

In April 2009, I was fortunate to attend the Austrauma conference supported by the Australian College of Emergency Nurses

My apologies for the late forwarding of my conference report but many exciting things have been happening in my career including spending 6 weeks working in an Australian Emergency department with the intention to gain some insight into working in a different area and in Australia to complement my teaching of ENPC and TNCC. I have also completed my portfolio and have subsequently had my interview with the NZ nursing council which allowed my registration a Nurse Practitioner in NZ.

While this is not a complete capture of all of the sessions included in the conference, generally it supports the information we are providing in both the ENPC and TNCC courses.

It is important as instructors that we read widely, talk often, share information and articles we find useful and recognize that provision of care does change as research and knowledge advances. By doing this, we can continue to provide the professional, excellent courses we currently do.

The Austrauma conference was attended by many health professionals from many areas and had a wide variety of topics. I will attempt to report on the factors that influence our teaching of the ENPC and TNCC course.

The conference began with a very interesting talk by Chris Giannou who was a surgeon and director of several hospitals of the Palestine Red Crescent Society in Lebanon, Egypt and Yemen. Dr Giannou presented a number of topics the first being about the International Red Cross. This was rather interesting but I guess the point that I took home from this was a better understanding on the role of the Red Cross

The International Committee of the Red Cross (ICRC) is the mother group and is an impartial, neutral and independent organisation whose exclusively humanitarian mission is to protect the lives and dignity of the victims of war and internal violence and to provide them with assistance.

The Daughter groups are National Societies of the Red Cross or Red Crescent (or Red Crystal) and were founded in each country (186) as “auxiliaries to the medical services of the armed forces” and became “auxiliaries to the public authorities” after the War to end all wars. These groups are devoted more to disaster and refugee relief. The fundamental principles of the red cross/ red crescent societies is that of Humanity, Impartiality, Neutrality, Independence, Voluntary services, Unity and Universality. Specific tasks that they may do include: Prisoner registration and visits, work as a neutral intermediary to facilitate and accompany prisoner

liberation, assist with red cross messages, assist with re-establishing family links: tracing agency: disappeared, dead, provide assistance to the civilian population: public health approach (shelter, water, sanitation, economic security, preventative and curative medical interventions) and provide assistance to war wounded and war sick.

Dr Giannou also presented a topic entitled Humanitarians as Targets, where he spoke about the international humanitarian law or the “Law of War” that specifically designates the wounded and sick and those caring for them, Drs, Nurses and other personal as a protected class of people during armed conflict. He suggested that the security of humanitarian workers depended on a number of elements. He stated that the International Movement of the Red Cross or Red Crescent has identified 7 pillars of security, these being: Acceptance (by the enemy), identification, information sharing, rules, personality, communications and protective measures. Reflection on our work places in comparison with this concept identifies that we do better with rules,(on how pts and staff can behave), communication and information sharing, personality differences, and ensuring we keep ourselves safe, and putting in place protective measures such as safe exits from triage. He spoke a little about why humanitarians are not always safe during armed combat, and these are similar to circumstances and issues incurred by the general population.

Humanitarians sometimes become targets from acts of banditry, or particular belligerents or sometimes as the combatants fear the humanitarians become innocent “embarrassing” witnesses. He also suggested that a mixture of lack of discipline and training, along with a combination of adrenaline, testosterone, alcohol and various drugs create a toxic cocktail which increases risk to otherwise protected people. He spoke of triage categories the top one being extreme urgency where the triage person has a gun held to their head with a demand to have a wounded comrade treated first. He suggests negotiation and humanitarian diplomacy is the best safety measure for all.

Blast injuries

John Crosier, vascular surgeon, Liverpool Hospital presented a very interesting talk around blast injuries.

Some interesting facts:

When brought in bulk the price of a landmine in the US is 50 cents.

Before landmines became a political issue, companies like Fiat would often give away 100,000 of them as a sweetener when a government or rebel group bought a bulk number of RPGs or antitank missiles. Fiat made a lot of money doing this.

Explosives

Explosives are categorized as **high-order explosives (HE)** e.g. TNT, nitroglycerin, dynamite, and ammonium nitrate fuel oil (ANFO) or **low-order explosives (LE)** e.g. pipe bombs, gunpowder, and most pure petroleum-based bombs such as Molotov cocktails or aircraft improvised as guided missiles. High Order explosives (HE) produces a defining supersonic over-pressurization shock wave. LE creates a subsonic explosion and lack HE's over-pressurization wave.

HE and LE cause different injury patterns.

Pathophysiology of blast injuries

Primary blast: Unique to **high-order explosives (HE)**, and results from the impact of the over pressurization wave with body surfaces. Gas filled structures are most susceptible- lungs, GI tract, and middle ear

Types of injuries seen include:

- Blast lung (pulmonary barotraumas) transmission of wave thru chest wall, Hemorrhage into alveoli, laceration of hilar membrane
- TM rupture and middle ear damage
- Abdominal hemorrhage and perforation
- Globe (eye) rupture
- Concussion (TBI without physical signs of head injury) Primary blast injury head injury: brain blast, 95% deaths at scene, 15 % survivors are severe or critical

Secondary blast: Results from flying debris missiles and bomb fragments. Any body part may be affected.

Types of injury seen include:

- Penetrating ballistic (fragmentation) or blunt injuries
- Eye penetration

Tertiary Blast: Results from individuals being thrown by the blast wind. Any body part may be affected.

Types of injury seen include:

- Fracture and traumatic amputation
- Closed and open brain injury

Quaternary Blast: All explosion-related injuries, illnesses, or diseases not due to primary, secondary, or tertiary mechanisms. This includes exacerbation or complications of existing conditions. Any body part may be affected

Types of injury or illness seen include:

- burns (flash, partial, and full thickness)
- Crush injuries
- Closed and open brain injury
- Asthma, COPD, or other breathing problems from dust, smoke, or toxic fumes
- Angina
- Hyperglycemia, hypertension

Patterns of injuries

Pattern 1:

Stepping on landmine

Leg injuries, often high leg, check other leg

Contamination from clothes

Fragments driven upwards, Muscle planes, flap then goes back down

Pattern 2

Triggers e.g. cell phone

Tend to get fragmentation to any part of body

Missile

Hot gas, so tend to get thermodynamic injury

Fragments can travel several Km

Fragments of missile casing causes injury.

