Infection & Stability after Open Fractures

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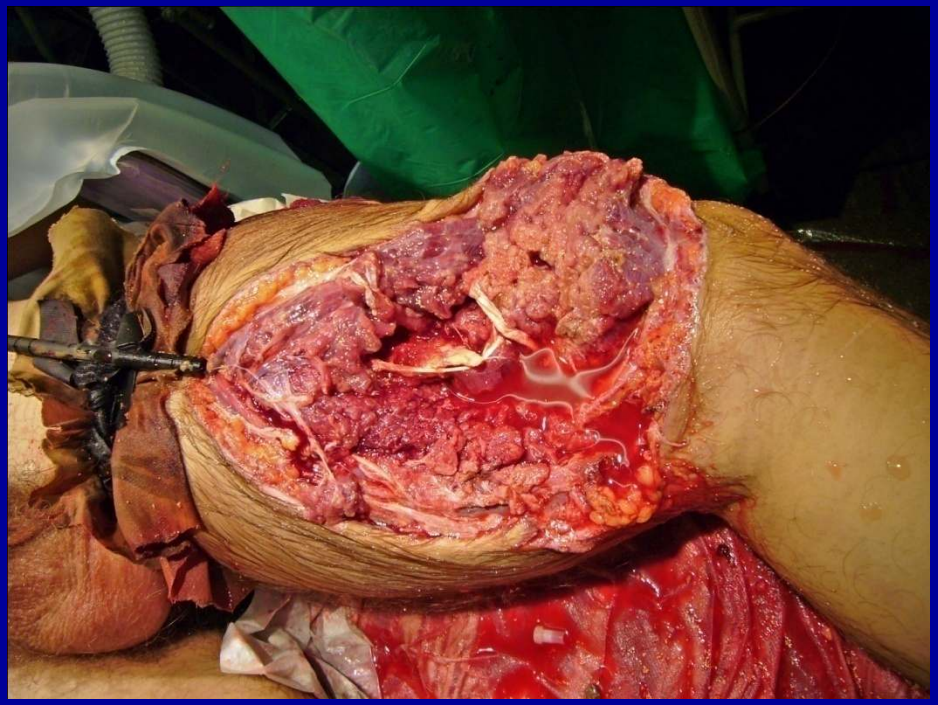
Aims

- Overview of the way the military initially manage open fractures
- Discuss stabilisation of open fractures
- Appreciate the opinion but lack of science, around open fractures

- Realise what experts say today will be dismissed tomorrow!

Problem



Optimal Treatment?

When I was a boy.....

- Open fractures HAD to be debrided within 6 hours and were left open
- Stable fixation essential (Nail/Ex Fix)

now

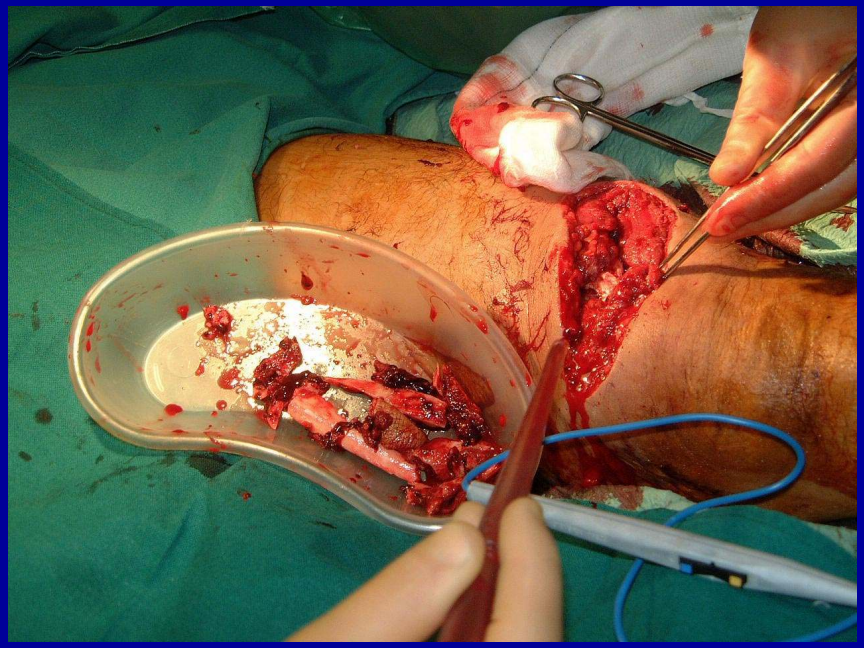
- Left undebrided and unstabilised up to 24 hours in *specialist centres*
- Use plates
- Selective primary closure

