 of the 21 243 patients admitted 359 (0.02%) had major facial injuries (AIS face ³2) and of those 10 had massive facial bleeding. The mortality was 80%. Proven cerebrovascular injury occurred in 6/10 patients.

To be an expert on this topic is therefore challenging and this paper will make recommendations on techniques.

Initial diagnosis of massive facial bleeding can be clouded by desires to secure and maintain the airway, manage better-known crisis in the early care of the patient and lack of recognition that the patient is exsanguinating. The arterial source of haemorrhage may be carotid, internal maxillary, zygomatic, lacrimal, ethmoidal have all been described.

Oro-nasal packing may be effective, coupled with fixation of fractures. Ligation of the external carotid had limited success and angioembolisation is the key.

Conclusion For massive facial bleeding immediately activate interventional radiology and temporise bleeding with packing. Where packing is successful still proceed to angiography.

TR021
SUBXIPHOID PERICARDIAL WINDOW IN TRAUMA

G. R. CHRISTEY

Hamilton, New Zealand

Subxiphoid pericardial window is a diagnostic test to determine the presence of blood in the pericardial sac following peri-cardiac trauma. It is usually performed in patients without clear evidence of a myocardial injury who would proceed directly to thoracotomy or sternotomy. The operative approach is straightforward, involving a subxiphoid skin incision or extension of the midline laparotomy wound, careful dissection to the pericardium, then pericardotomy under direct vision. The finding of pericardial blood mandates surgical exploration. Of vital importance is a robust decision-making process leading to the prompt diagnosis and treatment of cardiac injury, within which subxiphoid pericardial window plays a small but important role.

TR022
ABDOMINAL WALL RECONSTRUCTION HOW I DO IT

M. SUGRUE

Liverpool Hospital, Liverpool, New South Wales, Australia

Background Abdominal wall closure following abdominal decompression in the management of patients with abdominal compartment syndrome (ACS) is an increasingly frequent surgical challenge, facing the acute care trauma and emergency general surgeon. Between 5 and 25% of urgent emergency and trauma laparotomy patients now have an open abdomen. This paper will explore options for abdominal closure. The goal is early closure to reduce fistula formation yet avoiding recurrent ACS.

Patients can be divided based on their physiology and organ injury into potentially simple or complex categories. Simple patients include those with following stab wounds having damage control or patients undergoing second look laparotomy for bowel ischaemia. These can all invariably be closed early within the first 5 days. Complex patients are those who have had massive transfusion >10 units of blood, high velocity gunshots, mesenteric vascular injuries and patients with severe pancreatitis. Patient initially requiring silos, such as those with massive retroperitoneal haematomas are harder to close early.

Techniques for closure include;
 VAC dressing
 Sequential stages closure
 Dynamic Closure Systems
 Component Separation technique
 Allograft
 Prosthetic Graft
 Split Skin Grafts

Conclusion Individual patients required a tailored approach based on a considered weighting of physiology, underlying diagnosis and probabilities (experience).

References
<http://www.wsacs.org>

TR023
ORTHOPAEDIC DAMAGE CONTROL

T. KOSSMANN

Alfred Hospital, Melbourne, Victoria, Australia

The term 'damage control' stands for salvage, haemorrhage and contamination control, combined with intensive care management followed by operation/s for definitive repair and reconstruction. Damage control orthopaedics (DCO) and not early total care (ETC) should be considered for patients with multiple system injuries or in patients with unstable haemodynamics or in extremities. In trauma these patients have a temporary stabilisation of their long bone and pelvic fractures with an external fixator. In cases with soft tissue injuries, debridement and temporary wound sealing is applied. In spine trauma, posterior instrumentation with an internal fixator is advocated initially. Definitive surgery follows as soon as the patient has reached a physiological stable state and can be expected to tolerate the intervention/s.

Depending on the patient's status the definitive surgery may follow a staged protocol over a period of several days with rest periods in between. The DCO approach could prove a decrease in the inflammatory response of the patient, complication/s and improved outcome. The challenge of the DCO concept is to select the right patient and clinical examples will be demonstrated.

