Principles for treatment of Open fractures

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AO Plastic Surgery
Course 2014

Take home message

Principal recommendations

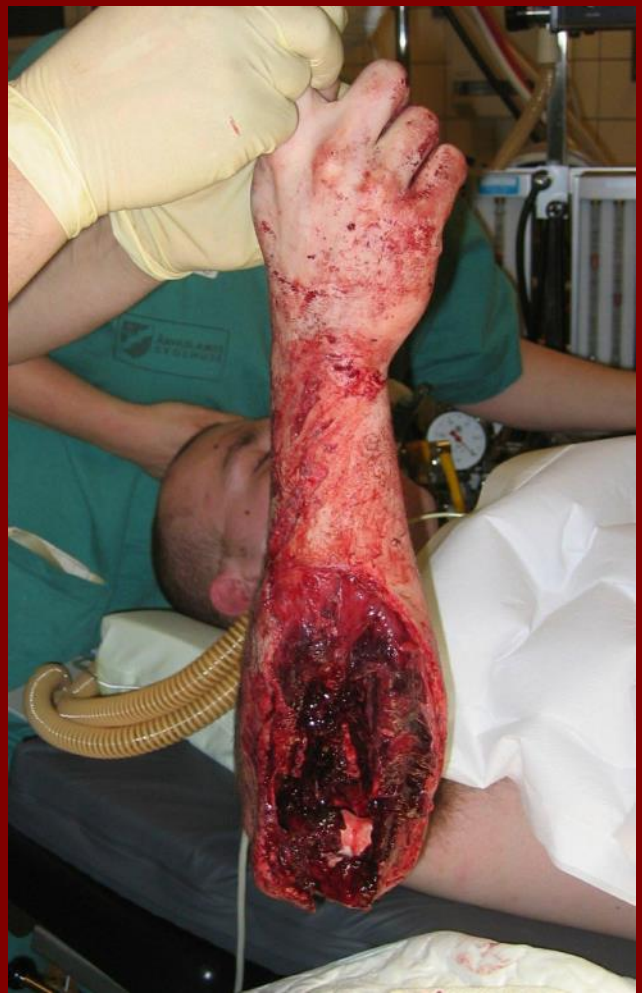
1. A multidisciplinary team, including orthopaedic and plastic surgeons with appropriate experience, is required for the treatment of complex open fractures.
2. Hospitals that lack a team with requisite expertise to treat complex open fractures have arrangements for immediate referral to the nearest specialist centre.
3. The primary surgical treatment (wound debridement/excision and skeletal stabilization) of these complex injuries takes place at the specialist centre whenever possible.

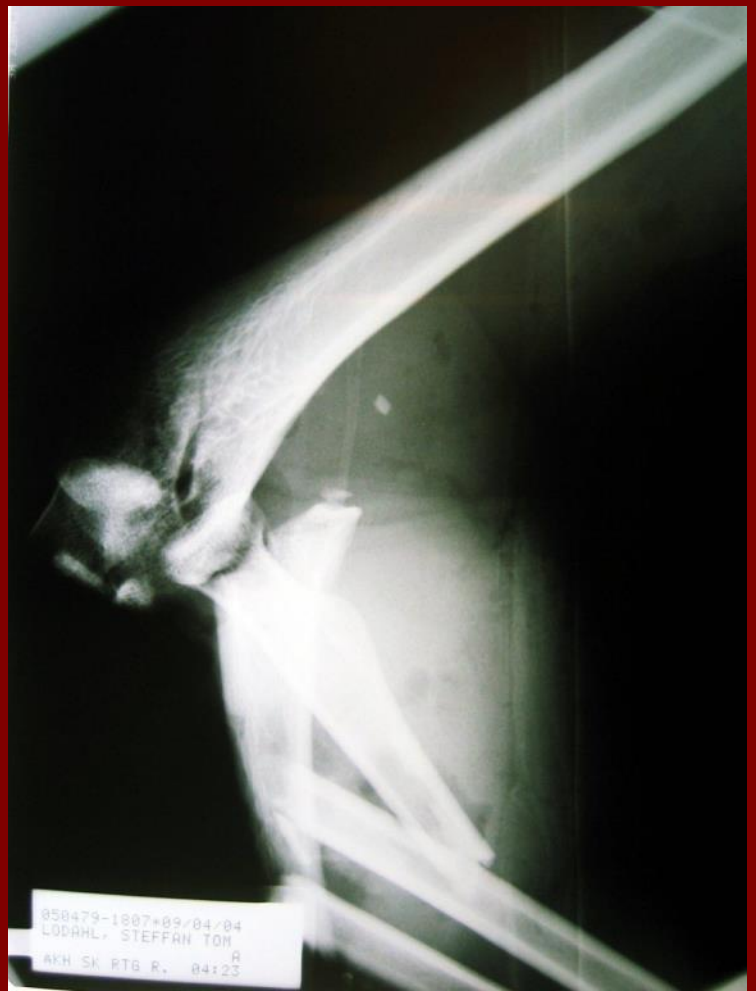
BAPRAS

British Association of Plastic Reconstructive and Aesthetic Surgeons

Open Fractures

Algorithm for treatment





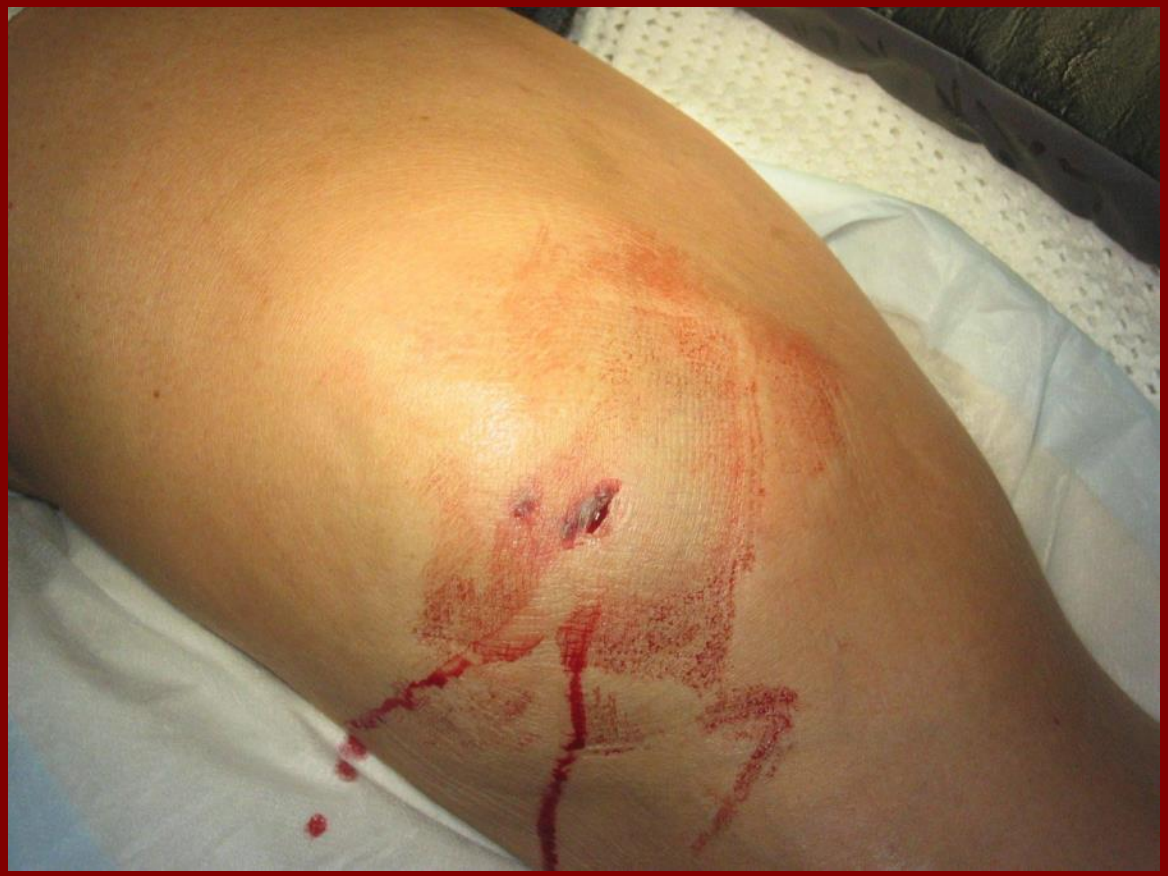
Open fractures - classification

(Gustilo & Anderson 1976 et 1984)

- Several systems
- None very good, non very bad
- Intra and inter observation problems
- Gustilo & Andersen most used and referenced

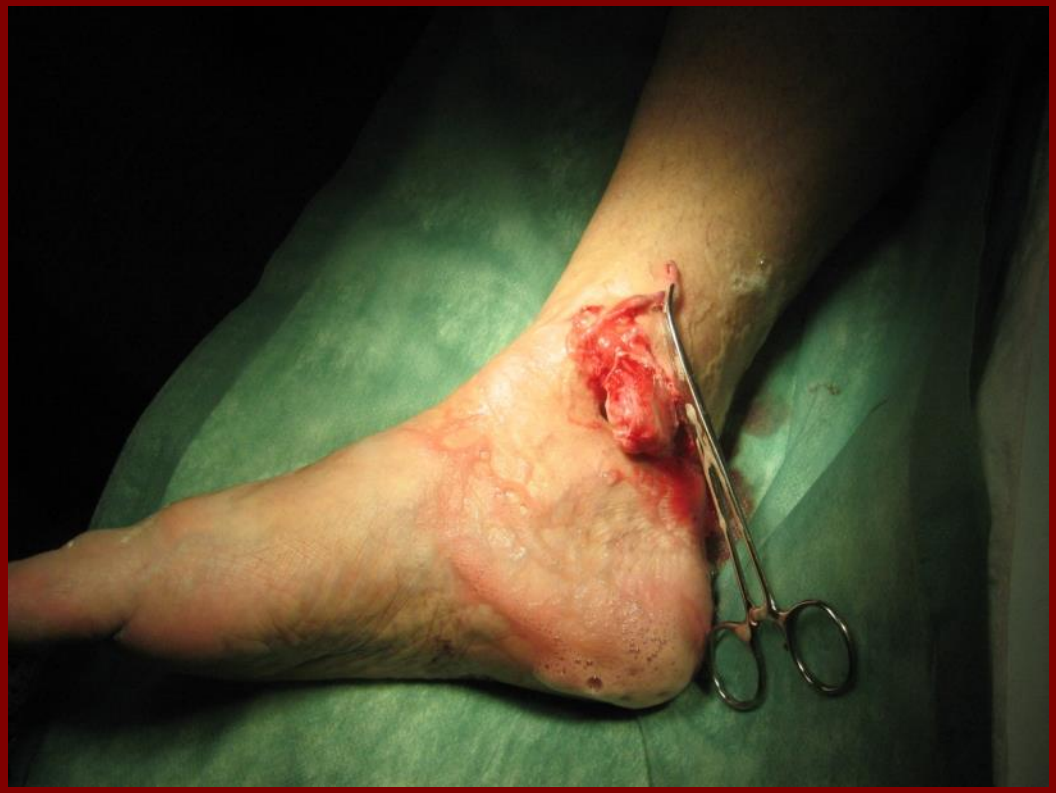
Open Fracture grade I

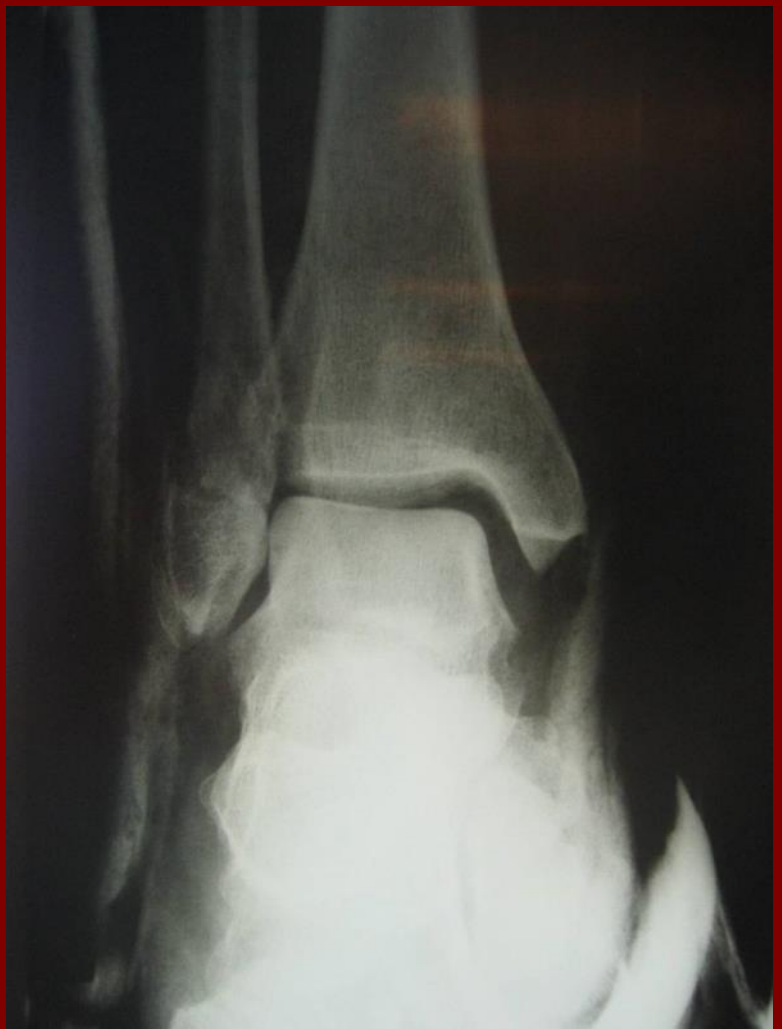
clean wound < 1 cm



Open fracture grade II:

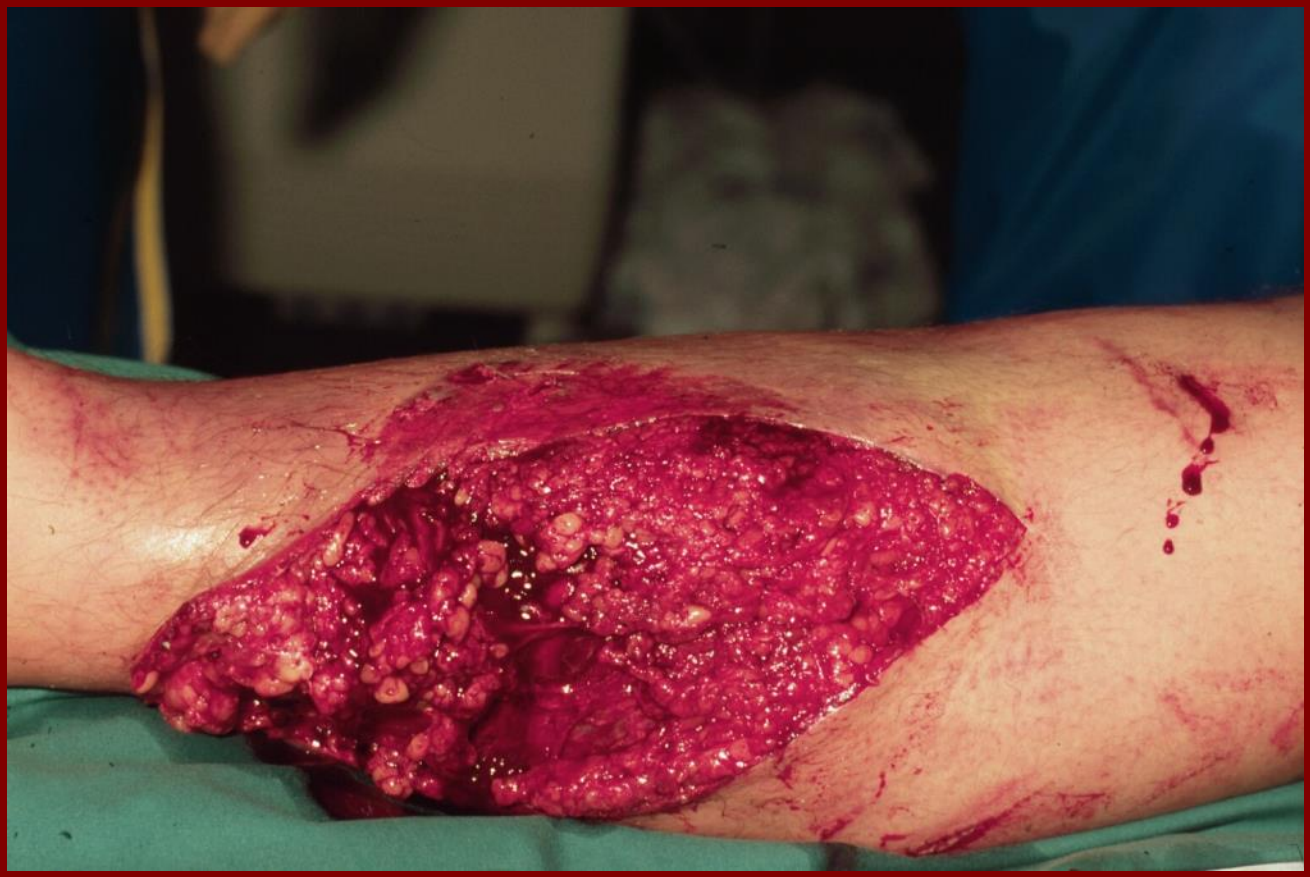
Wound > 1cm, uncomplicated





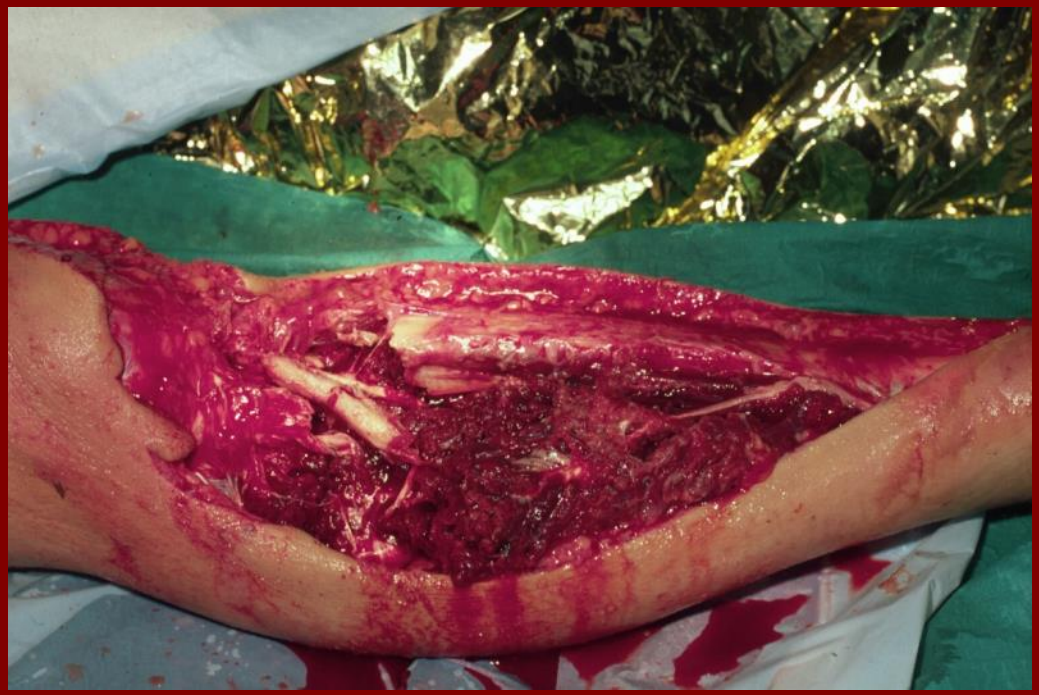
Open Fracture grade IIIA

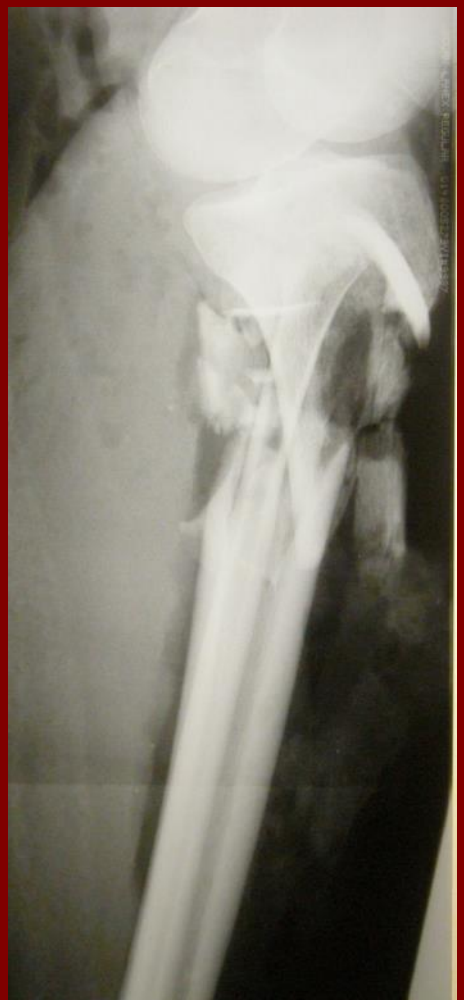
Extensive soft tissue laceration, intact periosteum



Open fracture grade IIIB

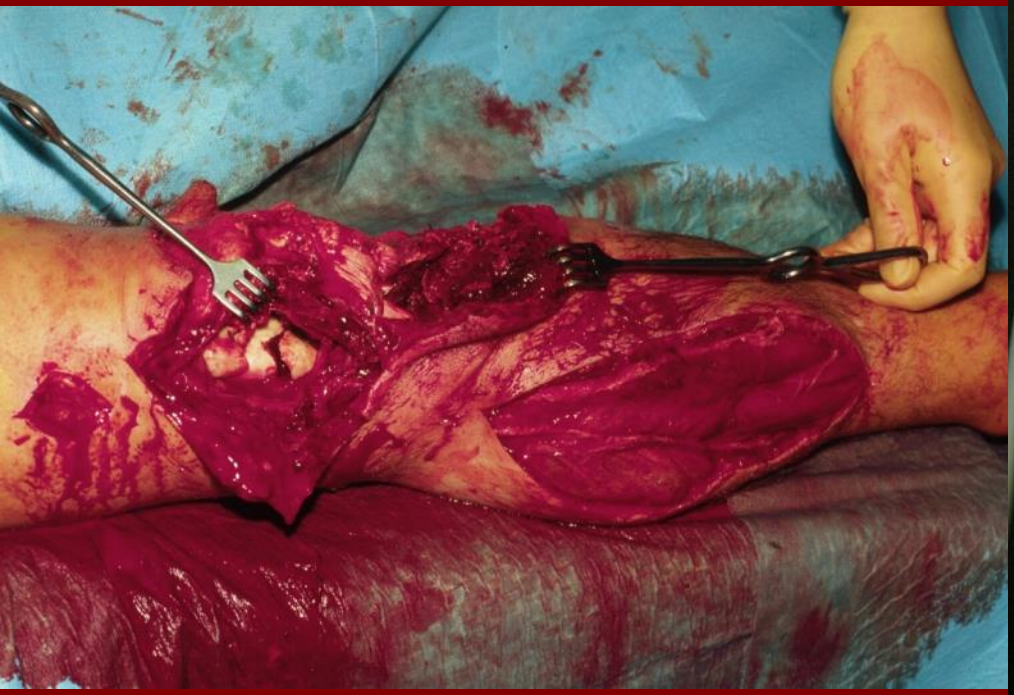
extensive soft tissue loss, periostal stripping, bone damage and often containation

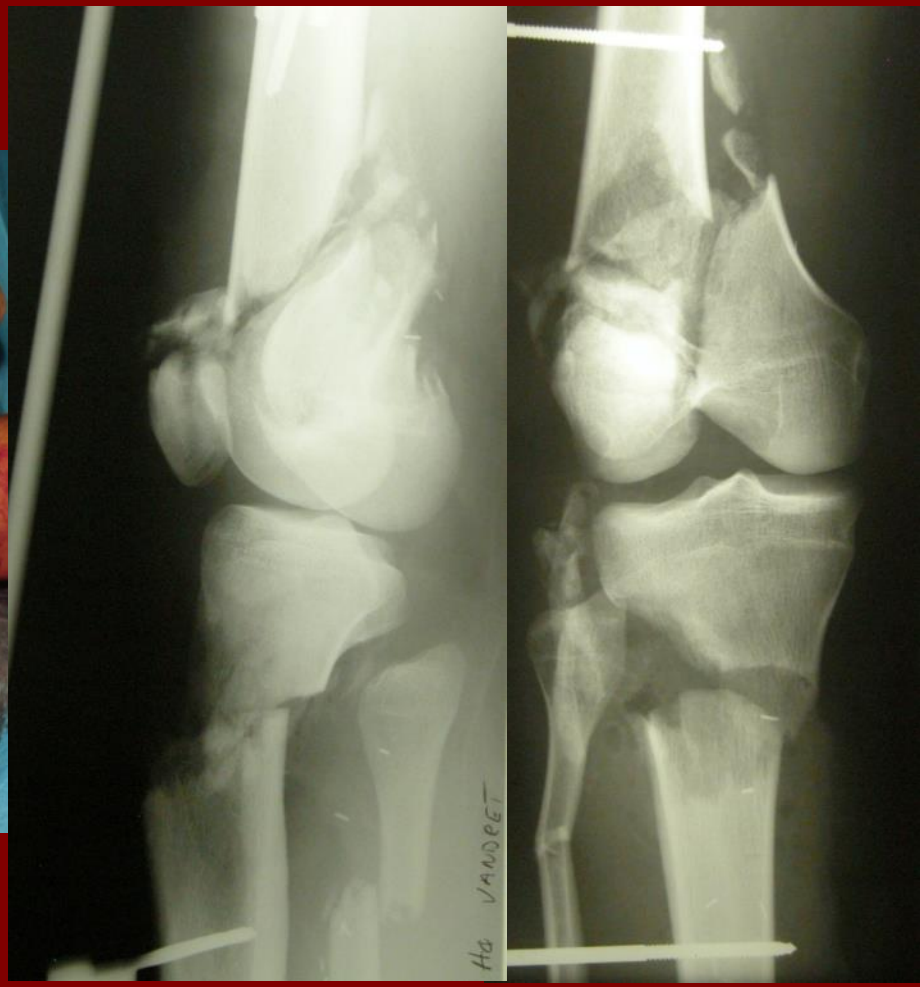




Open fracture grade IIIC

All with arterial injury, requiring surgical repair





Open fracture

Time for heling-Tibiael fractures

Court-Brown et al. 1990

Gustilo type	Time to heling
Type I	15 weeks
Type II	24 weeks
Type IIIA	27 weeks
IIIB	38 weeks
IIIC	74 weeks

Open fracture
Infection

Gustilo Type	Infection %
• Grad I	0-2 %
• Grad II	2-5 %
• Grad III A	5-10 %
• Grad III B	10-50 %
• Grad III C	25-50 %

Management of Open Fractures

CURRENT CONCEPTS REVIEW

TRENDS IN THE MANAGEMENT OF OPEN FRACTURES

A CRITICAL ANALYSIS

BY KANU OKIKE, BA, AND TIMOTHY BHATTACHARYYA, MD

Investigation performed at Partners Orthopaedic Trauma Service, Massachusetts General Hospital and Brigham and Women's Hospital, Boston, Massachusetts

- Antibiotics should be administered to a patient with an open fracture as soon as possible to reduce the risk of infection.
- A patient with an open fracture should be taken to the operating room on an urgent basis, with the stability of the patient, the preparation of the operating room, and the availability of appropriate assistance taken into account.
- Questions remain regarding the optimal solution and method of delivery for irrigation of open fracture wounds.
- Early closure of adequately débrided wounds is safe and can improve outcomes.
- Adjunctive therapies, such as the early application of bone grafts and rhBMP-2, may improve healing of open fractures.

One hundred and fifty years ago, mortality was common following open fracture[1,2]. With the advent of modern therapy, however, the expected outcome has improved dramatically. In the treatment of open fractures, the surgeon's objectives are to prevent infection, promote fracture-healing, and restore function. All patients presenting with an open fracture require initial stabilization, tetanus prophylaxis, systemic antibiotic therapy, prompt surgical débridement and copious irrigation, fracture stabilization, timely wound closure, thorough rehabilitation, and adequate follow-up. In addition, certain patients may benefit from local antibiotic therapy, open wound management (possibly including vacuum-assisted closure), flap closure, bone-grafting, or other adjunctive therapies.

In this review, we analyze the evidence concerning a number of important issues in the management of open fractures, including classification, use of antibiotics, timing of operative intervention, irrigation, fixation, soft-tissue coverage, and adjunctive therapies.