Total body disruption; Burns, inhalation toxic inhalant, Traumatic

Blast waves from high energy explosives dissipate the **least energy** into your body when you are lying down in an empty space, and dissipate the **most energy** into your body when you are lying down next to a wall or solid object (which is a common defensive reaction). Explosions in confined spaces (mines, buildings, or large vehicles) and/or structural collapse are associated with greater morbidity and mortality

Blast is a common mechanism of mass casualty production. Blast, burn, ballistic (projectile) and blunt injury may occur in isolation, or together in the same person injured in an explosion. Adulterants (chemical substances which should not be contained within other substances) may add further mechanisms for injury, such as bacterial, chemical or nuclear contamination. The paramount principle of blast injury treatment is review of the actual clinical pathology and physiology actually present, not providing care based on the presumption of the blast agent or mechanism.

Avoidance of blast injury requires foreknowledge of the potential blast threat, situational awareness and knowledge and implementation of methods.

Common pitfalls in the management of blast injury include:

Distraction by grotesque injuries

Failure to appreciate deep injury can occur despite relatively minor skin breaches

Inadequate debridement of wounds instead tends to be excessive antibiotic use.

Premature closure of wounds

Compartment syndrome not being observed for

Hollow viscus perforation in the unconscious patient

Fragmental; small hole but big injuries

Burns hide injuries

References for blast injuries

<http://www.cdc.gov/masstrauma/preparedness/primer.pdf>

Triage area: sieve away less injured

Standardized personal role

Early

Management

Severe

Trauma

Massive Bleeding Protocols

Kenneth Mattox. Professor and Vice chair Department of Surgery Houston Texas.

Please mark my word. Within no less than 10 years, probably even less than 5 years, any [one] that raises the blood pressure to higher than 3/4 the pre injury level, especially if using crystalloid solutions will be severely criticized as violating one of the indicators, whether the injury be penetrating, blunt, elderly, child, or one's own self or family.

Also mark this down on this date. The final target for a prehospital or EC measured BP will be that greater than 80 SYSTOLIC will be the level that the QA moral police will cite that those of you who believe in two large bore IVs, Rapid infusers, intraosseous and sternal infusers', the 3 to 1 rule, and cyclic hyper resuscitation as causing unnecessary complications, deaths, and costs.

Ken Mattox.

*Trauma.Org Trauma-List,
30th August 2002*

Parts of an editorial written by **Kenneth L Mattox, MD** made interesting reading and he discussed these principles at the conference.

Whether from blunt or penetrating etiologies, less than 10% of all trauma victims have immediate post traumatic hypotension. The true percentage is somewhere between 6-8%. Of that 6-8%, 1/3 are hypotensive from causes other than blood loss, such as pneumothorax, gastric dilatation, drug ingestion, etc. In all series, the survival rate in this group is virtually 100%, regardless of treatment or non-treatment.

Only 2-3% of the entire trauma population has post traumatic hypotension which relates to the resuscitation debate. In this group, much like patients with leaking abdominal aortic aneurysms, there is a natural compensation with a blood pressure between 70/- and 85/-, with moderate maintenance of cerebral status and urinary output. In this group of patients, elevation of blood

pressure to pre injury levels and prior to operative control of the bleeding site results in progressive and repeated re-bleeding, now with decreased platelets and clotting factors in each aliquot of blood loss. Aggressive resuscitation in this group of patients results in the now oft-repeated "cyclic hyper-resuscitation." In this group of patients, such hyper-resuscitation results in sicker patients in the ICU, often developing abdominal compartment syndromes, renal failure, coagulopathies, respiratory insufficiency, and prolonged ICU and hospital stays. One could easily suggest that such complications and any associated "preventable" deaths are clearly iatrogenic from over aggressive fluid management.

Several interesting non-trauma anomalies should be considered in applying logic to this subject. Virtually every textbook and training manual for EMS, nursing, emergency medicine, critical care, and trauma stipulate that patients presenting hypotensive following a rupture of an abdominal aortic aneurysm need to be kept hypotensive until proximal control of the aorta above the area of leakage. This preserves what intravascular volume remains and prevents new additional blood loss from the site of the rupture. In patients with dissecting aneurysm, all health care workers are taught to administer afterload reducing agents, induce hypotension and limit any treatment that would elevate blood pressure until a treatment strategy has been developed, which might include operative control of the dissection. Patients with pulmonary contusion are treated all over the world with fluid restriction to prevent the lung from acting like a sponge and developing pulmonary insufficiency. Seasoned internists often treat patients with bleeding duodenal ulcers following the principle, "keep the blood pressure low and don't give blood. If you raise the blood pressure, more bleeding will ensue."

A number of descriptive terms have emerged the last 5 years, including, "permissive hypotension," "purposeful hypotension," "fluid restriction," "selective minimal resuscitation," and others. These terms reflect a new trend to keep the blood pressure at a level that prevents any fresh clot from being dislodged, resulting in rebleeding.

In large animal "uncontrolled hemorrhage" models, the clot is "popped" at approximately 80/-. This extremely reproducible level of hypotension is identical to the observations made in patients with penetrating or blunt trauma. Thus, both animal researchers and trauma personnel have adopted the term "pop a clot," to be that phenomena which occurs with aggressive resuscitation. "Pop a clot" occurs at a blood pressure of 80/-. Therefore, the concept of permissive or purposeful hypotension in patients with posttraumatic hypotension has great logic.