TR024
FRONTLINE HAEMOSTASIS

J. READ

Royal Darwin Hospital, Darwin, Northern Territory, Australia

Purpose Its widely regarded that exsanguination is the most important potentially preventable cause of battlefield death. This presentation details current attitudes and novel products to assist the surgeon from the battlefield to the operating room.

Methodology The personal experience of a surgeon whilst deployed for three months with a high volume of battle casualties in Balad, Iraq.

Results and Conclusions Three areas are discussed.

Firstly the successful application of the use of tourniquets without any adverse consequences by the US forces. The indications for tourniquet application may be made more liberal in the presence of reliable aeromedical evacuation.

Secondly, the average severely wounded battle casualty is a massive consumer of blood products, and coagulation failure is common. The role of clotting factors, whole blood and adjuncts to clotting eg Recombinant Factor VIIa in a field hospital is discussed.

Finally, some clinical experience with newer topical haemostatic dressings (Haemcon, Quikclot). The initial experience with these agents is promising.

TR025P SEVERE HETEROTROPIC OSSIFICATION IN A BURNS PATIENT WITH FEMORAL SHAFT FRACTURE

I. FREDMAN, J. BALAKUMAR AND S. DOIG

Alfred Hospital, Melbourne, Victoria, Australia

As major trauma and burn therapies have evolved to enable greater numbers of patients to survive these respective injuries, increasing attention is being focused on preserving and restoring function in these patients. Heterotopic bone formation about joints and in soft tissue is reported to occur in a small percentage of both major trauma and burns patients, and has the capacity to cause joint immobilization and permanent physical impairment. This paper describes an highly unusual case of severe heterotopic ossification about the femur in a patient who sustained both major trauma and severe burns injuries. Previous reports on HO following thermal burn injuries have described HO about the elbow or shoulder. To the authors' knowledge, this is the first English language report of severe HO about the femur in a burns patient. The case is discussed in the context of the current literature regarding the pathophysiology, treatment and prevention of heterotopic ossification.

TR026P VITAMIN D DEFICIENCY IN FRACTURE OF THE PROXIMAL FEMUR: IT IS NOT TOO LATE TO TREAT

A. VO AND D. MITCHELL

Wangaratta Hospital, Wangaratta, Victoria, Australia

Purpose Fracture of the proximal femur remains a major public health concern with Vitamin D deficiency an important contributing factor. Despite being labelled the sunburnt country, it is a fallacy that Australians receive adequate vitamin D from casual sun exposure.

This study aims to report the prevalence of Vitamin D deficiency in fractured proximal femur and challenges orthopaedic surgeons to be more vigilant in its treatment.

Methodology A prospective observational study was performed at two major hospitals in Ballarat Victoria on all patients presenting with fractured proximal femur or fixation failure between 1/2/05 and 30/6/05. Plasma 25-hydroxy vitamin D was measured and all deficiencies were treated as per current recommendations.

Results Of 80 patients presenting with fractured proximal femur, 60 (75%) were vitamin D deficient. This includes 45% with a mild deficiency, 22.5% moderate, and 7.5% severe. 2 cases of fixation failure occurred, one with moderate vitamin D deficiency and the other with a severe deficiency.

When comparing patients from different places of residence, it was also found that vitamin D deficiency was 100% in patients from institutionalised accommodation compared to 64.3% in patients living independently.

Conclusion Vitamin D deficiency is high in Australia despite high relative sun exposure and the resultant osteomalacia may contribute to fixation failure and re-operation. Given that vitamin D deficiency first presents itself one

third of the time with a fracture, orthopaedic surgeons are in a prime position to be proactive in its treatment.

TR027P TRAUMAWARE: A WEBSITE FOR EDUCATION AND ACQUISITION OF TRAUMA INSTRUMENTATION

R. SAWHNEY AND R. IVERS

Rockhampton Hospital, Rockhampton, Queensland, Australia

This site can be visited at www.toowoombaortho.com.au/trauma.

TRAUMAWARE is a website that we have developed to assist Trauma Surgeons' education and acquisition of implants required in Trauma Surgery. It allows the surgeon to view the variety of implants available for fractures/injuries of each specific bone/soft tissue segment of the body. The surgeon is then able to gain information directly and through web links on each product. The site also lists the manufacturing company as well as the distributors for that company. Contact details of distributors, especially personalised contact details of company representatives and the areas they cover are included for ease of implant ordering.