Classification of Open Fractures

A fracture is considered to be open when disruption of the skin and underlying soft tissues results in a communication between the fracture and the outside environment. Open fractures are most commonly classified according to the system developed by Gustilo and Anderson[3] and subsequently modified by Gustilo et al.[4]. According to this system (Table I), type-I open fractures are characterized by a wound of <1 cm with minimal contamination, comminution, and soft-tissue damage. Type II features lacerations of >1 cm and moderate soft-tissue injury, but wound coverage is adequate and periosteal stripping is not extensive. Type-III open fractures are divided into three subtypes. Type IIIA is characterized by high-energy trauma, extensive soft-tissue damage, and substantial contamination, but wound coverage remains adequate after débridement has been completed. Type IIIB is similar to IIIA, except that wound coverage is not adequate and coverage procedures are required. Type IIIC is an open fracture associated with an arterial injury requiring repair. Given the prognostic relevance of soft-tissue and bone injury in the depths of the wound, it is important that open fractures be classified not in the emergency room but in the operating room, after surgical exploration and débridement have been completed.

Recently, the authors of two studies found the Gustilo and Anderson classification system to be associated with low interobserver agreement[5,6]. Brumback and Jones presented 245 orthopaedic surgeons with twelve videotaped case presentations that included patient demographic data, the history of the injury, the results of physical examination, the appearance

Okike & Bhattacharyya; JBJS Vol. 88-A, dec 2006: 2739-2748

Acute treatment

- Initial assesment and treatment ATLS
- Remove gross contaminants
- Photograph for records
- Seal from environment
- Splint the extremity
- Antibiotica as soon as possible

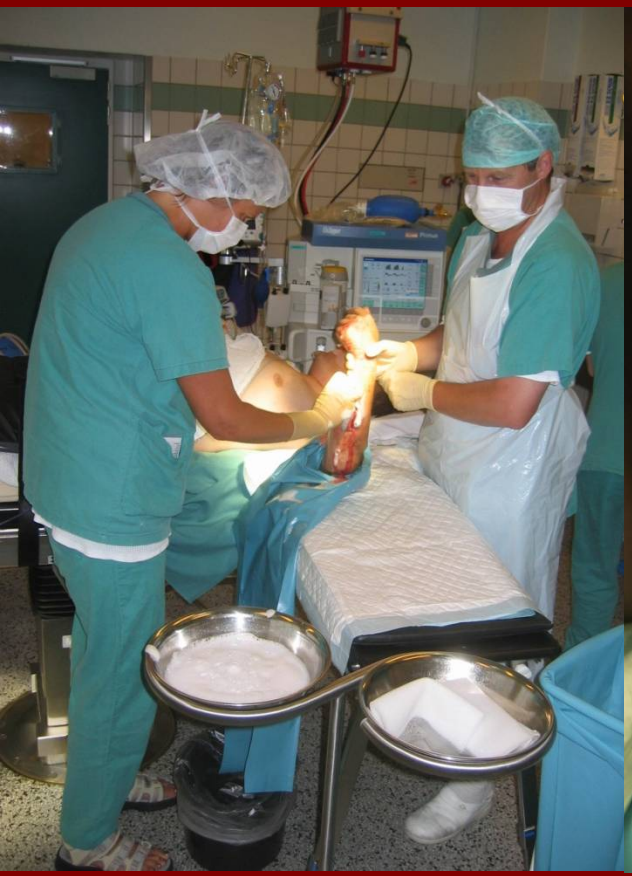
Surgical treatment

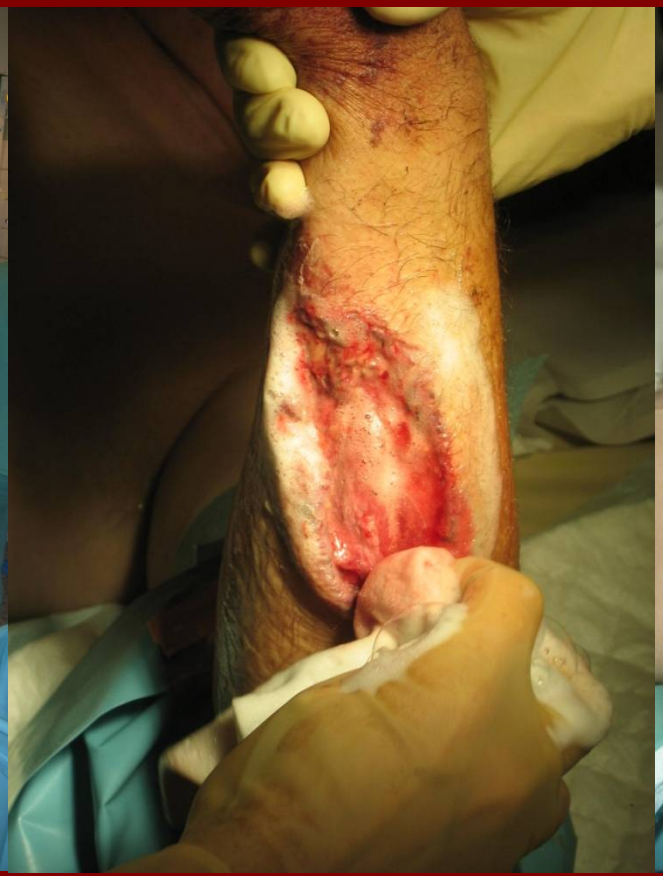
- “The solution to polution is dilution”
- Wash the wound
- Irrigate
- Debride
- Early accurate debridement most important

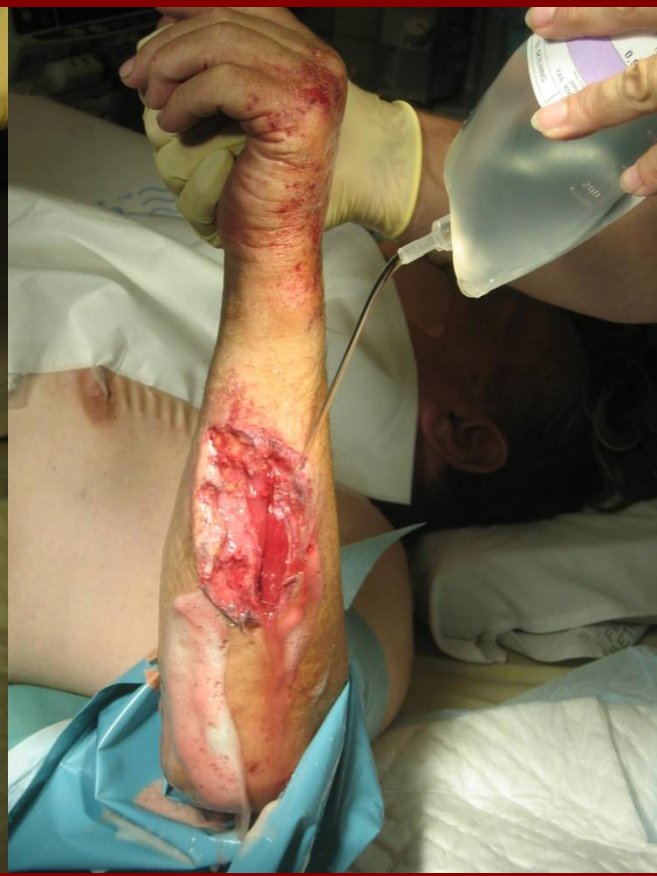
Strategy……

- Now the team decide for a strategy
- Primary closure
- Split skin
- Rotational flaps
- Free flaps
- VAC and later closure
- Orthopaedic procedures