Military Limb Salvage

- Initial surgery in the field (Camp Bastion)
- Evacuate to static base hospital & definitive management (at Birmingham)

Initial Surgery for Military Wounds

- Explore, debride and wash out
  - remove all foreign and non-viable material
- **Stabilise fractures**
- Antibiotics and tetanus prophylaxis
- Evacuate/transfer the casualty



Stabilisation?

Initial Stabilisation of Fractures

- We use:
  - Plaster
  - Traction
  - External Fixation

We are constantly being told we should use ORIF!

People aghast that we use a Thomas' splint

Plaster

Originally developed for battlefield use

Cheap

Easy to use

Little equipment

Trueta (1939) – Spanish Civil War

- Debridement and total encasement in POP
- Allow to heal by secondary intention
- 1073 fractures
- 2 deaths from infection
- 88% 'good results' – healed, no osteomyelitis

Plaster is good for

- Simple fracture - low-energy transfer
- Moderate soft tissue injuries

Plaster - problems

- Wont maintain length
- Not good if significant bone loss
- Not good for femur/humerus
- Are these problems with the wound?

- Poor access to wounds (problem?)
- How does TNPT work

Witschi (1970) - Vietnam

- 84 tibial fractures treated in POP
- 23 'high velocity' injuries
- All healed 18-22 weeks
- 83% <1cm shortening
- **8.3%** chronic osteomyelitis

Skeletal Traction

Skeletal Traction – good for

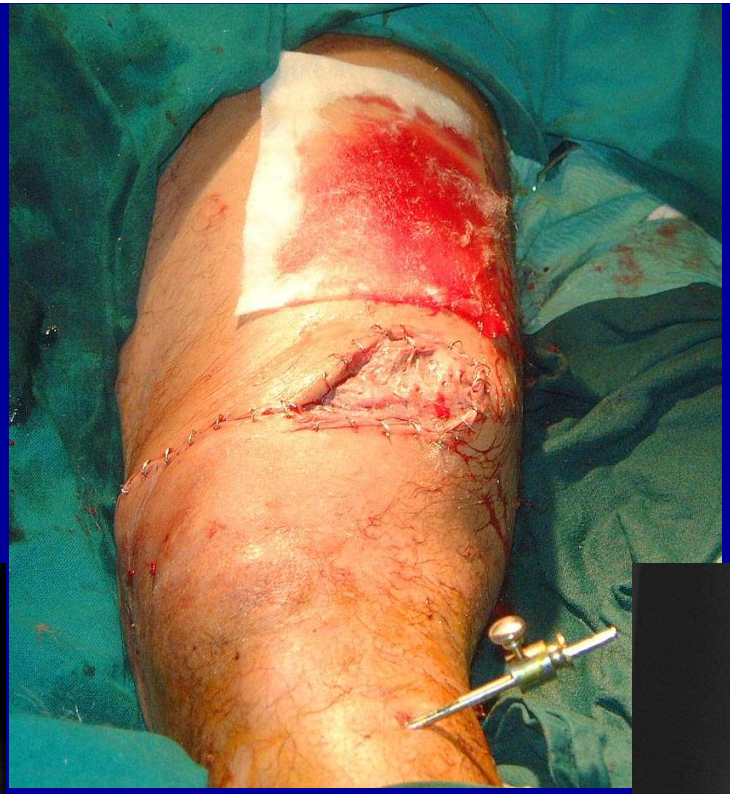
- Lower limb especially femur
- Multifragmentary fractures as you can prevent shortening