These comments beg another issue - the effectiveness and utility of our "end point measurement of resuscitation." Traditionally, one of the mainstays of evaluating "shock" and determining the effectiveness of a resuscitation effort has been the blood pressure. Many factors affect blood pressure, both low and high. The systolic blood pressure perhaps is one of the LEAST RELIABLE measures of shock or as an end point in resuscitation. Other end points do need to be and will be developed. One could even predict that the well informed resuscitator of the next 10 years will disallow the use of a peripheral blood pressure recording device in assessing the level of hypoperfusion and adequacy of any treatment (or non-treatment).

Aggressive cyclic hyper resuscitation using crystalloid fluids also has other hazardous and reproducible physiological consequences. At approximately 750ml of administered crystalloid solution, cytokines are activated and an iatrogenic dilutional coagulopathy occurs. Platelets, prothrombin time, PTT, and thromboelastograph evaluations demonstrate statistically abnormal difference compared to normal values in patients who have post traumatic hypotension and have received no or limited fluid resuscitation. The cyclic hyper resuscitated patient arrives in the operating room from the ambulance dock or the emergency center, already with a preventable coagulopathy even before the first incision or onset hypothermia. AND, those who caused the coagulopathy were never aware that they presented the surgeon with a situation that made optimal therapy much more difficult.

One can then question clinical protocols for patients in the ambulance or in an emergency department. In the field or in the emergency center, blood pressures should basically be abandoned as a tool to determine level of shock or adequacy of resuscitation. The ability for the patient to cerebrates or for the attendant to detect the presence of a peripheral pulse (roughly equivalent to a blood pressure of 80/-) can be used as the major trigger point in therapy. No IV lines should be started if the patient cerebrates normally or if a line is started, the rate of fluid administration should be to keep open only. Some clinicians would desire an intravenous portal just to be available in case the patient "crashes." In the absence of cerebration, the examiner looks for the presence of a radial or pedal pulse. If present, no lines are started and transport or treatment is determined on the basis of diagnosed injury. Should the peripheral pulse be absent, a solution of an acceptably standard fluid is given in aliquots of 25 ml. until a pulse returns. At that point, NO ADDITIONAL FLUID is administered. This approach has been recently used with success in some international military campaigns.

Kenneth L Mattox, MD

From the conference

The progressive objectives in approaching the massively bleeding patient have evolved from protocols to restore volume and blood pressure, to addressing oxygen delivery to hemorrhage control, to addressing inflammatory mediators and finally now to addressing and treating coagulopathy.

Many of the historic protocols only focus on having enough compatible blood and crystalloid available to achieve a normal blood pressure prior to surgery

Such an approach actually increases bleeding, coagulopathy and complications. Newer protocols now encourage hypotension, restriction of fluid that incites cytokines and early administration of blood plasma and platelets in a ration 1:1:1

Management has changed significantly since the 1970 / 1980's. It should now be rare to give over 6 to 8 units blood (objective). Management should include

History
Monitor BP (debatable)
Restore intravascular volume (to permissible levels)
Oxygen delivery
Haemorrhage control
Management of inflammatory mediators
Control coagulopathies

Dr Mattox proposes (somewhat skeptically)

Lose BP monitors

Now control coagulopathy

That recombinant activated factor VIII is not proven to be useful

Clotting studies: INR is useful for Warfarin only. TEG thrombelastography is the best measure

He suggest that there is little value in knowing the Hb and haematocrit

The anticoagulated pt needs FFP immediately.

Fresh blood is better than “old blood”, Whole blood is best but not easily available.

Topical haemostatic agents are not useful.

That there is a new army tourniquet that is proving quite beneficial but is not available for civilian use.

TEG

The TEG(r) monitors hemostasis as a whole dynamic process instead of revealing information of isolated conventional coagulation screens (²). The TEG(r) measures the viscoelastic properties of blood as it is induced to clot under a low shear environment resembling sluggish venous flow. The patterns of changes in shear-elasticity enable the determination of the kinetics of clot formation and growth as well as the strength and stability of the formed clot. The strength and stability of the clot provides information about the ability of the clot to perform the work of hemostasis, while the kinetics determine the adequacy of quantitative factors available to clot formation.

JW respect

He also proposed that:

Patients with massive bleeding should not be resuscitated prior to definitive care (OT). He suggests don't resuscitate – take to OT stat. ED is only a place to wave and say hello as they pass by.

Shock room: (resus room)

Time 1 to 3 min max

Portal 22 guage

Volume 125 mls

Clots lab

End measure is CNS status and Pulse

BP 80/ or less or will pop clot.

Stat to OT with 6 units and thaw FFP

CT should only take 5minutes

Pre op:

Limited crystalloid

50 mmHg mean BP

Replace blood loss with “fresh” blood.

FFP at equal volumes as blood

Platelets 1 unit per 3 bloods

TEG ABG q30 minutes. Check lactate

ICU VOL 1:1:1 Clotting TEG Q1HR till normal

Find BE

WEBSITES

www.trauma –critical care.com

http://rch.org.au/emplibrary/bloodtrans/MH-W-001_massive_transfusion_protocol.pdf

http://www.adhb.govt.nz/massive_Transfusion_Protocol_Ver6.pdf

<http://ccforum.com/content/11/2/128>

Antibiotic abuse

Jeffrey Hammond

The golden age of antibiotics began during World War II when penicillin became widely available

1945: Alexander Fleming in an interview to New York Times suggested that the misuse of penicillin could be the propagation of mutant forms of bacteria that would resist the new miracle drug.

Antibiotic Resistance: the facts

Given enough antibiotics and time, resistance will appear

Resistance is progressive, moving from low to intermediate to high. Must do surveillance to know that this is occurring.

Organisms that are resistant to one antibiotic are likely to become resistant to others (horizontal/cross resistance)

Once resistance appears, it is likely to decline slowly, if at all.

- Slow loss is linked to poorly reversible genetic and environmental factors
- Fastest way to reverse resistance is to replace these strains with susceptible ones

Each person's antibiotics choice affects others in the extended or immediate environments.

Not going to disappear due to indiscriminate use of antibiotics, fear of infection

Antibiotic Abuse in the Food Chain

70% of all antibx used in US -2005

“Growth Promoters”

2-4% increase in feed efficiency



"I'll try the turkey, with chestnut and penicillin stuffing."