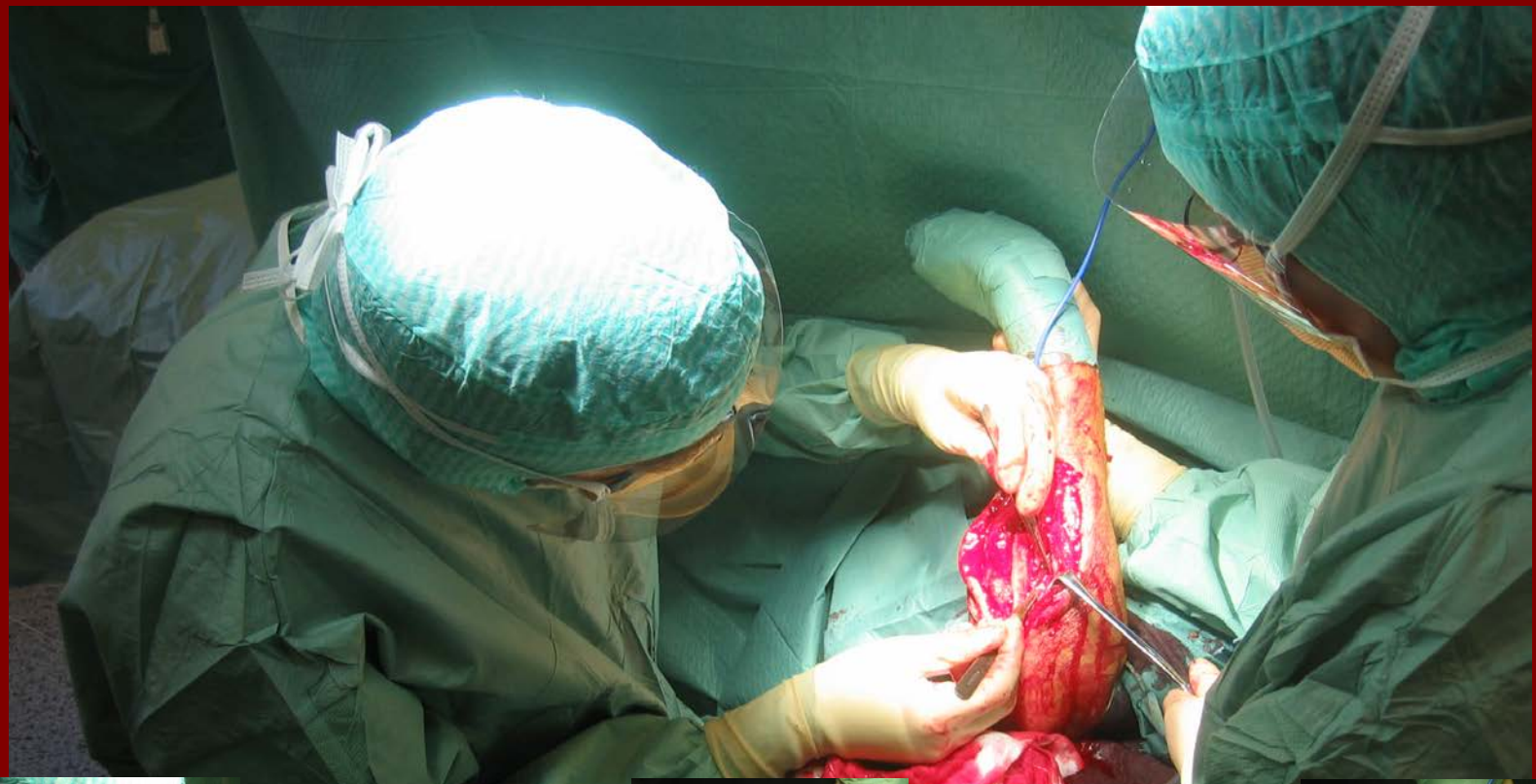
Wash

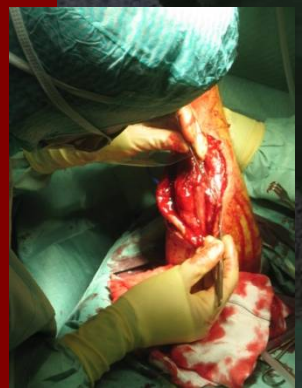


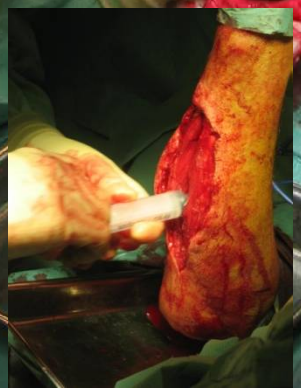


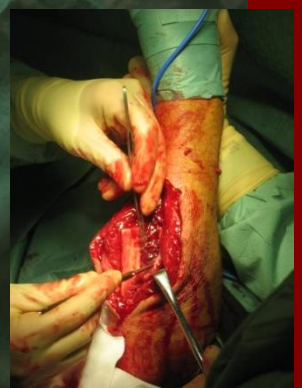


Surgical debridement

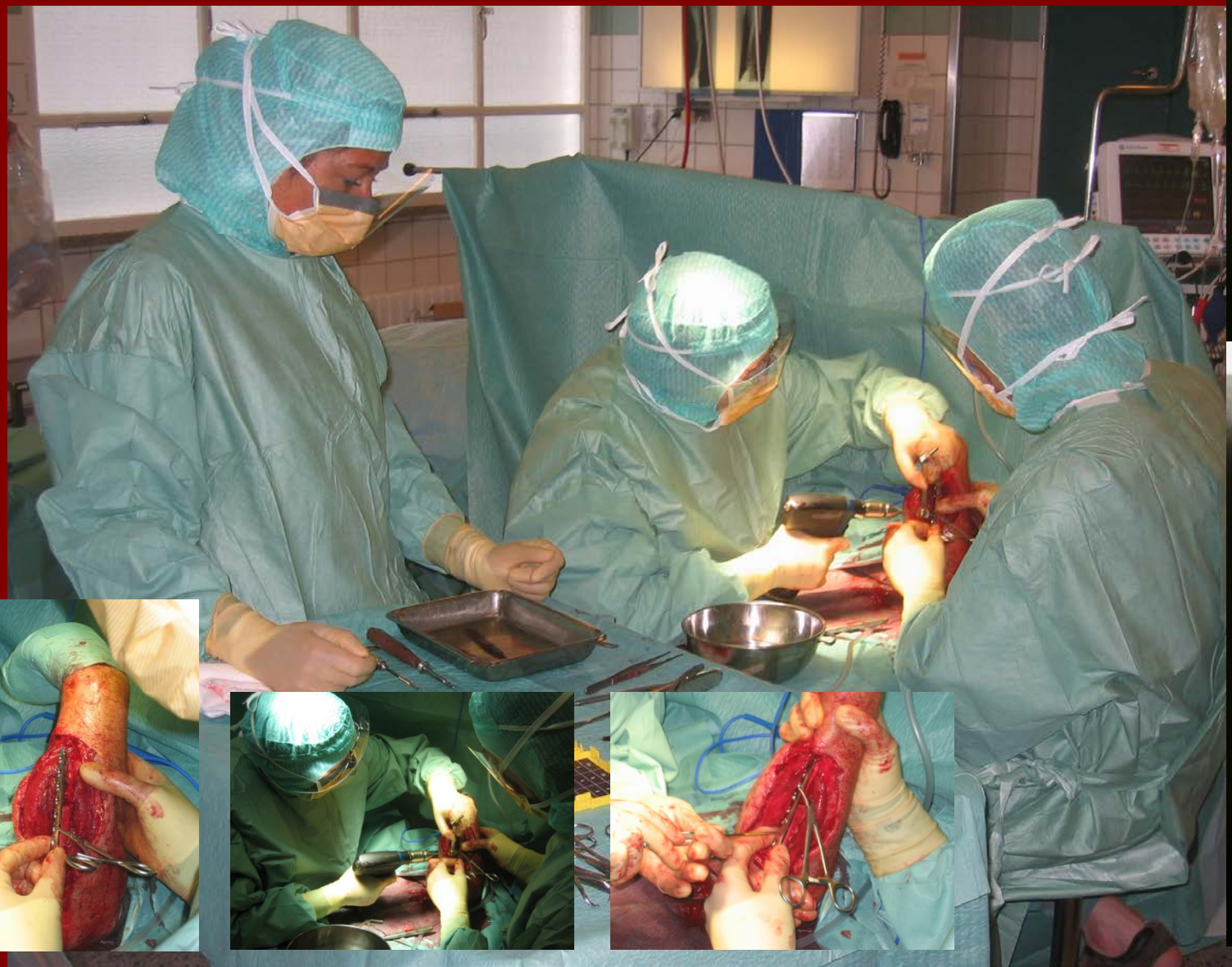


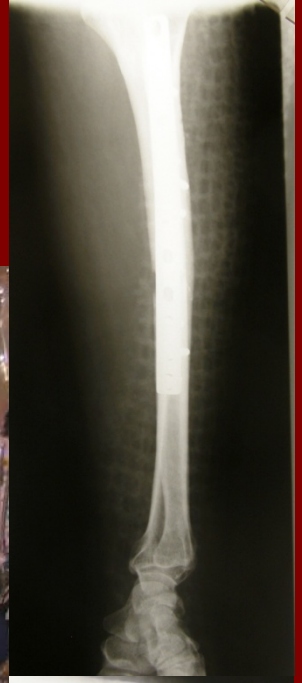


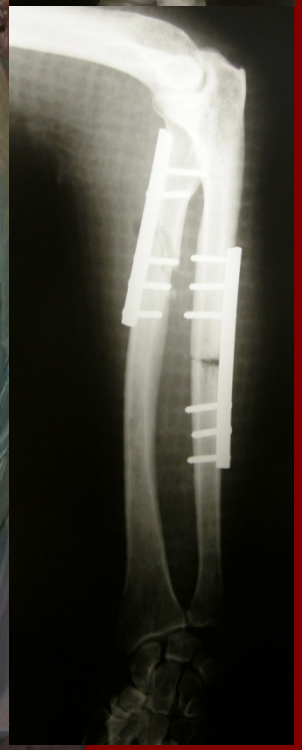




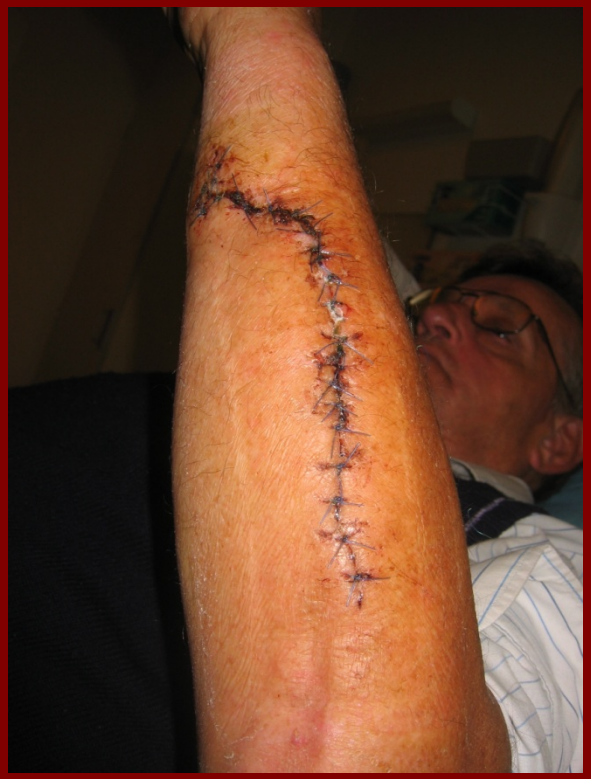
Primary osteosynthesis and wound closure



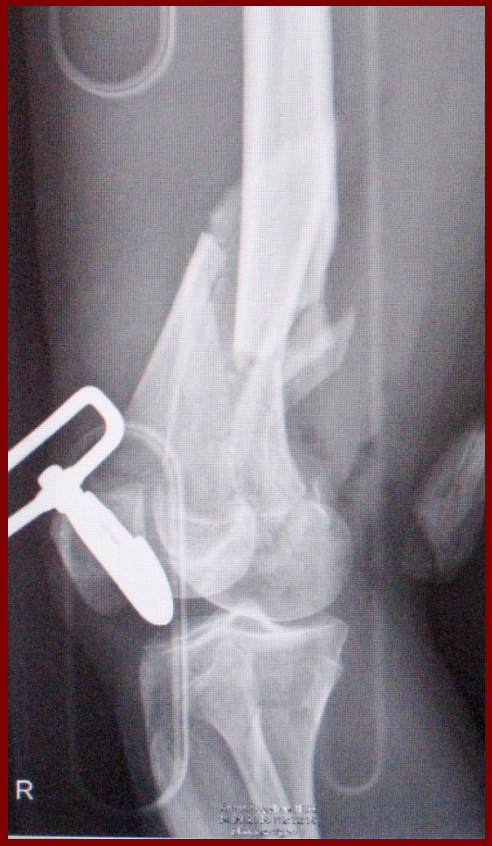


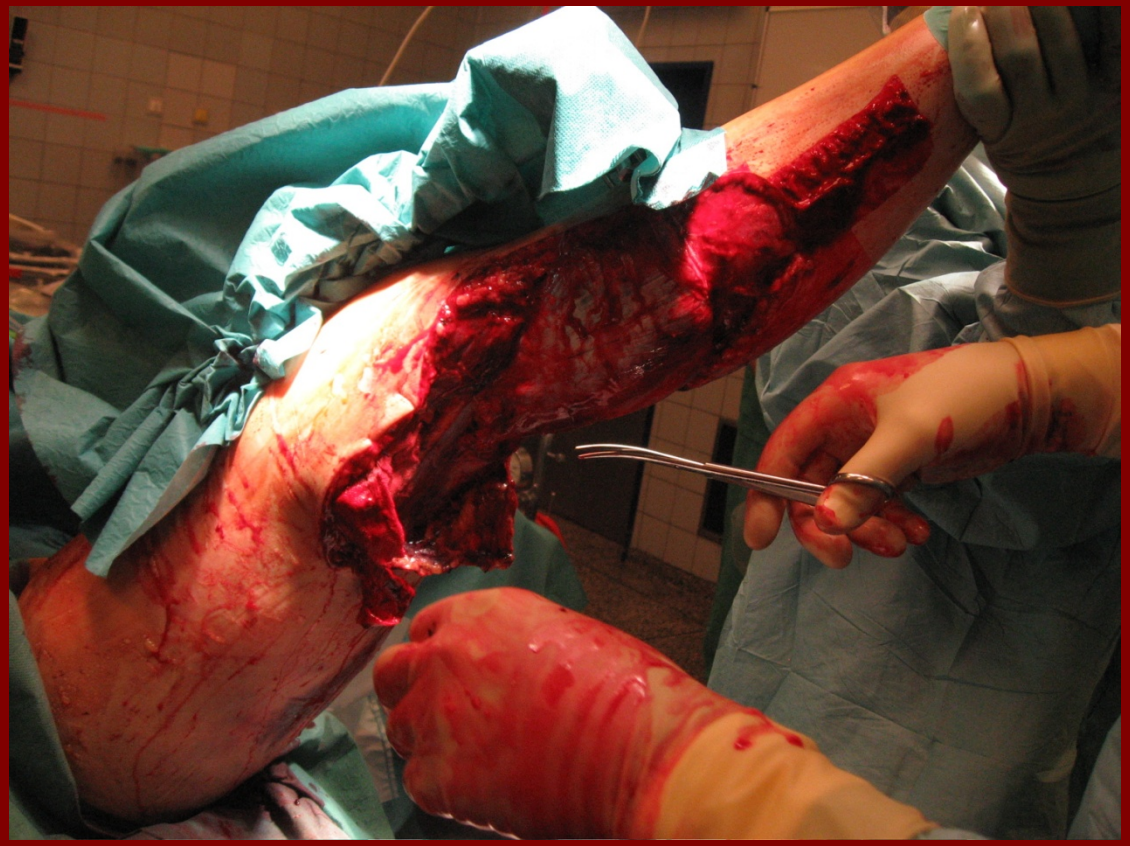


3 weeks...

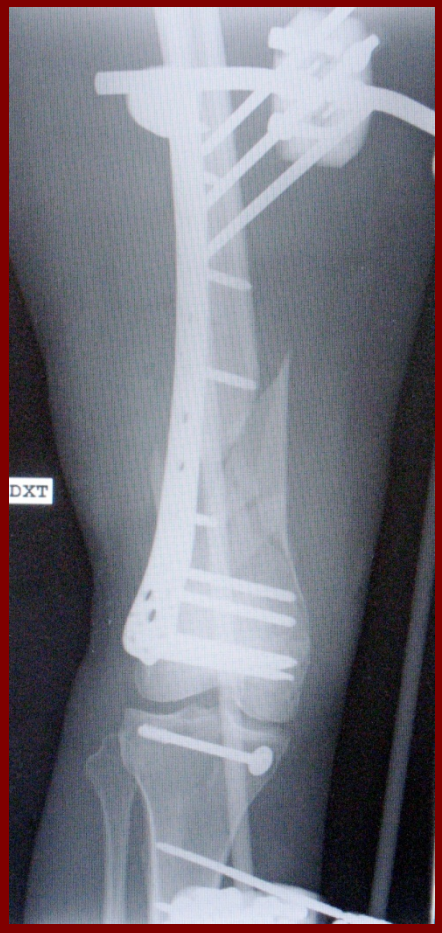


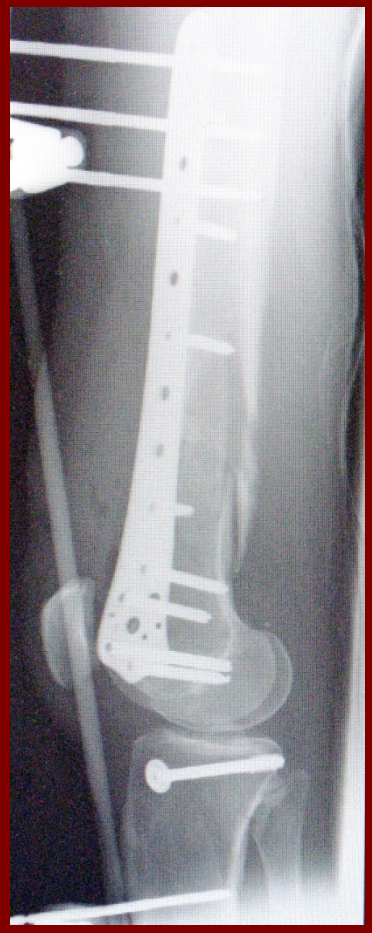
Bike versus bus, decollement.

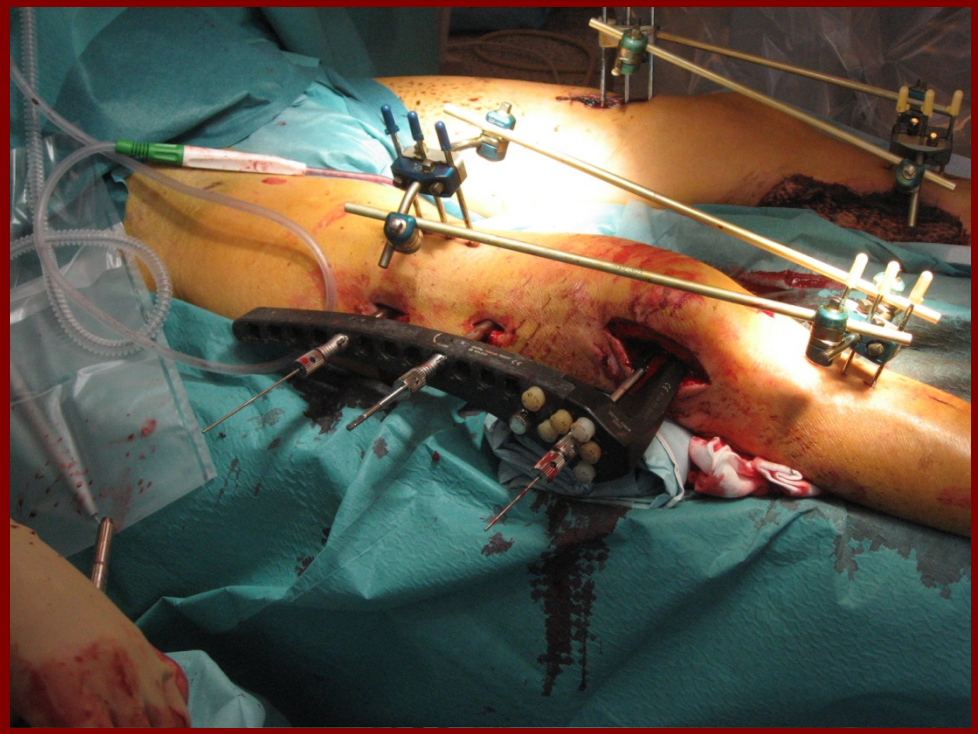




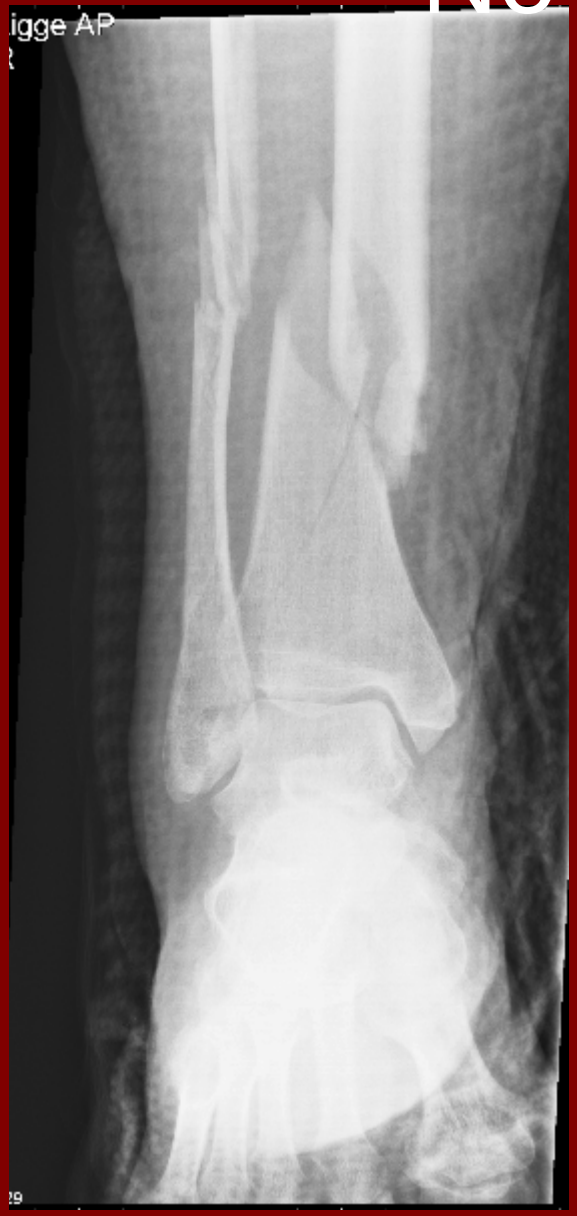
Acute treatment and surgical debridement
Stage 1: ex-fix and split –skin
Stage 2: internal fiation