- Not going to transfer casualty

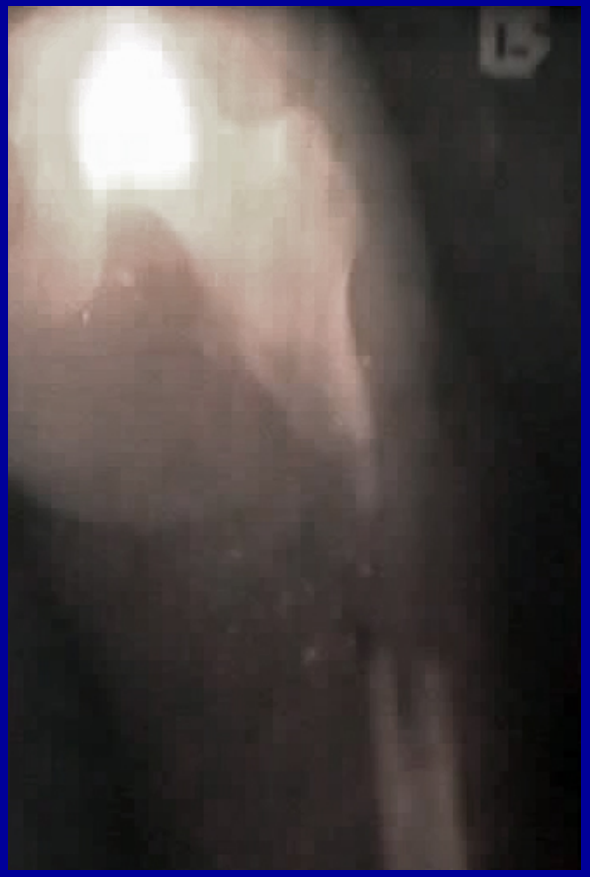
Skeletal Traction – problems

- Not good for severe soft tissue injuries
- Casualty evacuation/transfer difficulties

- 'Not rigid enough'



Traction



4 months

Ryan et al – J Trauma 1981

- 43 low velocity GSW fracture of femur
- Minimal debridement in ER
- Admitted for skeletal traction
- All healed, 1 pin track infection
- 'healed faster than closed fractures'

Clasper & Rowley - JBJS(Br) 2009
ICRC Hospital Lopiding, Kenya

- 52 patients with a minimum of 24hrs without any surgery
- 1 died - ? Related
- 3 amputations for persisting infections
- 48 healed
- 4 needed permanent shoe raises

Gustilo RB, Anderson JT. Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones: retrospective and prospective analyses.

J Bone Joint Surg [Am] 1976;58-A:453-8.

- **Advocated plaster or traction for open fractures to <u>reduce</u> the infection rate**