Current & Emerging Problems of Antibiotic Resistance

How did we get into this predicament?

- Natural selection process
- Indiscriminate /inappropriate antibiotic use
 - Treatment of viral URTI with antibiotics
 - Treatment of colonizing flora and contaminants as opposed to true infecting pathogens
- Antibiotic use in agriculture (animal feeds)
- Prolongation of life for immunocompromised and critically ill pts
- New settings for transmission (e.g. daycare)
- Increased worldwide travel

The Emerging Crisis:

No drugs for bad bugs

“Product development in areas crucial to public health goals, such as antibiotics, has slowed significantly during the past decade”

“Big” Pharma is part of the problem

Big pharma sees better return from the treatment of chronic diseases.

In contrast, antibacterial therapies are:

- Costly to develop
- Short courses, used for acute illness
- Market place issues (cost inertia)
- Rarely blockbusters
- Liability

Factors increasing antibiotic resistance

- Increased severity of illness
- More severely immunocompromised pts
- Newer devices and procedures

- Resistance in the community
- Ineffective infection control and compliance
- Increased prophylactic, empiric antibiotics
- Antibiotic utilization patterns

Consequences: 3 examples

Candida

Acinetobacter

C difficile

Risk factors for Candidemia

- Prolonged use of antibacterial antibiotics
- Presence of central venous catheters
- Hyperalimentation
- Surgery esp. that transects the gut wall
- Prolonged ICU stay
- Colonisation by candida of multiple non sterile sites

Acinetobacter baumannii (AB)

Multi-resistance gram negative coccobacillus

- Normal colonization of skin and female genital tract
- Generally low virulence
- A “water” organism
- Hardy in most environments
- Seasonal outbreaks
- Rapidly develops new resistance

Pan-resistance AB

Infect Control Hosp Immunol 2002 23

-2 hospitals in Queens, NY in 2000

6/122 completely resistant to FDA approved a/b

All had significant co-morbidities or recent surgery and had received a/b

3 progressed to infection; 1 death Conclusion: a marker

A brief against antibiotic overuse: the case of Clostridium difficile

C difficile Colitis: cascade of Events

- Antibiotic exposure
- Depressed “colonization resistance” (protective effect of normal gut microbiota)
- Exposure to C difficile germinate in terminal ileum and multiply in colon
- Toxins A and B produced – induce gut tissue damage and disrupt cell- cell junctions, leading to connective tissue degradation and apoptosis.

Clostridium difficile Associated disease (CDAD)

Increasing virulence

- clinically significant since 2000
- more resistant to fluoroquinolones
- higher rates of toxic megacolon, shock and death

Increasing frequency

Rate of hospital discharge diagnosis of CDAD increased 26% in 2000-2001

2005: estimated 3 million cases with 2.5% mortality rate in US

c.difficile: role of Fluoroquinolones

Independent risk factor

C-8-methoxy fluorquinolones such as gatifloxin and moxifloxacin incriminated

- higher anti-anaerobic activity
- 4 epidemics reversed by switching back to levofloxacin

The Emerging Crisis- what can we do

In the absence of development of novel antimicrobial agents for multi-resistant micro-organisms, physicians and other health care workers must be much more vigilant about the use and abuse of antibiotics and must pay much more attention to the principles of infection prevention.

CDC’s 12 steps to Prevent Antimicrobial Resistance: hospitalised adults

Prevent infection

Vaccinate

Get the catheters out

Diagnose and Treat Infection Effectively

Target the pathogens

Access the experts

Use antimicrobials wisely

Practice antimicrobial control

Use local data

Treat infection, not colonization

Treat infection not contamination

Know when to say no to vancomycin

Stop treatment when infection is cured or unlikely

Prevent Transmission

Isolate the pathogen

Break down the chain of contagion

Diagnose and treat infection effectively

Fact: appropriate antimicrobial therapy saves lives

Actions

Culture the pt

Target empiric therapy to likely pathogens and local ANTIBIOGRAM

Target definitive therapy to known pathogens and antimicrobial susceptibility test results

Use antimicrobials wisely

Fact: The prevalence of resistance can vary by locale, pt population, hospital unit, and length of stay

Actions:

Know your local antibiogram

Know your pt population

Treat infection, not contamination /colonization

Fact: A major cause of antimicrobial overuse is “treatment” of contaminated cultures

Actions:

Use proper antisepsis for blood or other cultures

Culture the blood not the skin or catheter hub

Use proper methods to obtain and process all cultures

Treat pneumonia, not the tracheal aspirate of colonized secretions

Those who cannot remember the past are condemned to repeat it

“There may be a danger in under dosage. It is not difficult to make microbes resistant to penicillinby exposing them to concentrations, not sufficient to kill them....if you use penicillin, use enough”

Alexander Fleming Nobel lecture Dec 11 1945

Antibiotic overuse – Solutions

Commitment

Pharmacist Involvement:

- Use optimization
- Pharmacodynamics

Formulary and ID Controls:

- ? antibiotic cycling

Antibiograms and Data Collection

- Data reporting

Infection Control

IDSA and SHEA Guidelines for developing and Institutional Program to enhance Antimicrobial stewardship

Streamlining or de-escalation of empirical antimicrobial therapy on the basis of culture results and elimination of redundant combination therapy can more effectively target the causative pathogen, resulting in decreased antimicrobial exposure and substantial cost savings (A_11)

De-Escalation Therapy

Stage 1

Administering broad –spectrum antibiotic therapy to improve outcomes (decreased mortality, prevent organ dysfunctions, and decrease length of stay)

Stage 2

Focusing on de-escalating as a means to minimize resistance and improve cost effectiveness

In some patients, redirection of therapy needed to cover resistant pathogens not covered with the initial regime, to provide source control, or to treat fungal pathogens

Massive Pelvic Trauma

Michael Shuetz

Professor Orthopaedic Surgeon

Director of Trauma

Princess Alexandra Hospital Brisbane

Severe pelvic ring injuries still remain a challenge for the treating team and require a comprehensive medical experience as well as logistic demands to the hospital environment. The appropriate early management of the haemo-dynamically unstable patients to control the bleeding is crucial. In the last decade with the establishment of selective embolisation procedures by the interventional radiologists, the rates of open surgical interventions to pack the potential spaces inside the complex anatomy of the pelvis could be reduced. However, there is no clear evidence for either of these procedures and debates are ongoing about the timing and priorities of computer tomography (with or without angiography), pelvis fixation (external device such as pelvic binder, external or internal fixators), angiographic embolisation and surgical packing pre or retroperitoneal). *Fevert et al Injury 2008: Osborne et al Injury 2009: Cothren et al J Trauma 2007*

Many trauma centers develop their own management protocols to follow clear clinical pathways reducing time consuming decision –making discussion and achieving better outcomes.