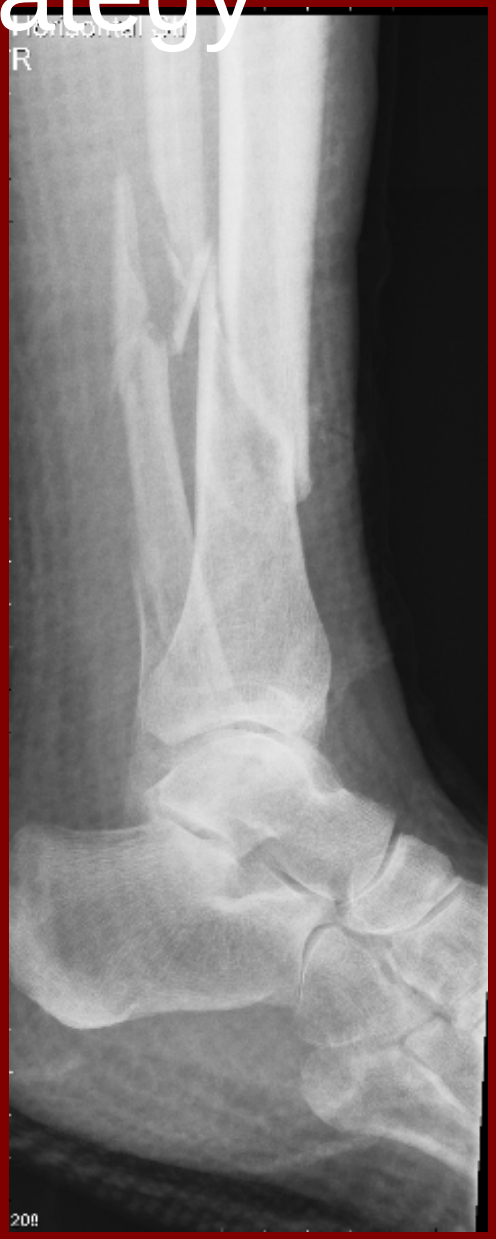


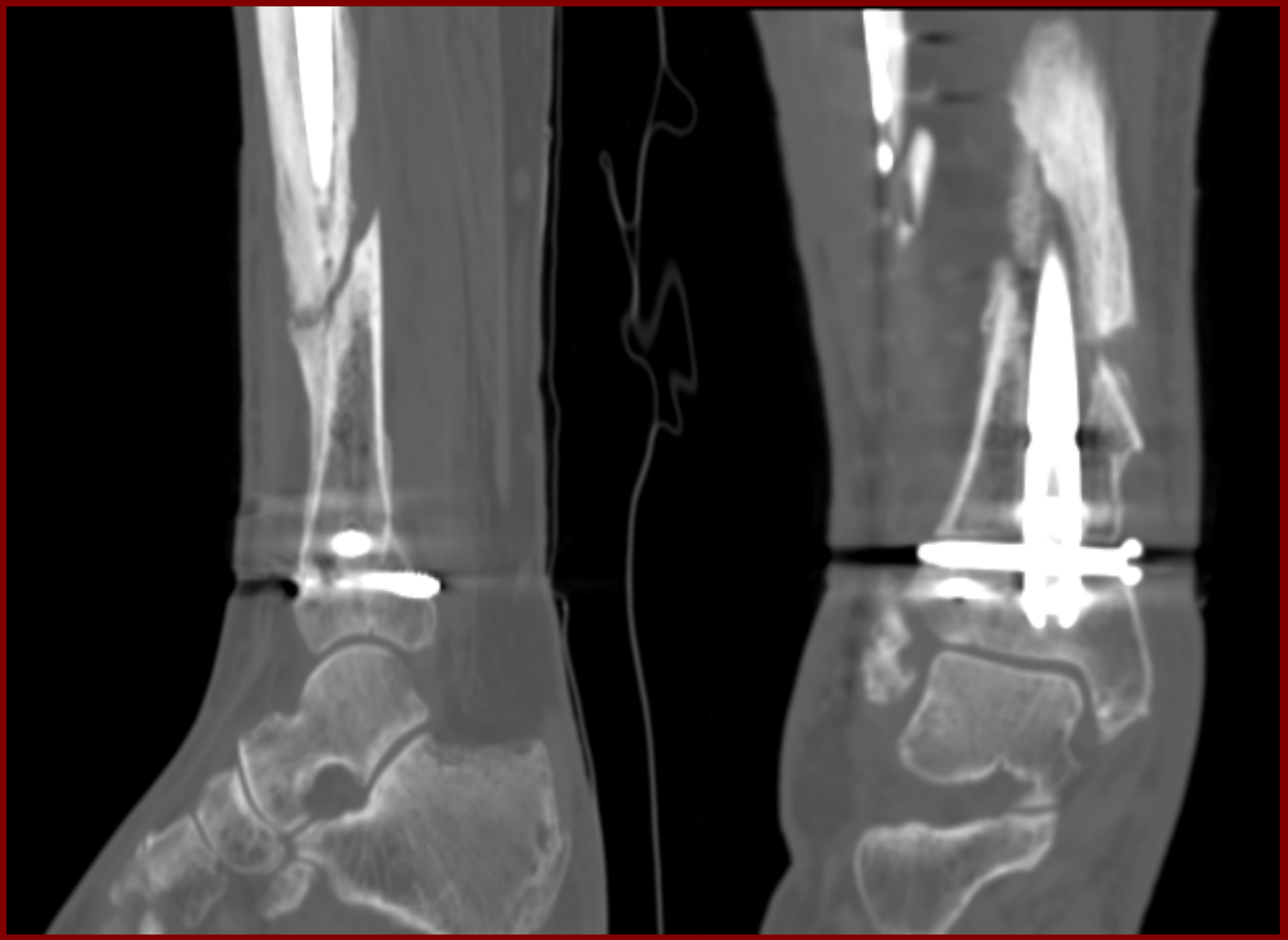


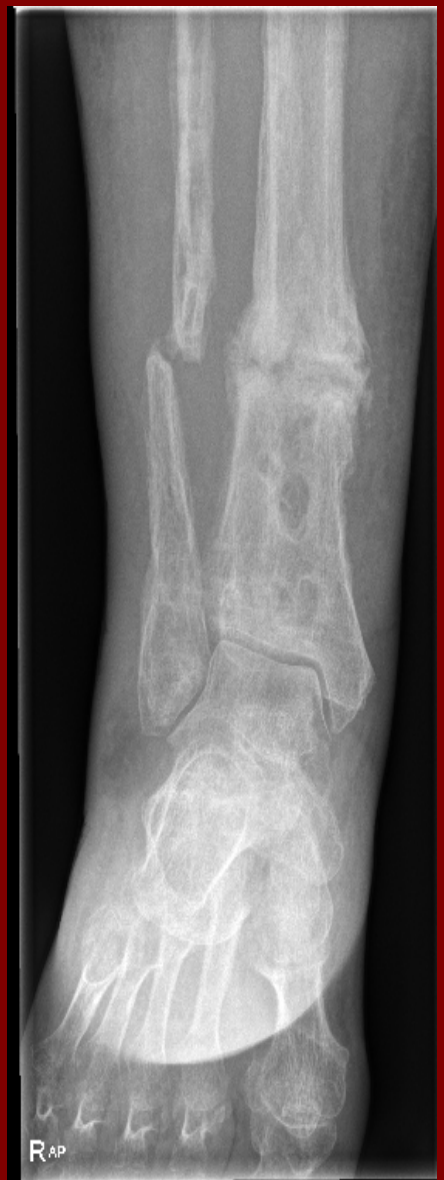


No strategy





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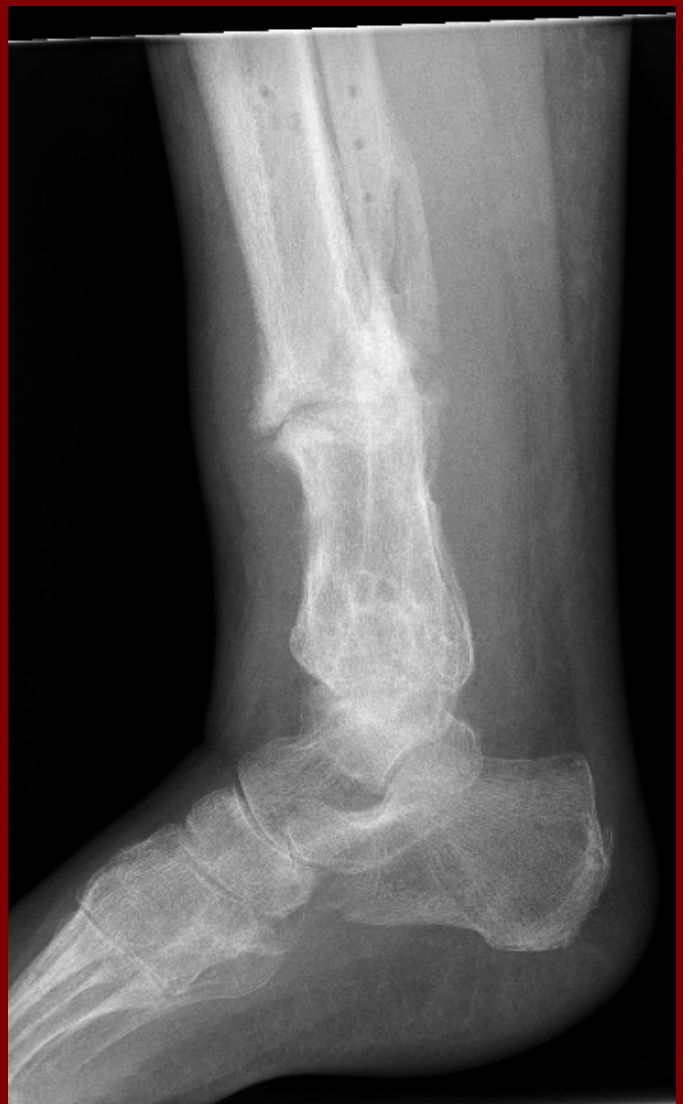

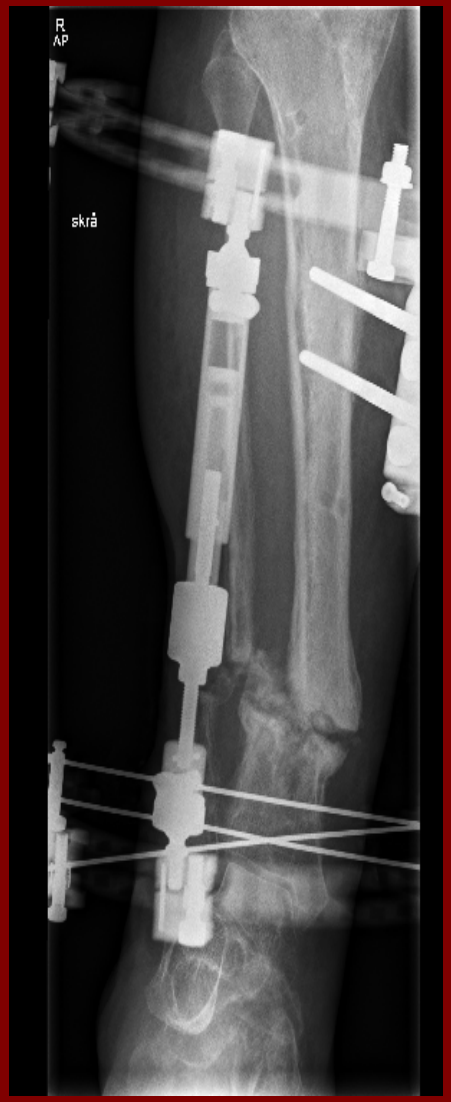
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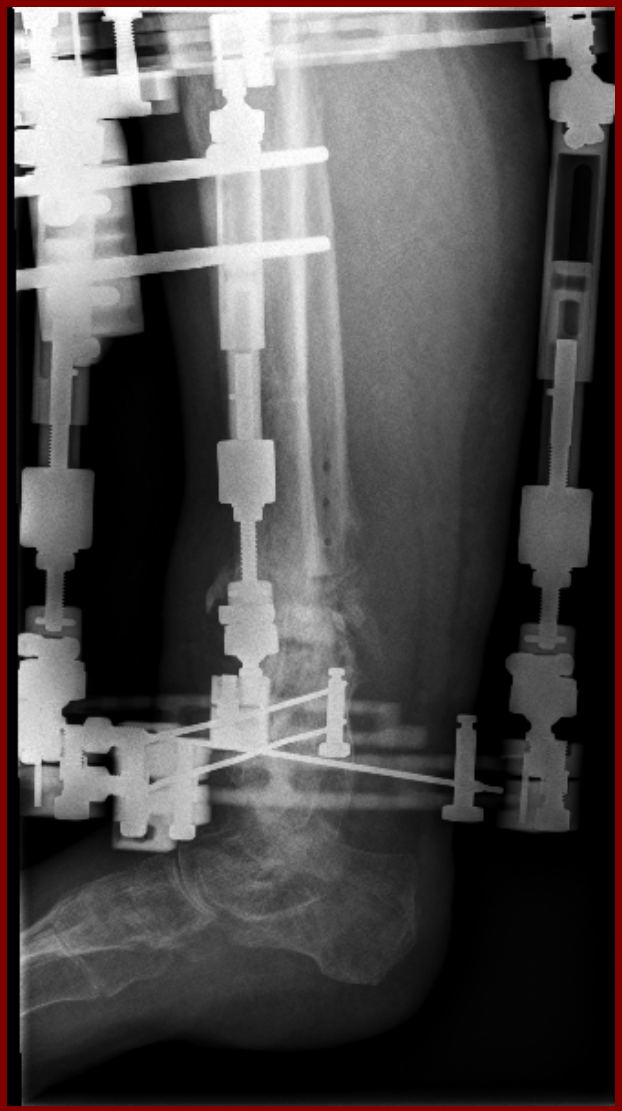