The site has been formed with no financial or other sponsorship from any company and remains impartial. It is intended to be a site formed by Trauma surgeons for Trauma surgeons to use.

We will endeavour to mature the site through peer comments and constructive criticism on implants so experience can be shared through the Trauma community. We request our user colleagues to take time in forwarding thoughts and case reports to our attention. We wish this to be an interactive facilitative website. The site will be continually updated with new implant technology. Contact details and weblinks are continually being changed and we shall endeavour to update these as they happen.

Next, we plan to form other limbs to our website. This will include ARTHROWARE for Arthroplasty prostheses and RECONWARE for implants used in Plastic and Reconstructive Surgery.

TR028P THREE WAYS TO GET PLASTERED IN SYDNEY:-- PROPERTIES OF CASTING MATERIALS

H. SOEHARNO, P. SMITHAM, D. STEWART AND W. R. WALSH

Prince of Wales Hospital, Sydney, New South Wales, Australia

Numerous plaster materials are available for use in the Orthopaedic arena. Often the same patient undergoes different types of plasters during the same injury. New materials are being developed on a regular basis and their suitability for clinical use is under constant review. Rowley and co-workers (1) have reported the compressive and bending properties of Plaster of Paris and materials available at the time. Considering the recent developments in thermoplastics, we sought to investigate these new materials compared to materials used currently.

Three casting materials (Rhena Therm, Rhena Cast and Plastrona) were examined in four-point bending, diametrical compression, flexibility, lamination, fatigue life and radiolucency using 2, 4 and 6 layers at 24 hours and one week. Mechanical testing was performed using an 858 Bionix testing machine.

Results showed that the newer materials were significantly stronger than Plaster of Paris with the same number of layers and lighter. The remouldable material was easily remoulded and lost only 10% strength compared to the fresh material in the 6 layer specimens. Radiographic evidence showed that the POP did lose some clarity of bone definition, however this was not significant. POP at 1 week was noted to be twice as strong as the 24 hour material whilst the other materials maintained their original strength.

Overall the newer materials were lighter, stronger, and stiffer than the Plaster of Paris and improved bone visualisation on radiographs.

1) The comparative Properties of POP and Plaster of Paris Substitutes. Rowley *et al.*; Archives of Orthopaedic and Traumatic Surgery, 103:402-407, 1985.

TR029P
UNCOMMON SIMULTANEOUS INJURIES OF BILATERAL
CAROTID AND VERTEBRAL ARTERIES

F. S. COLLET E SILVA, R. PORTA, P. PUGLIA, R. S. POGGETTI AND
D. BIROLINI

Emergency Surgery – Hospital das Clinicas, Sao Paulo, Brazil

Bilateral dissections of vertebral arteries are rare. Only a few cases were reported in literature. Biffi *et al.* found 0.53% vertebral artery injuries in patients with blunt trauma. There is no report of association of bilateral vertebral artery dissection and bilateral carotid artery dissection. Mechanisms of this injury in blunt trauma are neck motion can produce a forced hyperextension or rotation and may cause cervical arterial injury. Penetrating trauma may cause indirect injury due to kinetic energy of bullet or by neck motion.

We report one case sustaining gunshot wound with no arterial direct injury but indirect injury (dissection of the bilateral vertebral and carotid arteries).

A 59-year-old man sustain a gunshot wound, entrance wound was in superior lip and without exit. His mouth and tongue were bleeding. He was awake but anxious and spitting blood.

After orotracheal intubation, skull and neck X-ray showed bullet near C2-C3. Angio CT-scan showed a dissection and pseudoaneurysm of left internal carotid artery near the skull and another dissection of left vertebral artery. Angiography showed confirm the CT-scan findings and visualized dissection of the right vertebral and carotid dissection too. Left internal carotid arterial dissection and pseudoaneurysm were treated with a covered stent.

Anticoagulation was possible only after tongue and mouth treatment. Unfortunately the patient presented an acute cerebral ischemia.

Early diagnosis and appropriate treatment are based on high index of suspicion in cervical and/or skull gunshot patients for secondary injury due to cervical motion, when high velocity bullet and small distance injuries occur.