PRE-HOSPITAL CARE & MASSIVE TRANSFUSION: A MILITARY PERSPECTIVE

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Overview

- Differences between military/civilian PHC
- What is Military Massive Transfusion?
- Military management of Massive Transfusion
- Evidence...
- Practicalities
- Research
- Questions
**Evacuation Chains**

- **Civilian**
  - Point of Injury
  - Recovery by Ambulance Service
  - Definitive treatment in Hospital
  - (Referral for Specialist Care)
  - <100km

- **Military**
  - Point of Injury
  - Self/Buddy Aid/Team Medic
  - Casevac
  - Initial treatment role 2 (+)
  - Tactical CCAST
  - Strategic CCAST
  - RCDM
  - 1000km+
First responder intervention is lifesaving

80% die within 30 mins of wounding - this has implications for provision of medical care

The platinum ten minutes
US Army Vietnam

Percentage of Total Combat Deaths

Immediate < 5 min 5 to 30 min 30 min to < 2 h 2 to < 6 h 6 h to < 1 d to < 1 wk ≥ 1 wk

Killed in Action
Died of Wounds
ISS > 15 = 10% + mortality

Civilian 60% MVA, <10% GSW.
Military 55% Blast, 30% GSW

Military v Civilian Injury Severity Scores

% of total injured

0-15 16-24 25-35 36-75

ISS

Civilian
Military
So- military casualties are different.

Can we still learn from them?
Traditional ATLS teaching- ABCDE

- Stabilise for surgery
- Definitive surgery early
- Tourniquets are bad

New paradigms:

- C-ABc
- CAT
- DCR & DCS
Immediate management:
Haemorrhage Control

- Early: FFD, Tourniquet, Haemostatics
- Later: ACoT treatment
- 25% arrive in ED with coagulopathy
  - Incidence increases with severity of trauma
  - Multifactorial
    - Fibrinogen
    - Acidosis related platelet dysfunction
    - Dilutional
    - Consumption of factors

Brohi et al J Trauma 2003. 54(6)
Evolving Information/Evidence
  - Observational, multiple databases

Military v NHS
  - Rapid changes in doctrine possible
  - CRASH 2 (& subsequent observational studies)
  - ROTEM/TEG
MERT offers:
- Haemorrhage Control
- Airway Management
- Analgesia & Anaesthesia
- Chest Drains
- Blood & Products
- Complex Decision making
- Overflight to surgery
Military Massive Transfusion

- Definitions
- Historical Management
- Changing demographics allied to rapid transfer
What is a massive transfusion?

- **Civilian practice:**
  - 100% BV 24hrs

- **Military practice:**
  - Life threatening bleeding
    - 50% BV 3hrs
    - 100% 24hrs
    - 150ml/min
11% of UK casualties have MTP (10u/24hr)

20% of MTP have >100u

Mean 22u, max 237u/24h

85% survival

Allcock EC et al. JRAMC Dec 2011. 157(4)
Military MTP

Shock Pack 1
4 RCC & 4 FFP

Shock Pack 2
4 RCC & 4 FFP
& 1 ATD plt
& 1 pool cryo

Shock Pack 3
4 RCC & 4 FFP
& 1 ATD plt

TXA1g; 10ml CaCl₂

10ml CaCl₂

10ml CaCl₂

? Dextrose/insulin

?? FVIIa; FWB

Hct 0.3; Plt >100; Fib >2; T 36°C; BX >-2; Ca++ >1.0
- Used in WWI & II
- Uncommon in Civilian Practice
- 10-15% of US military use
- Walking donor pool
  - (inc platelet donation)
Issues

- Cold Chain – 5000 miles
- Afghan temperatures (-25-+50°C)
- Rapidly warming blood
- Tracking transfusions
Rapid access to:

- Appropriate surgery
- Decision Makers-
  Damage Control Surgery
  & Investigations
- Blood & products
  - (Bastion c.f NHS)
- Monitoring
Haemostatic Resuscitation

- Cryoprecipitate, Prothrombin Complex Concentrate, Antifibrinolytics, lyophilised plasma (LyoPlas N)

Freeze dried products

- E.g. platelet derived haemostatic agent-PDHA, platelet microparticles etc

Oestragen, Haemoglobin substitutes
Hypothermic acellular resuscitation
  - (Emergency Preservation & Resuscitation - EPR)

- Animal in vivo experiments
- Human Clinical trial started

- $\text{H}_2\text{S}$, LT69L

- Space surgery
  - Robotics, foam packing
Lessons for Civilian care

- MTP Rarely required in civilian practice
- Concepts are transferrable
- MTP is only one part of whole trauma care
Military care different from Civilian care
  - Different casemix
  - Different Product requirements

But applicable lessons/concepts

Dynamic response
  - DCR/DCS/Whole body CT etc
  - Products before results
  - Major haemorrhage packs

Educated sensible discussion with colleagues