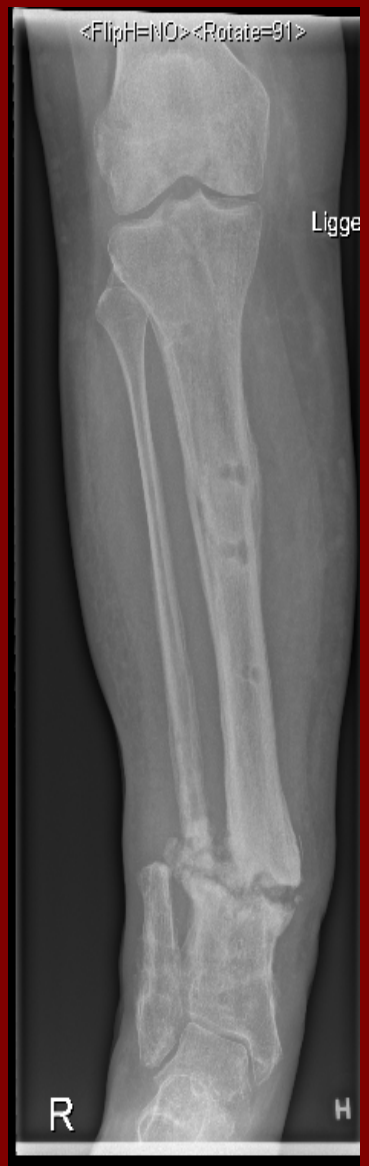
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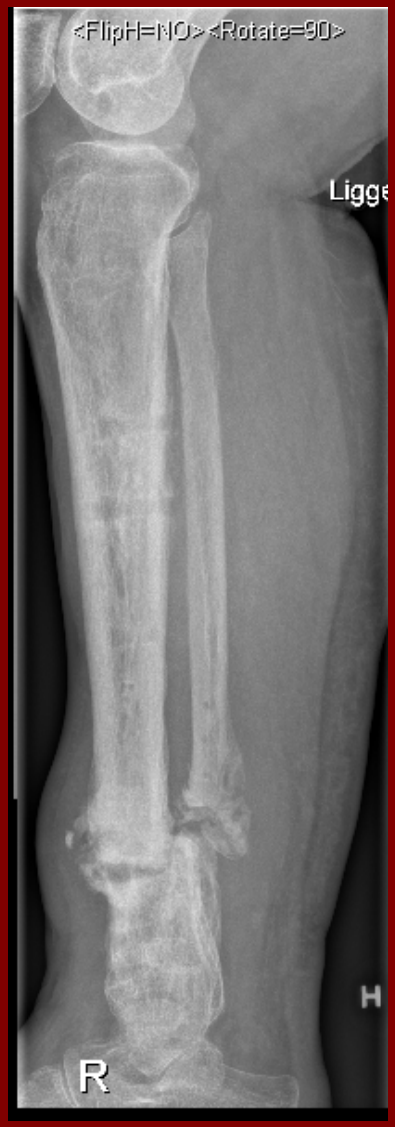
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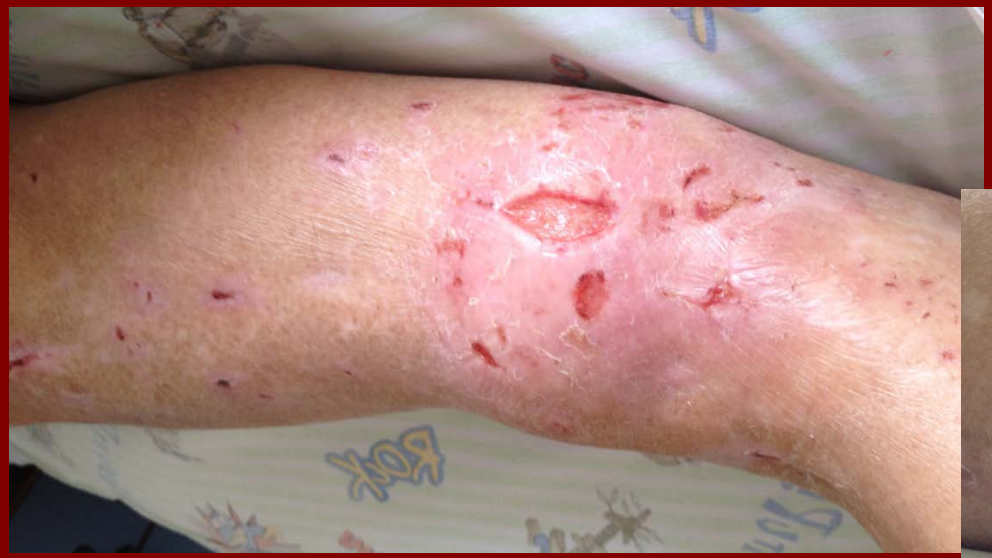
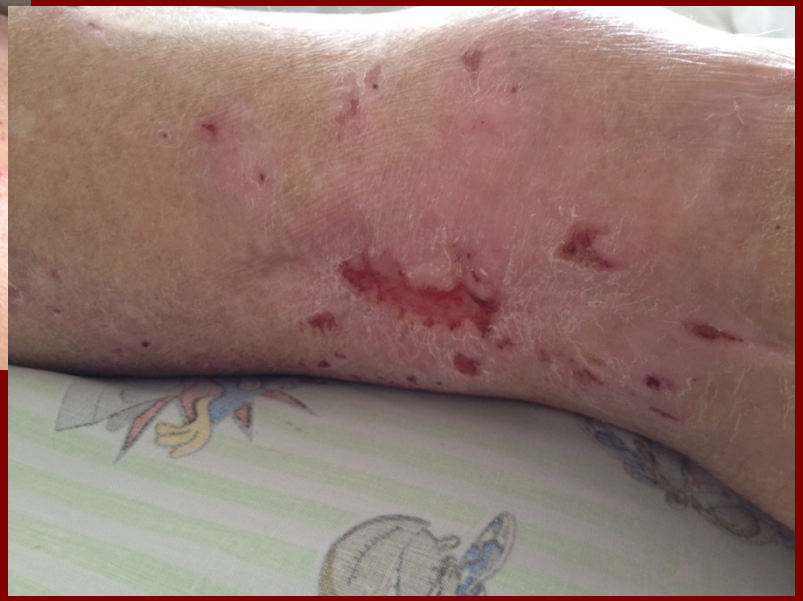
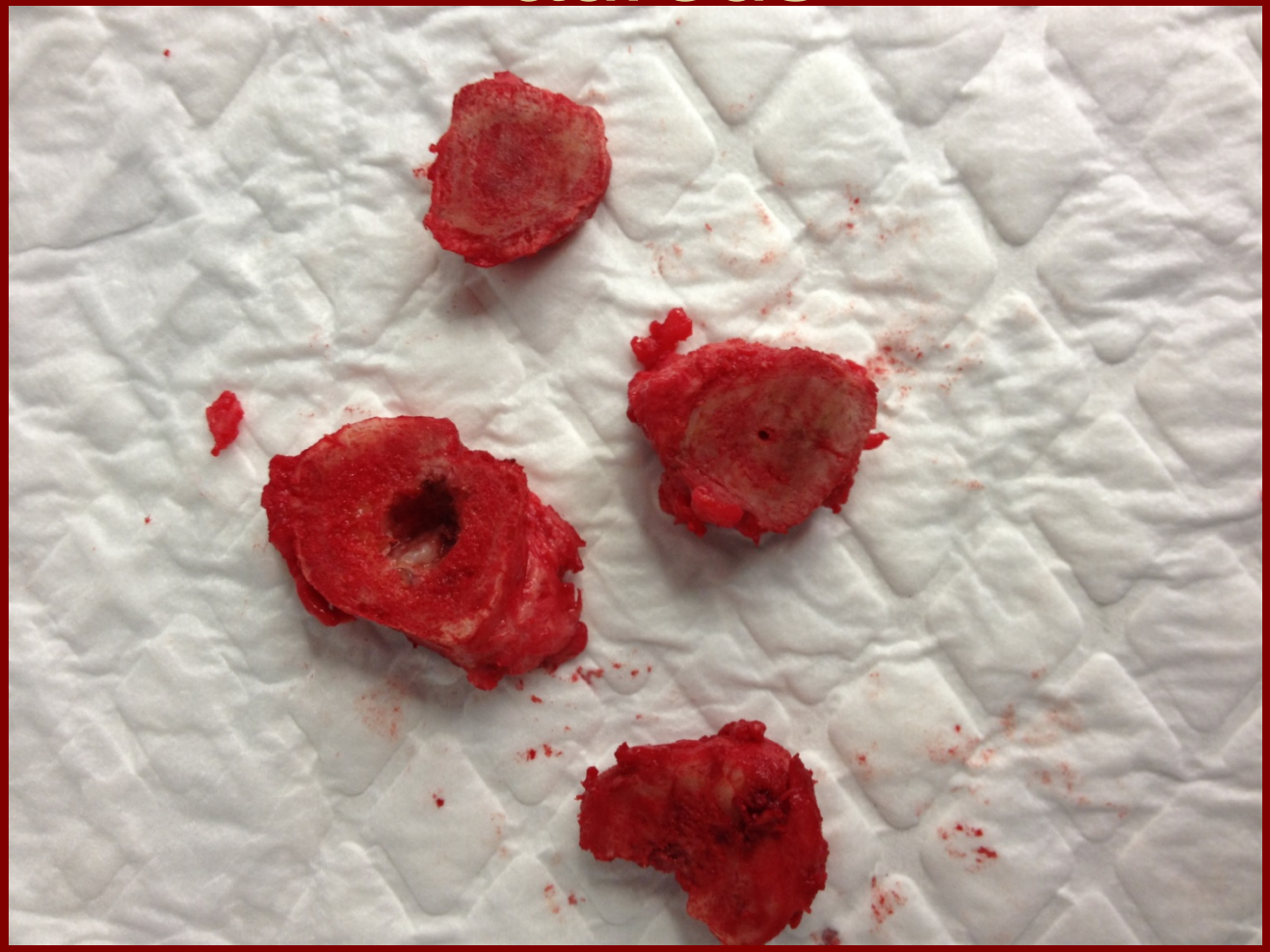




Infected pseudoartrosis staph aureus



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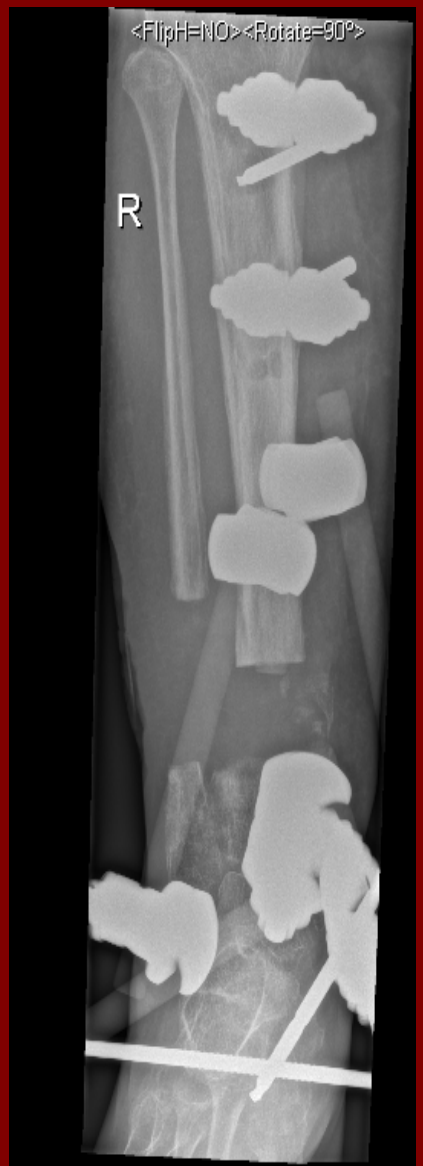
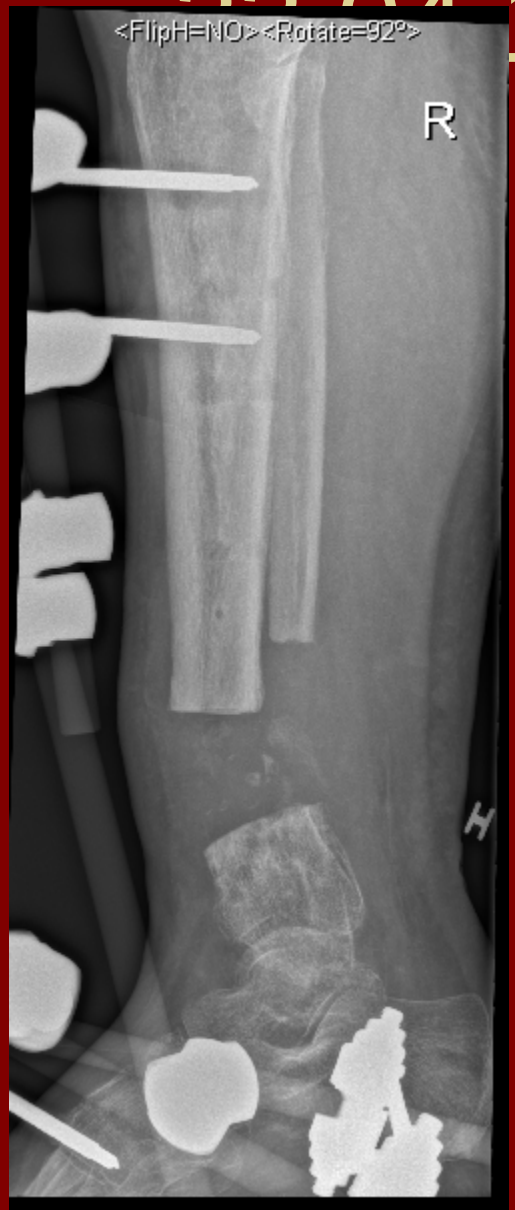
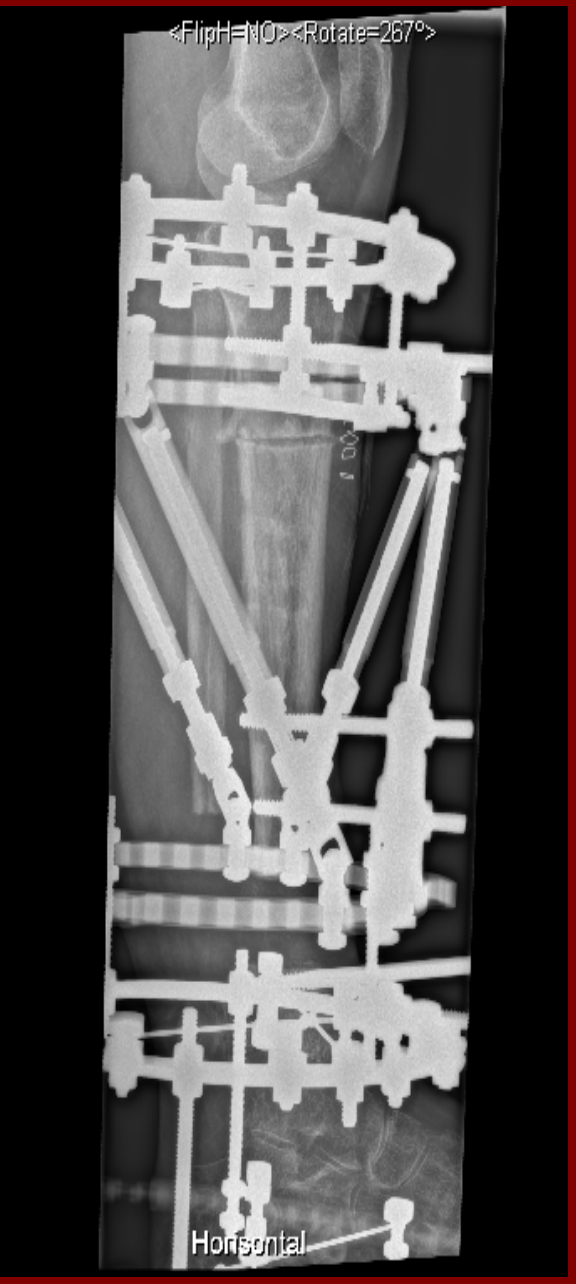
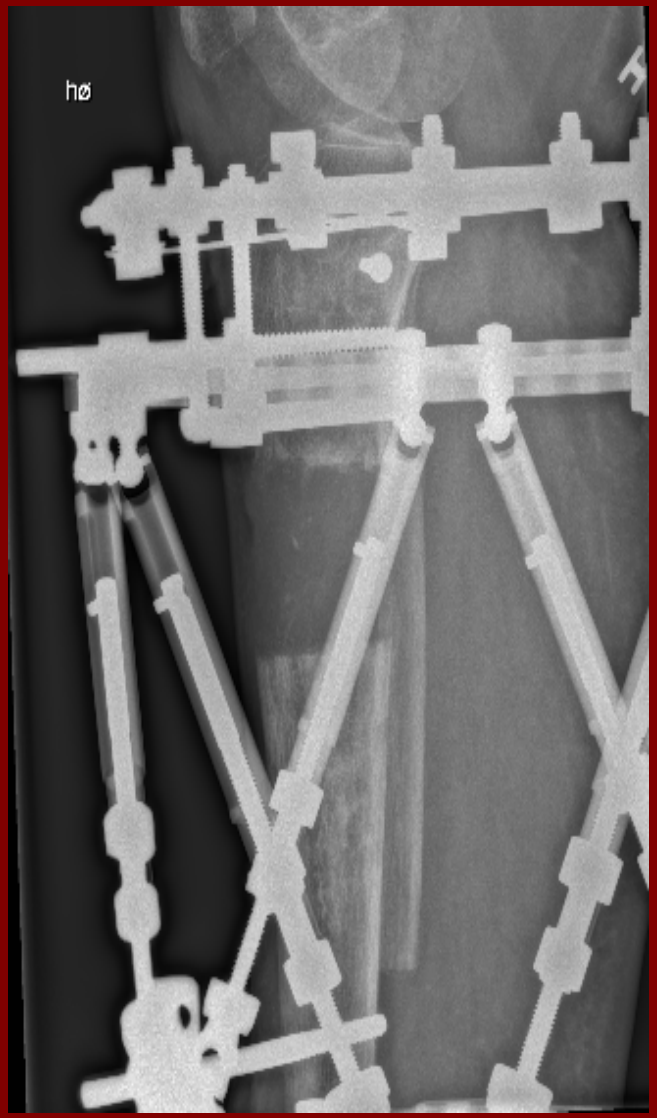