On the other hand, compound pelvis injuries especially perineal lacerations involving the urogenital and ano-rectal areas as well as extensive soft tissue damage caused by crush –type injuries are facing high mortality rates (up to 30 to 50%) Those challenging injuries also require early and quite often strictly ongoing surgical management including good communication between the involved specialties in working out priorities and treatment options to reduce the deadly septic and toxic complications.

Dr Shuetz presentation outlined the principles of the management of the complex pelvic injuries and included a treatment algorithm that they are following at the Princess Alexandra Hospital. His presentation I focused on the decision-making processes throughout the early stage of diagnostics and treatment, as mentioned above, and discuss those multidisciplinary issues, which

occur on a regular basis in the ED and Radiology department, in the operating theatre and intensive care unit.

Included is article around management of pelvic trauma

blush and pelvic injury.pdf

The open abdomen: A nightmare?

Robert C Mackersie Professor of Surgery University of California San Francisco California

Introduction:

Damage control laparotomy followed by the deliberate post-operative decompression of the abdomen is arguably one of the most important adjuncts to trauma care to come along in a generation. The pathophysiology of the abdominal compartment syndrome is now reasonable well understood and is known to cause derangements in cardiac, pulmonary gastrointestinal and renal function as well as amplify the inflammatory response. Improvement in organ perfusion that is accompanied by the deliberate abdominal decompression has helped limit ARDS and other post-operative multiple organ failure syndromes. In addition, the use of planned return to the operating theatre for washout has also limited the number of missed injuries, and improved peritoneal toilet in the setting of gross contamination or peritoneal sepsis.

Unfortunately, as is typical with many improvements in surgical care, the solution to one problem often creates another one. Problems created with the open abdomen: loss of abdominal cavity domain, inability to perform definitive closure. Exposed bowel, GI fistula etc. have created a new family of problems, often coexisting in the setting of a critically ill patient. **Table**

The focus of this discussion will be on the post-operative, post resuscitation management of the open abdomen, as well as on some of the problems unique to this approach.

The Anatomy and Physiology of the open abdomen.

While there is no formal classification scheme for the open abdomen, it is useful to consider 3 separate categories, if only for the purposes of this discussion.

Early closure: These are generally less severely injured pts for whom a definitive operation cannot be preformed, but who typically has not undergone massive volume and fluid resuscitation. Examples include: temporary hepatic packing with planned return to the operating room or the need for a second look operation in the setting of potential pancreatic or GI injuries. The abdomen, while left open initially, is closable at the second or third operation.

Intermediate closure: These pts are generally severely injured and have a more prolonged recovery time. The clinical “trajectory” follows a more protracted course, making primary closure difficult or impossible within the first 1 to 2 weeks. In pts whose course is uncomplicated by prolonged inflammatory response, MOF, or sepsis, the resolution of bowel, retroperitoneal, or other rd space oedema accompanied by techniques to prevent loss of abdominal “domain”, usually permits primary abdominal closure, often within the first 2 to 3 weeks.

Late closure or non closure: These pts represent the most difficult group and typically have associated ARDS or other organ failure, sepsis or SIRS. Their recovery is prolonged for a number of weeks or sometimes months, making definitive abdominal closure often impossible. In these pts, maintenance of abdominal domain & preventing organ block adhesions to the abdominal wall becomes increasingly difficult.

PRESERVATION OF THE ABDOMINAL DOMAIN:

The natural tendency for the musculature of the abdominal wall, within the oblique attachments laterally / inferiorly and laterally / superiorly, is to apply distracting forces on the midline. Combined with the caudad and cephalad forces created by the rectus abdominis, the open abdomen, if left to its own devices, will try to conform, more or less, to an open circle. The natural contraction of the immobilized fascial and muscle components, coupled with increased volume of the abdominal contents produced by prolonged retroperitoneal and GI oedema, results in progressive loss of abdominal domain. This loss (or preservation) of abdominal domain is one of the most important determinants of successful abdominal wall closure, particularly in the intermediate and late closure groups. Many of the technical approaches to managing the open abdomen are directed at recapturing or preventing the loss of abdominal wall contraction and loss of domain. The two principal elements of doing this involve the maintenance of abdominal wall tension, and preventing adherence of the abdominal visceral “block” to the parietal peritoneum.

TECHNICAL CONSIDERATION

Following the completion of all (planned) abdominal procedures (removal of hepatic packs, primary re-anastomosis, diverting colostomies etc) the closure of the abdominal wall becomes the primary reconstructive goal. The technical aspects of maintaining abdominal wall domain & tension on the abdominal wall have been the subject of much discussion and debate. There is no single “best technique as yet established for doing this, and surgeons are prone to engage in spirited discussions regarding their own favorite methods. A variety of methods are in current use and include elastic tensioners on the abdominal wall, the use of various prosthetic meshes with or without sutures or in some cases Velcro bands (Witmann patch), and the use of simple abdominal wall sutures. The underlying principle is the same – the staged delayed primary closure of the abdominal wall through gradual re expansion and /or resolution of visceral / retroperitoneal oedema. The associated use of a large plastic drape (fenestrated) to separate the

abdominal wall from the visceral “block” has, in our experience, been essential to allow independent expansion of the abdominal wall. The failure to create and maintain this plane between the organ block and abdominal wall will reduce the chance for successful primary abdominal closure.