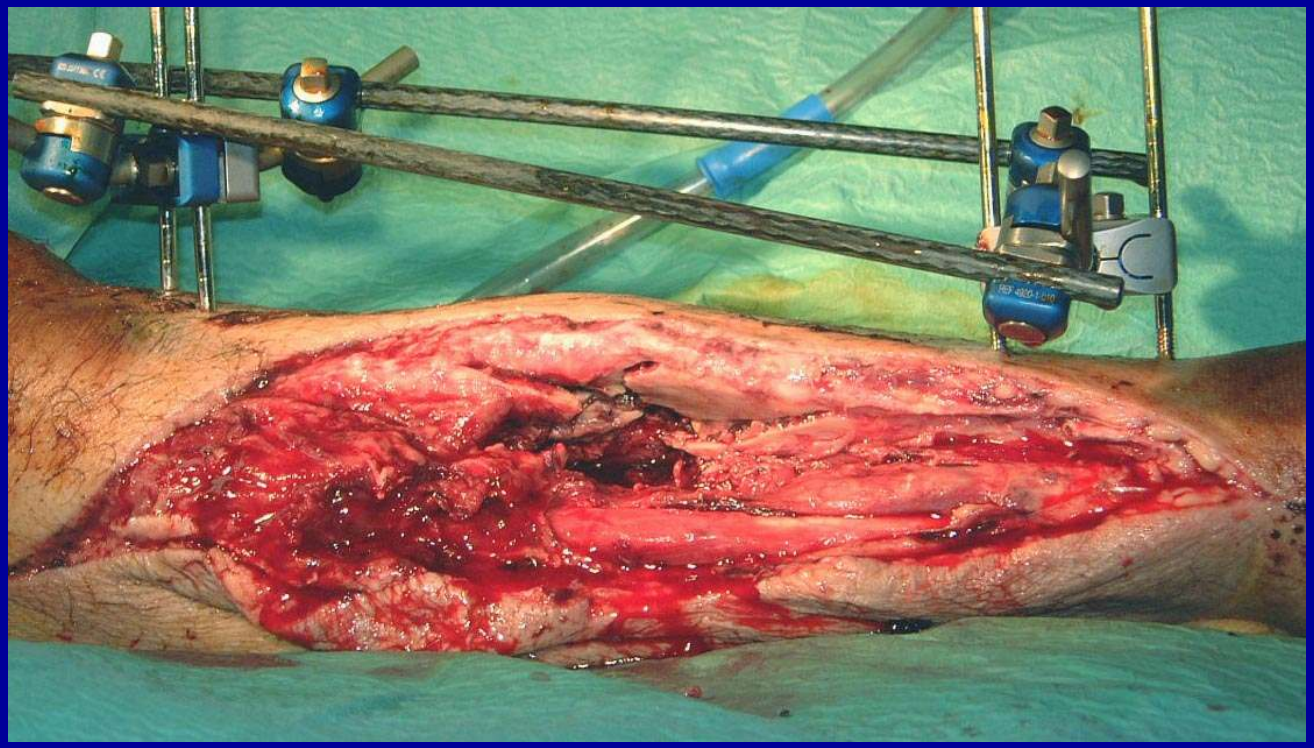
Chapman MW. Role of bone stability in open fractures. ***Instr Course Lect*** 1982;31:75-87.

- SAID that was inadequate

Zalavras CG, Marcus RE, Levin LS, Patzakis MJ. Management of open fractures and subsequent complications. *J Bone Joint Surg [Am] 2007;89-A:884-95.*

- Doesn't even mention them as options

External Fixation

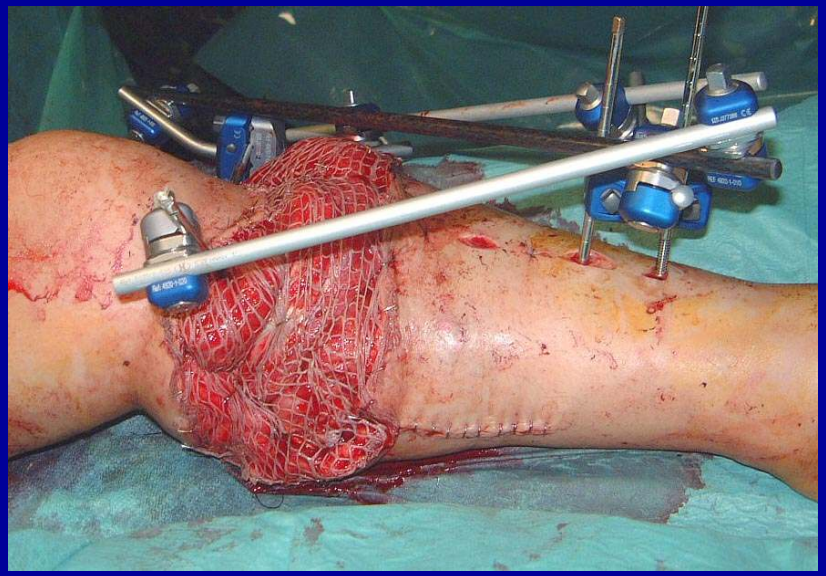


Has (1995) - Croatia

- 'external fixation is the method of choice for these open fractures'
- 9.3% osteomyelitis

Clasper & Philips J RAMC 2005

Prospectively follow-up all external fixators managed at 1 field hospital during Gulf War