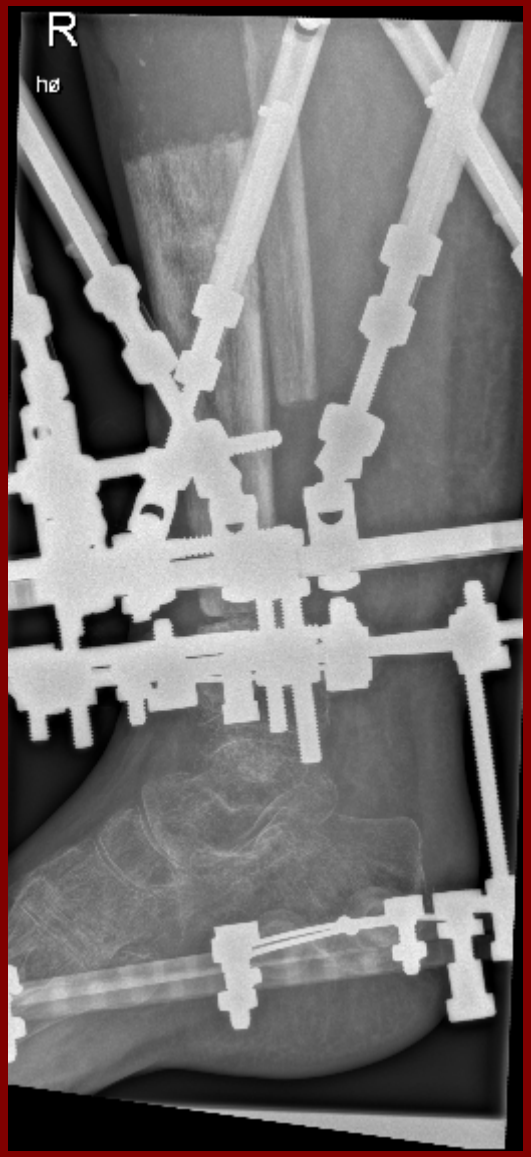


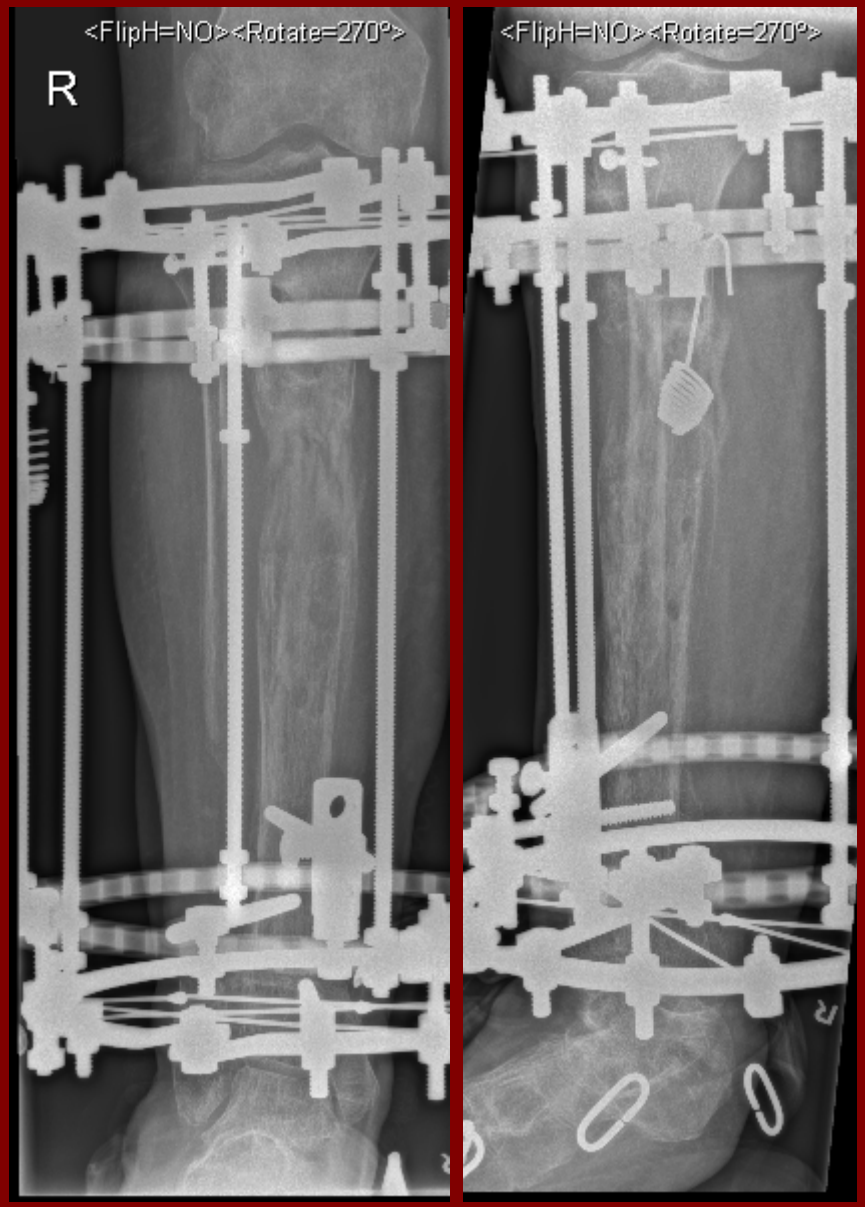


bonetransport

docking with autograft



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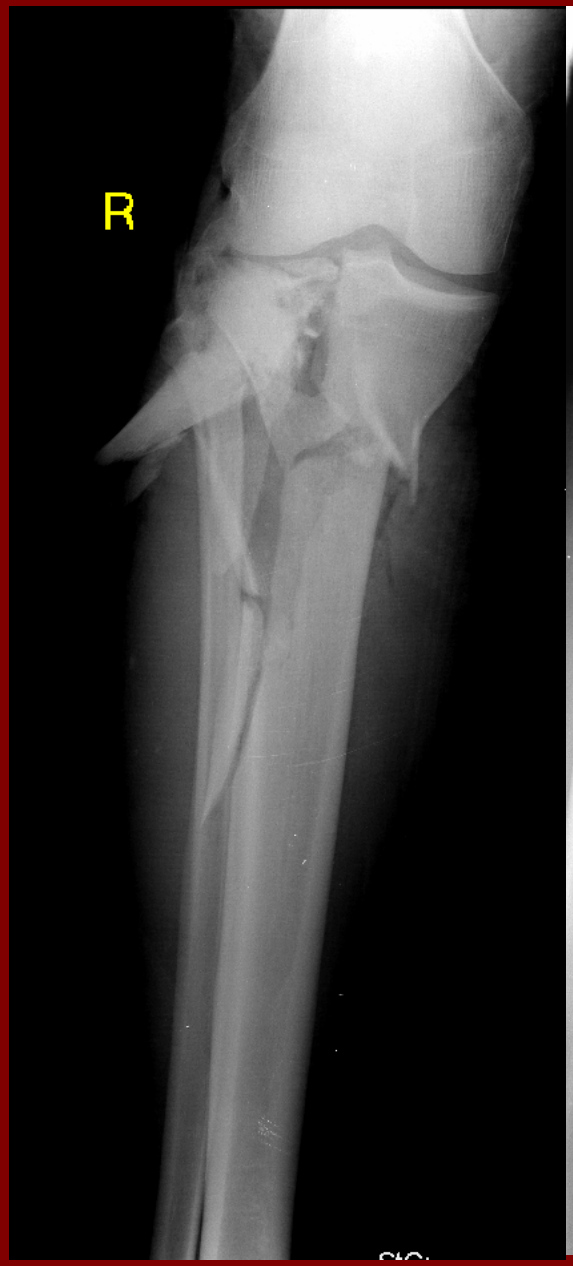
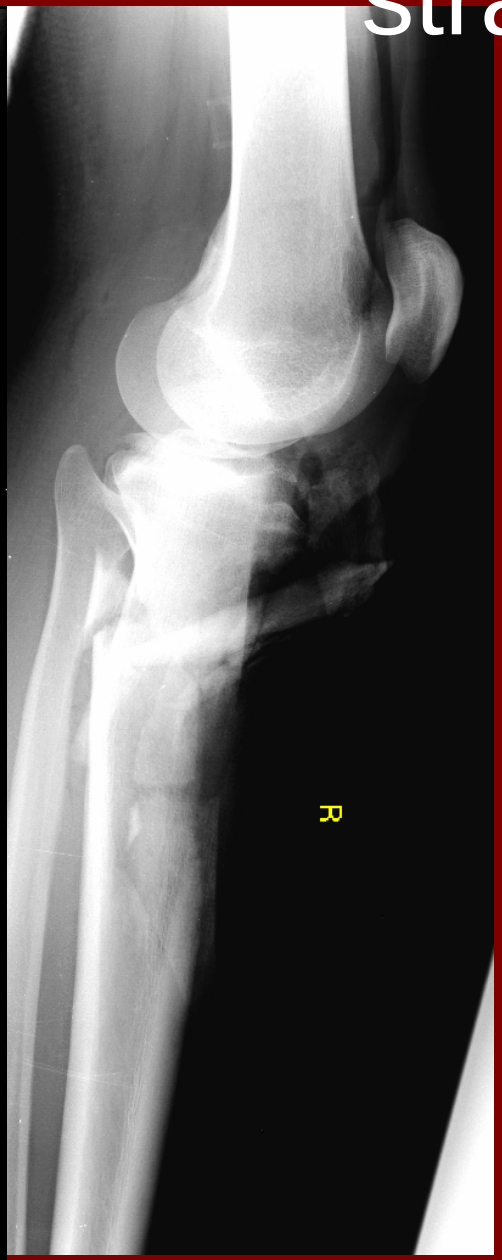
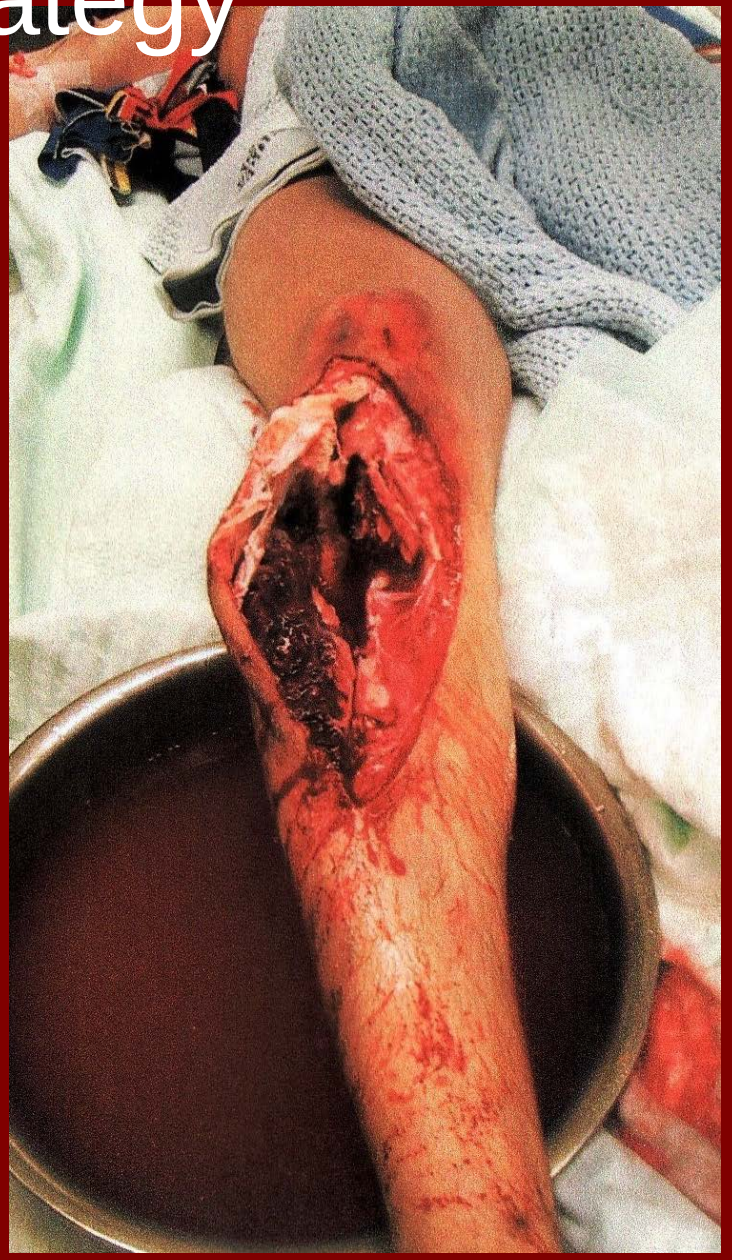
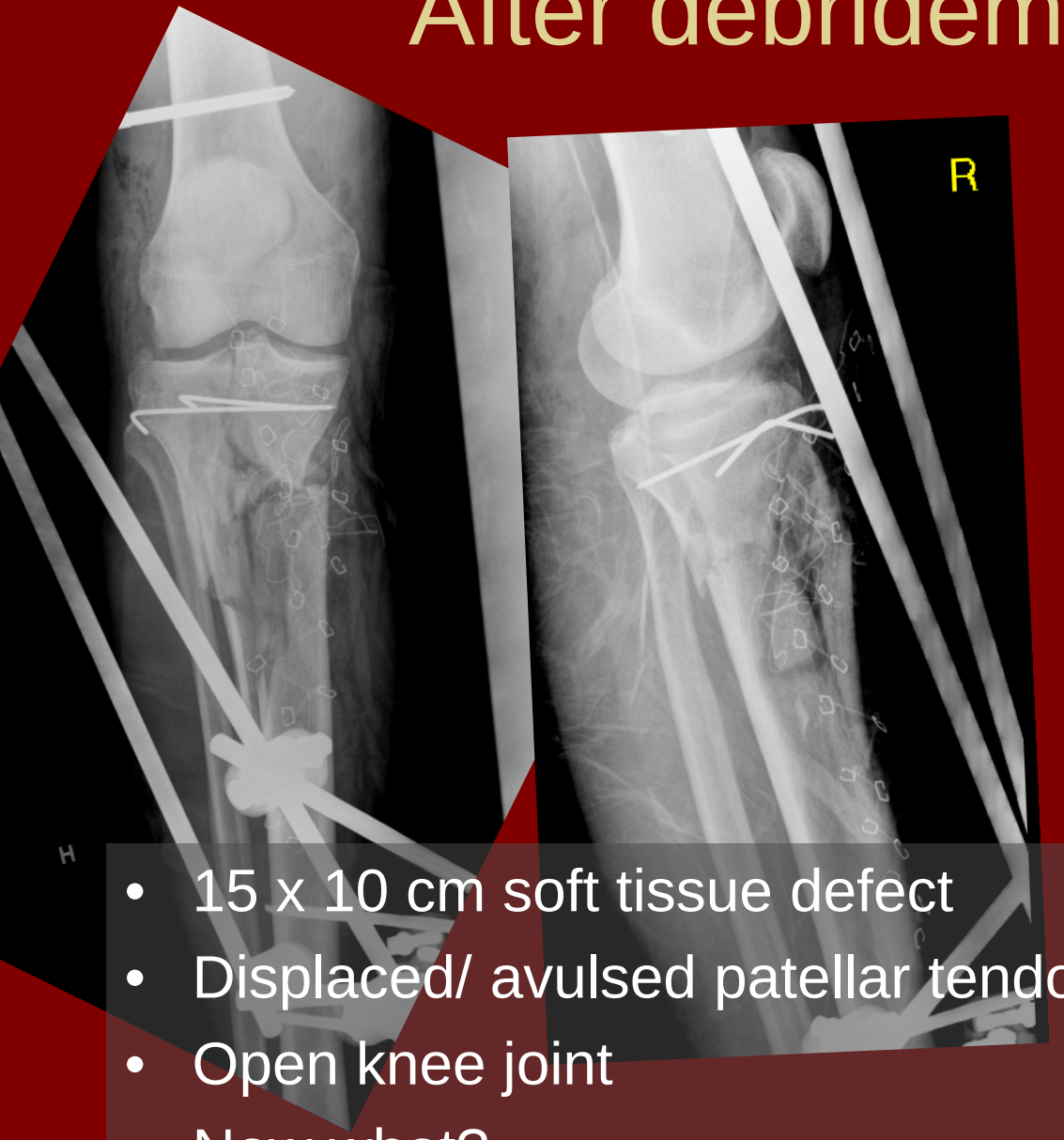
strategy