The use of the wound vacuum system (woundvac) is commonly used in conjunction with managing the open abdomen, either by itself or with associated mesh / suture staged closure. In many cases, however, the suction pressure exerted on the abdominal wall by the wound vac is insufficient to establish sufficient tension to allow staged closure without the use of other adjuncts (sutures, elastic tensors, prosthetic mesh). The wound vac does, however, maintain intraperitoneal toilet and has been used successfully in the setting of GI leakage without the development of peritoneal sepsis.

THE UNCLOSEABLE ABDOMEN

With careful attention to detail, judicious use of post-operative fluids, and the successful management of intraabdominal injuries, primary abdominal wall closure can be affected in the majority of patients whose course is not complicated by late sepsis or multiple organ failure. With the later conditions, however, the abdominal wall is sometimes rendered (primarily) “uncloseable”, necessitating secondary techniques to optimise late reconstructions and avoid bowel injuries. Autologous tissue of some sort will be required to definitively the abdominal wound until reconstructive surgery can be performed many months later, and the optimal management approach for doing this has yet to be determined.

Dressing with or without the wound vac, applied directly to the bowel is unappealing due to the direct injury to the bowel. Similarly, the use of conventional, non absorbable mesh (e.g. Marle, Polypropylene) has been associated with increased incidence of bowel injury or fistulisation. The use of engineered biomaterials such as cellular dermal or collagen products (e.g. Alloderm, permacol), has received more attention in the last several years. As experience with some of these materials in the open abdomen has accumulated, it appears that incorporation as a fascial replacement is not as complete or reliable as anticipated, and these products are subject to bacterial colonization and subsequent degradation by some wound flora (e.g. pseudomonas) Other forms of absorbable mesh (e.g. polyglycolic acid) viewed favorably by some as it provides some degree of bowel protection, and allows granulation and eventual closure by split-thickness skin grafting.

On occasion, careful staged closure may not quite allow primary re-approximation of the midline fascia. In carefully selected cases, partial relaxation of the lateral fascia or a modified separation of components approach may allow primary fascial closure.

Applying the KISS principle (keep it simple stupid), the closure of the open abdominal wound may sometimes be accomplished with nothing more than elaborate that mobilized cutaneous flaps , closed over drains. While the largest associated hernia must eventually be repaired, skin

flaps, when possible, often provide the most direct form of temporary autologous wound closure and bowel protection.

Complications

The classic “nightmare” scenario with an open abdomen involves the breakdown of either the GI anastomosis or perforation of exposed bowel in an otherwise frozen, hostile abdomen. These so called “entero-atmospheric fistulas” present perhaps the most troublesome of the long term complications of the abdomen. Definitive surgical closure is in most cases not possible with these fistulae, although there have been reports utilizing combinations of tissue glues and biological dressings. In addition to the “bite the bullet and reoperate early” approach (not recommended), other management techniques have included utilization of cutaneous or myocutaneous flaps with or without the establishment of a controlled fistula, and split-thickness skin grafting or definite wound closure with re=operation typically for to 9 months later.

Summary

For all its benefits on post injury physiology, the open abdomen has created a new family of problems. The vast majority of ‘early’ and “intermediate” closures can be accomplished with careful attention to detail maintenance of abdominal wall tension and abdominal domain, and separation of the organ and abdominal wall components. For those pts with prolonged multiple organ failure or septic courses in the post operative period, the abdomen may become primarily “uncloseable’ Protection of any exposed bowel and avoidance of fistulisation becomes the priority in these settings, with early autologous wound closure, and eventual abdominal wall reconstruction

Optimal analgesia

Andrew Pearce Clinical director Training and Standards South Australia Statewide retrieval service

Pain is not our friend and the response to pain varies in our patient population. As health professionals we do not deal with our patients pain as well as we could. Studies from the National Institute of clinical Studies (NICS) have shown our time to analgesia, amount of analgesia and type of analgesia all can be improved.

What about pre hospital? Our ability to put specialist retrieval teams in the field to perform complex procedures from extrication, stabilization and transfer to definitive care also requires the ability to give optimum analgesia.

Our pre hospital case mix requires brief repetitive intense analgesia of limited duration in emergency retrieval medicine.

It is long standing practice to minimize dosage requirements of an agent by combination therapy with another of a different class or mode of action and thus minimize the magnitude of a side effect profiles – this extends back to the addition of whiskey to the wooden bite block.

In the field of acute pain management the combination of the NMDA receptor antagonist Ketamine with opioid receptor agents is increasingly used for the treatment of severe pain, as has been long standing in the field of chronic pain.

Previous concerns about the use of Ketamine in the head injured pt do not have appeared to have translated into poor outcome and experimental evidence is emerging that neuronal protection may occur. Poor chronic pain outcomes are common in trauma and are directly associated with poor pain control.

Observational practice in the arena of field trauma medicine has shown that very small sub anesthetic doses of Ketamine have profound analgesic effect after Morphine loading in the field. It is repeatedly that as little as Ketamine 10mg with an opioid is sufficient to remove entrapped multiply injured patients from vehicle crashes.

This experience lead to the search for a combination with rapid onset, which is titratable to clinical condition , with intense brief but controllable duration which could provide analgesia short and ongoing to one or many in a mass casualty situation.

Ketamine 200mg and fentanyl 500micrograms was carried by the Royal Adelaide retrieval service separately requiring opening and mixing using valuable time and disposables. After ascertaining the compatibility and stability of the combination, RAH pharmacy services now

supply a premixed syringe of Ketamine 10mg and Fentanyl 25 micrograms in a 20 mls syringe with brilliant coloured labeling to effect rapid access and identification in the field.

Initial bolus dosage is commenced at 0.5 to 1.0 ml and doubled or halved after initial effect. This is then repeated as required and can be used as an ongoing infusion in the awake and spontaneously breathing pt.