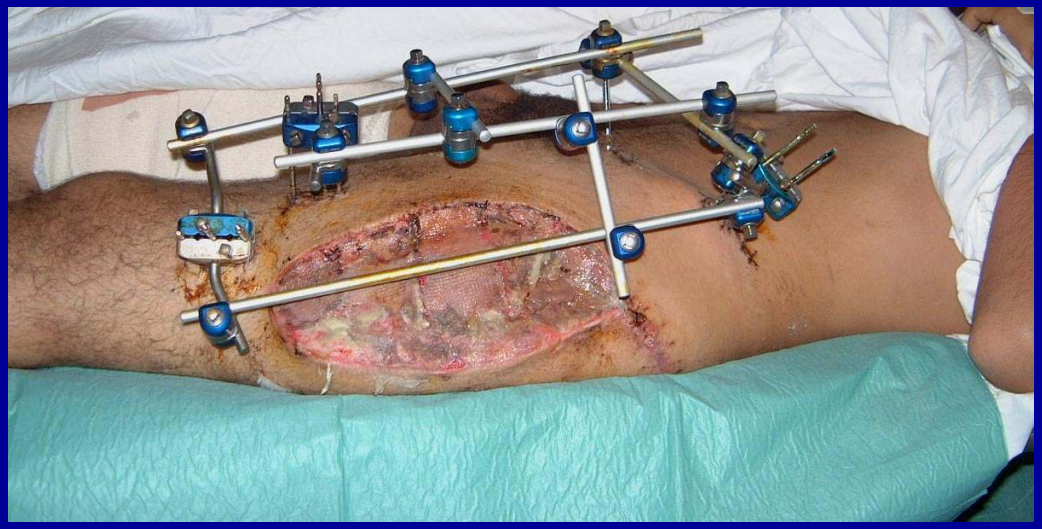
Instability at Fracture Site

- 10 (67%) unstable – all applied to stabilise fracture site
- 7 revised – limb shortened
- 3 removed
  - 1 treated by POP
  - 1 treated by skeletal traction
  - 1 required amputation

Main Factors in Failure

- Injury severity and frame design
  - Multifragmentary fracture with gap
  - Unilateral frame
  - Use on femur or across knee
- Traction better?
- Type of fixator
- Experience of surgeon

Better with Traction?



Dubravko (1994) – Balkans (Experienced Unit)

- 116 external fixators, 109 patients with open fractures from missile injuries

- 46 tibial fixators
- complications occurred in 79 (68.1%);
- pin track infection occurred in 35.3%
- pin track osteomyelitis in 7.8% of patients

Thoughts/knowledge

- Using POP/Traction initially DOES NOT increase the infection rate
- Loose fixation devices increase infection risk
- Unstable Ex Fix leads to pin loosening
- This leads to infection
- This is not the same as instability at the fracture site

Acute Internal Fixation

- Tried in WW1, WW2, Vietnam and Gulf
- Technically demanding
- High infection rate

- Has a secondary role in base hospitals

Secondary Management

UK - Management at Base Hospital

- Wound inspection +/- debridement (within 24 hours)
- Consider TNPT dressings
- Further debridement as required
- If appropriate internal fixation

DCO – Mody et al, *J Trauma.* 2009;67: 758-761

- 58 patients median 9 days to IM nail
- 88% open, 57% femoral
- Median follow-up 447 days
- 40% infection rate, 70% union, 57% kept nail
- *Acinetobacter baumannii* and *Staph* spp.

- ***'Despite infection, fracture union and nail retention rates were high, suggesting a good outcome'***

Results

- US – 17% osteomyelitis
- Most common cause of late amputation S. Aureus osteomyelitis – implant bug!
- Some centres have stopped nailing after Ex Fix – others 'good outcome'

- Our provisional results
  - Secondary amputation rarely for infection
  - Osteomyelitis rate 5 - 10%

Summary

- Military surgery involves the management of open fractures
- Aim is to the reduce infection rate
- POP and Traction still have a role
- External fixation high complication rate
- Despite treatment osteomyelitis occurs

- Our results aren't any better than historical controls!


Questions?