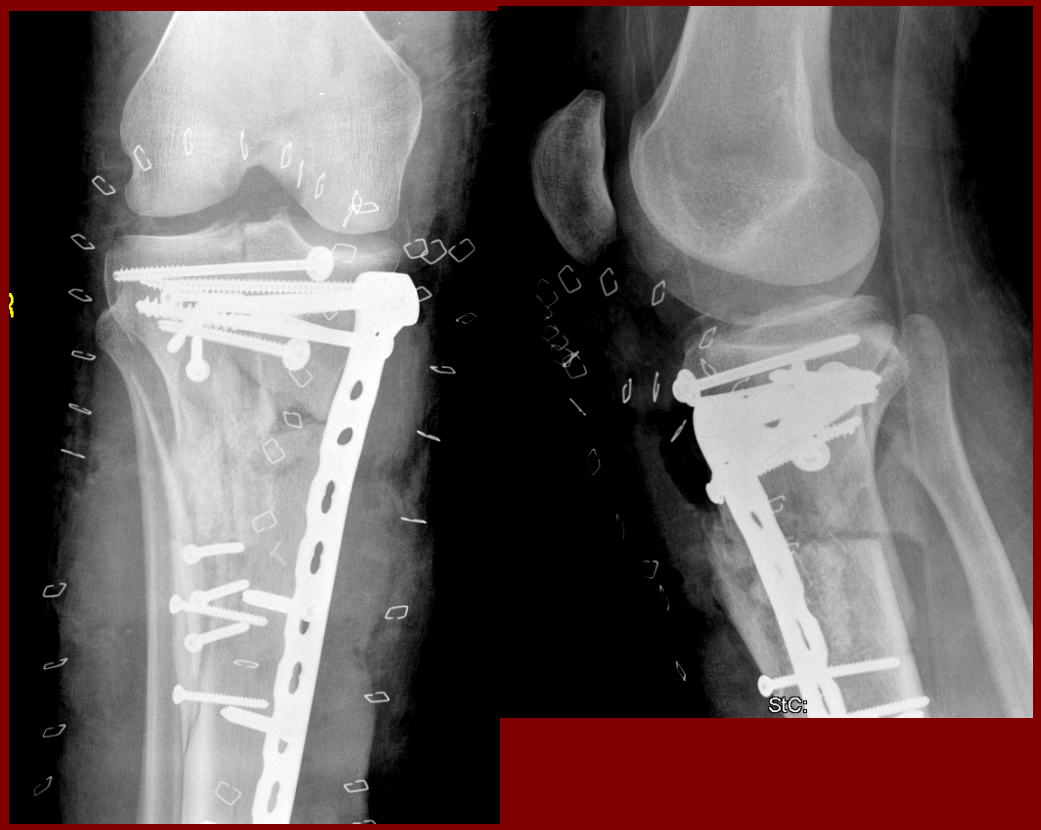


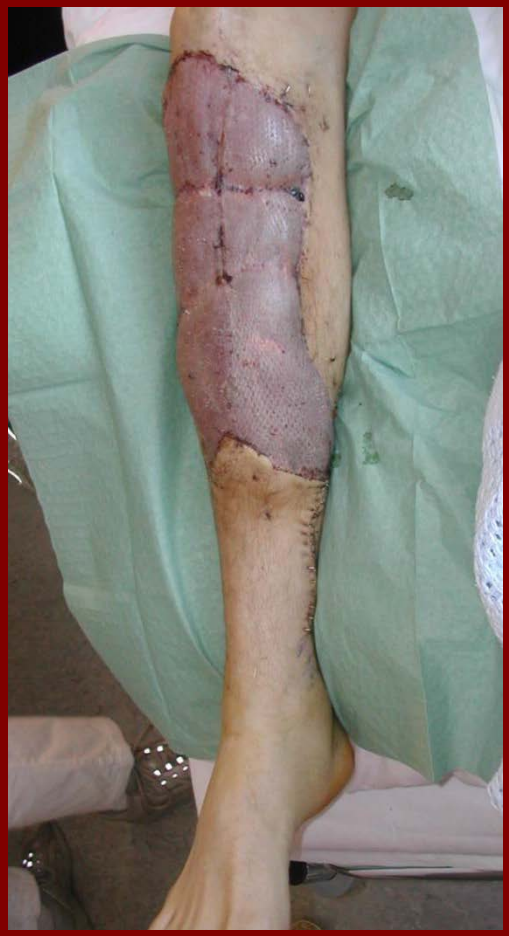
After debridement on day 1



- 15 x 10 cm soft tissue defect
- Displaced/ avulsed patellar tendon insertion
- Open knee joint
- Now what?

ORIF and free flap on day 2 (26 hours)





Key reference:

Godina M. Early microsurgical reconstruction of complex trauma of the extremities. Plast Reconstr Surg 1986;78(3):285–92.

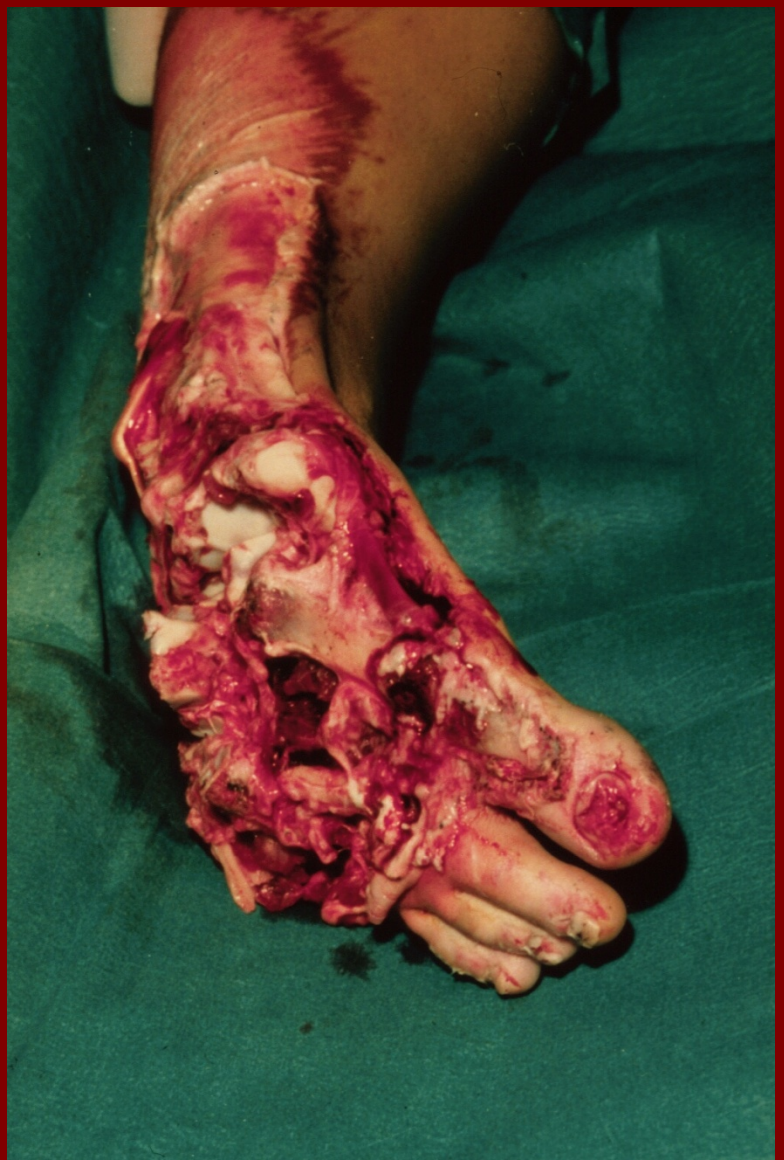
Open Fracture
Primary Amputation

19 Years old woman

Run over by 5 ton machine

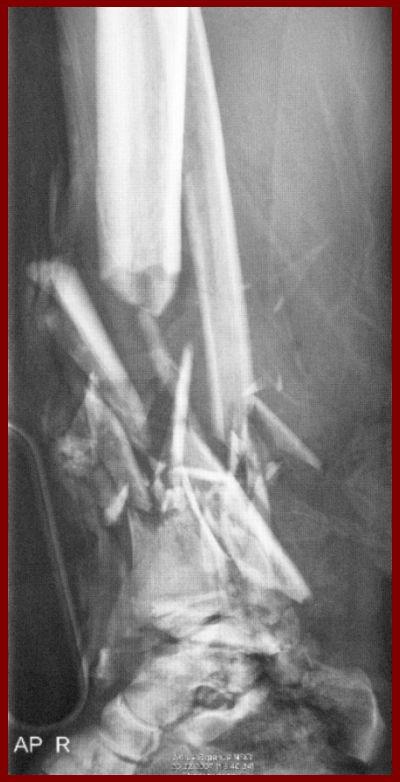
Good functionally prosthesis

20 years later



Open fracure - Primary amputation

48 year old, multitrauma-primary amputation



Take home message

Principal recommendations

1. A multidisciplinary team, including orthopaedic and plastic surgeons with appropriate experience, is required for the treatment of complex open fractures.
2. Hospitals that lack a team with requisite expertise to treat complex open fractures have arrangements for immediate referral to the nearest specialist centre.
3. The primary surgical treatment (wound debridement/excision and skeletal stabilization) of these complex injuries takes place at the specialist centre whenever possible.

BAPRAS

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