Royal Adelaide Retrieval service has now used this combination successfully for several years in single and multiple casualty situations. Typical use per pt for all of their care pre hospital is 4 to 8 mls.

From lecture

Pain is an unpleasant sensory and emotional experience

Policy includes timely early assessment and introduction and review

Other interventions include: reassurance, splinting, cling film for burns

Sandmuct Journal of Accident and Emergency 199 15 147-150

Fentanyl:

Preference to Morphine

Rapid onset

80 x more potent than morphine

Can cause Bradycardia, Dec RR, Apnoea

Getting dose right is aim

Can cause heavy sedation after removal of painful stimulus

Ketamine

New approach to combine drugs

Provision of Dissociative sedation

Profound analgesic

Sedative / amnesic effects, don't use with midazolam

Retains protective airway

Used with morphine is good.

Can use with head injury

IV 1-2 mg /kg

Protecting the Innocent: Healthcare and Child Abuse

Marla L. Nanore Trauma Program Manager The Children's Hospital of Philadelphia

Child abuse and neglect fatalities: Statistics and interventions, June 2008 US dept of health and human services www.childwelfare.gov

Child abuse statistics March 2008 Australian Institute of Family services ISSN 1448-9112
<http://aifs.gov.au/nch/pubs/sheets/rs1/rs1.htm>

www.aifs.gov

Nurse family partnership <http://nursefamilypartnership.org>

National Council on Child abuse & family violence <http://www.nccafv.org/child.htm>

Rights of the child, August 29 2006 United Nations General Assembly
<http://www.violencestudy.org/IMG/pdf/English-2-.pdf>

Child abuse includes actions or inaction by caregivers that hinder the normal development of children. There are 4 types of abuse, physical, sexual neglect and emotional. 50% increase in reports since 2003.

Most common victim's children < 4 yrs

Physical abuse recognition

- Unexplained or inadequately explained injuries
- Injuries incompatible with developmental age
- Changing stories
- Unexplained delay in seeking healthcare
- Evidence of repeated injuries

Shaken baby syndrome

- Irritability
- Lethargy

- Vomiting
- Seizures
- Difficulty breathing
- Coma

Sexual abuse recognition

Behavioural

- Hypersexual behaviors depression, withdrawal, school, or other phobias, truancy, running away behavior, poor school performance
- A history of sexual abuse given by child

Physical

- Genital discharge, genital bleeding, bruising or lesions, culture –proven sexually transmitted diseases (outside neonatal period)
- Sexual abuse may be present with common , unexplained physical symptoms

Neglect and emotional abuse recognition

- Neglect
 - Inappropriate dress
 - Poor hygiene
 - Inadequate nutrition
 - Lack of supervision
 - Unattended ,medical needs

Emotional needs

Antisocial, aggressive, behaviors, habit disorders (sucking, biting, rocking

Abusers come from all walks of life social, ethnic and income levels. Usually young and poor with lower educational level s, commonly abused themselves and they lack a successful role model for parenting. Immature and do not have an understanding of child development. Depression and substance abuse often compound the problem.

Australian Statistics

- 2006 to 2007 309,517 reports of child abuse or neglect
- Inc of 50% since 2002-2003
- 58563 reported cases were substantiated
- Ranges from 2.0 per 1000 in western Australia to up to 12.0 per 1000 in the Capital territory

Role of Healthcare worker

- Recognition
- High index of suspicion
- Thorough medical history and exam
 - Mechanism
 - Family /social history
- When suspected
 - Radiology : ct plain films
 - Ophthalmology

Family Presence during Resuscitation

Maria L. Vanore Trauma Program Manager

- 1) The practice of having a family member stay in the treatment area during procedures: minor procedures, Invasive procedures, Resuscitations

Are they Spectators or Partners?

1st reports 1980s

- 2) Why Now?

Father's presence at childbirth has opened the door

Growing consumerism: previously health professionals had complete trust but not so now. People look at internet etc.

Support by national organisations: ENA, AHA, ACEP, and AAP

Growing literature in support

- 3) Family Presence literature

Most published research is on Paediatrics, groups including minimally invasive procedures, medical codes and trauma resuscitations

Trauma specific research is extremely rare.

- 4) Controversial:

- 5) Who: Family , Caregivers, Patients

- 6) Does it benefit families?

Most families want:

The choice

Would chose the option

Would chose the option again

Report favorable experiences

Feel that it is beneficial to themselves and the patients

Decreases post traumatic stress

- 7) Does it benefit caregivers?

Favored more highly by clinicians

With prior experience with FP

With more clinical experience

Nurses vs. physicians

ENA members vs. AAST members

- 8) ED staff Opinions

- Survey ED attending, nurses and residents
- Attendings and Nurses rated FP higher
- All rated approval higher for less invasive procedures
- Trauma resuscitations: overall only 31%
 - Attendings: 63%
 - Nurses 62%
 - Residents 4%

9) Staff benefits

- Ability to ask families questions
- Increased ability to view the patient as part of a family system
- Increases the respect families have for the caregivers
- May decrease legal action

10) Is there a down side for the staff?

- Interference with procedures
- Decreased ability to dehumanize the patient
- Lack of confidence of caregiver (RN DR)
- Decreased ability to teach
- Potential for violence

11) Does it benefit patients?

- Clinical care
 - Saccetti et al Acad Emerg Med 2005
 - Observed 54 family members /37 pts
 - Invasive procedures / non trauma centre
 - Subjective score by 2 physicians
- Reassurance
 - Eichorn et al AJN 2001
 - Interviewed 9 patients 5/9 trauma
 - Positive reaction
- Trauma

12) Assessment of family presence during trauma

197 families participated in Family presence
 7 were asked to leave the trauma area by staff
 Survey started 6 months after start of FP program
 Sept 1 2003 to March 31 2005

13) Assessment of family presence during trauma

- 97% no effect or improved decision making

- 94% no effect on or improved institution of care
- 92% No effect or improved communication among providers
- 98% no effect or improved communication with family members

14) Time to Completion of trauma interventions

- Time to log roll -0.96
- Time to first radiograph 1.1
- IV access -1.7
- Central line -19.7
- Intubation 7.4
- Chest tube 8.6

15) Sterile cockpit rule

- Prohibits non essential activities during certain times (taxi, takeoff, landing etc
- Half of crew error accidents attributed to interruptions, distractions or preoccupation with one task at exclusion of others.

16) CHOPS

- Level 1 pediatric Trauma centre since 1986
- 1350 admitted trauma pts per year
- 80,000 Ed pts per year, ¼ injured children
- 0 to 18 years of age

17) CHOP experience

April 2003 Family presence initiated in the ED for all events

Guidelines:

- Option not an expectation
- Family support person
- Screen family
- Enter at discretion of ED attending / trauma chief
- After primary/ secondary survey
- Stand away from pt as a spectator

18) Acceptable family behaviors

- Quiet
- Distressed, crying but consolable
- Distracted but able to focus and answer questions
- Anxious or scared but co-operative and follows instructions

19) Worrisome behavior

- Uncooperative
- Physically aggressive, combative

- Threatening or argumentative
- Extremely unstable emotionally, hysterical, loud and cannot be redirected or calmed
- Intoxicated
- Suspected abuse case
- Suspected perpetrator of violent crime

20) Guideline deviation

- Family in too early
- Family in without a support person
- Allowing family to stand at bedside

21) Recommendations

- Additional research needed
 - Trauma specific
 - Adult vs. paed
- Carefully develop policies and procedures
- Trauma involvement early and continuously
- Extensive education and monitoring

Trauma in pregnancy

Guidelines developed by Royal Melbourne Hospital

Guideline was developed involving 2 hospitals, 4 drafts, 8 disciplines, 13 references, 17 page document.

Trauma affects 8% of pregnancies

Trauma admission in 1/250 pregnancies

50% road trauma

22% falls

22% assault

80% fetal mortality if maternal shock

Changes in Pregnancy

Physiology:

- Increased plasma volume
- Decreased BP, FRC, gastric emptying
- Supine hypotension syndrome
- Hypercoagulable state
- Uteropelvic blood flow

Anatomy

- Enlarged uterus
- Raised diaphragm
- Stretched peritoneum

Priorities

Primary survey (mother)
 Foetal assessment
 Secondary survey of mother
 Definitive care of both pts

Primary Survey

Same principles as non pregnant:

Airway

8 x failed intubation
 Increased risk of aspiration – relaxed sphincter, Raised diaphragm

Breathing

Careful chest tube placement
 Liberal use of oxygen

Circulation

15 degree lateral tilt - full length wedge,

Secondary survey

Bhcg in all females under 50
 Obstetric history
 Viable fetus =>24 weeks
 Obstetric consult
 Pelvic exam
 Kleihauer-Betcke test
 8 to 30 % FMH
 Predictor of preterm labour
 Rhogam in RH neg mothers

Fetal Assessment

Main risks:
 Preterm labour
 Placenta abruption
 Uterine tenderness / contractions
 Vaginal bleeding
 Fetal heart tones
 CTG monitor x 4 to 6 hours- if more than 24 weeks
 Ultrasound

Placental abruption

2- 4 % minor trauma

Up to 50% of major trauma

20 to 35% fetal mortality

Signs: Fetal distress by CTG

Vaginal bleeding, cramps

Uterine tenderness

U/S picks up only half

TX: abruption + distress = immediate delivery

Alarm bells

Urgent obstetric review for >24 weeks and:

- Vaginal bleeding
- Uterine irritability
- Abdominal tenderness
- Pain
- Cramping
- Absent fetal heart tones
- Leaking amniotic fluid

Secondary survey : special considerations

Obstetric History –accurate dates

Anti D (Rhogram) if RH neg

- Kleihauer test

Further imaging? The pregnant pause....

Diagnostic workup

- We are highly dependant on imaging as an adjunct to physical examination
- BUT we are concerned about birth defects from ionizing radiation
- How do we manage risk vs benefit of imaging the pregnant patient.

2 important factors:

Exposure: most x-rays pose minimal risk

Background risk: of all pregnancies is of 3% for major birth defect and 15% for miscarriage.

Risk to fetus

Most diagnostic procedures expose the fetus to <5 rads

< 5 rads will not increase reproductive risks (birth defects or miscarriage)

The reported dose of radiation to result in an increased incidence of birth defects or miscarriage is >20 rad.

Imaging data

Radiation to fetus 1/3 that of mother

Risks: death, birth defects, LBW, leukemia

<5 rad definitely safe

< 10 rad probably safe

Study	Fetal rads
--------------	------------

CXR	0.005
PXR	0.4
CT head	0.05
CT chest	0.1
CT A/P (10mm)	12

From East practice management guidelines

Risk from non-abdo/pelvis exam

- When a diagnostic x-ray study (including CT) is of the head, neck, chest, or limbs, the radiation exposure is not to the fetus
- Scatter that might reach the fetus is miniscule and would not represent an increased risk for birth defects or miscarriage.

If fetus is exposed

The pt must be informed about the magnitude of the radiation dose to the embryo / fetus and counseled about any potential risk.

The practitioner must not on purely physical considerations, recommend a termination of the pregnancy

Summary

There is no reason to avoid use of non-abdo CT to evaluate a pregnant trauma pt. CT will provide more accurate diagnostic information than any other investigation and will allow the mother the best chance for survival and completion of the pregnancy. Decisions about abdo or pelvic imaging should be made at senior level and with multidisciplinary input.

Imaging –recommendation

Image pregnant women as needed

Plain x-rays are safe

Shield abdomen

Use ultrasound over CT for abdominal imaging when possible

Exposure is higher with fluoroscopy

Mother still comes first

Perimortem caesarian

Can save the fetus

Can save the mother

Within 3 to 5 minutes of arrest

->26 weeks pregnant

Consider open cardiac massage

Outcomes

-50% live births

Time delays + neurological sequelae

Long term survival rate 5%

Again thanks for the opportunity to attend this conference and apologies in the delay in completing this report