Maxillofacial War Surgery
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Introduction

- Head, face and neck (HFN) vulnerable areas in combat
- Numerous accounts of facial injuries in contemporary and famous literature
- Mylonas et al. 2008
  - 24 books of Homer’s Iliad
  - 48 references to CMF injuries

Background

- Helmets protect the cranium but offers little protection for the face and jaws
- Full head and face protection may compromise visibility, communication and mobility
Introduction

- Anatomically complex
- Aesthetic considerations
- Functional considerations
- Rehabilitation
- Importance of the face from a psychosocial aspect
“Your foot or your hand? Your genitals or your arm? Which would you rather lose? For me it was anything but my face. I was scared stiff of going home with my looks twisted and scarred by battle, perhaps burnt, maybe rearranged by bullets and shrapnel. Teeth missing, jaw shot off, eyes blinded”

(Beattie, 2008)
First World War 1914 -1918
First World War 1914 -1918

• Machine gun
• Tank
• Airplane

• Surgical specialties
  • Orthopaedic surgery
  • Thoracic surgery
  • Plastic and Maxillofacial surgery
  • Neurosurgery
First World War 1914 - 1918

- Leading innovators in face and jaw surgery were Germany and France
- German “observers” in Balkans War 1912-1913
  - Direct wiring techniques
  - Simple trough appliances over teeth
  - Local infection and sepsis
  - Wound breakdown
  - Poor aesthetic results
• Hospitals in Berlin, Strasbourg, Hanover and Dusseldorf ready to receive face and jaw injuries by 1914

• Multidisciplinary teams of surgeons, dentists and dental technicians organised into face and jaw units
The Maxillofacial Team

- Plastic surgeon
- Dental surgeon
- Dental technician
- Nursing staff
- Radiographers
- Orderlies
- Cooks …
A Famous Partnership
“... Fry went to work with Gillies, suggesting to him as the outcome of their agreeable first meeting: “I’ll take the hard tissues. You take the soft”, a division of responsibility that governed their technical relationship through the remaining war years.”

Pound R (1964). Gillies - Surgeon Extraordinary
London: Michael Joseph, p31
Fracture management

• No reliable method of bony fixation and immobilisation except for using dental appliances
• Cumbersome
• Lengthy rehabilitation
• Diet, hygiene, speech etc.
Fracture management

- Simple fractures of the mandibular relatively well managed
- Avulsive injuries difficult to manage in terms of soft tissue loss, hard tissue loss and reliable methods of reconstruction
- Bony fragments often displaced due to scar contraction of soft tissues
Historical management

• Simple wiring of fracture segments of the mandible using gold wire passed around the teeth adjacent to the fracture

• No mention of wiring the jaws together (Inter Maxillary Fixation)

• Reinforced with strips of leather glued to the chin and bandaged
Those physicians who have not judgment combined with their dexterity, expose themselves in fractures of the jaws…

(Hippocrates)
Management issues
General considerations

• Technically challenging
• Materials primitive
• Shock
• Malnutrition
• Lengthy delays in evacuation
• Sepsis – pre-systemic antibiotics
“He who wishes to be a surgeon, must first go to war”
“The Church does not shed blood ...”
Historical management

• “Dark Ages” 11th and 12th centuries turning point in medicine
• Council of Tours 1163 edict:
  “The church does not shed blood”
• Surgery now performed by lay people viz. barbers, bath keepers and hangmen
• Rise of the Barber-Surgeons
Henry VIII and The Barber Surgeons 1540

(Hans Holbein the Younger, circa 1543)
Barber-Surgeons

- Bandaging, blood letting, lancing boils, pulling teeth and cutting for stone
- Seven year apprenticeship
- Final examination

- Ambroise Paré
  (c.1517-1590)
Only in Ireland …
Historical management

• 18\textsuperscript{th} and 19\textsuperscript{th} centuries – surgery becomes a profession rather than a trade
• Research and sharing of scientific ideas
• Wiring techniques inadequate
• Use of dentition to anchor rigid fixation devices
Gunning Splint 1866
Historical management

• Use of dental appliances becoming more sophisticated
• Management of jaw injuries now in the realm of the dental profession
• Dental technicians essential in manufacture and design of appliances
Midface injuries

- Midface fractures particularly difficult to manage
  - Imaging and diagnosis
  - Anatomical reduction
  - Inadequate fixation
- Use of intraoral appliances with extraoral extensions to stabilise the midface
  - Head frames
  - External pins
  - Bandages
Case Illustration
Henry Percy Pickerill

- First Dean of Dental School
- Appointed Head, NZ Section for face and jaw surgery 1916
- NZ Face and Jaw Unit, 2 NZ General Hospital, Walton-on-Thames 1917
- Transferred to Sidcup 1918
- Full time plastic surgeon, Sydney 1927
- Elected FRACS in 1930
“the whole of the upper face had fallen backwards, the nose was sunken and depressed, the maxilla was too far back by three quarters of an inch, as judged by the hiatus between upper and lower teeth, zygomas had united but were in malposition and bulging outwards; there was also a long scar and an unsightly swelling on the right cheek”

Pickerill 1918
<table>
<thead>
<tr>
<th>1916</th>
<th>2014</th>
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<td>1. Reduction of bony fragments</td>
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<td>2. Maintenance of fragments during healing</td>
<td>2. Restoration of normal occlusion</td>
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<td>3. Restoration of normal occlusion</td>
<td>3. Rigid fixation of bony fragments</td>
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<td>4. Stretching of scar tissue</td>
<td>4. (Immobilisation)</td>
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<td>5. Prosthetic replacement of defects</td>
<td>5. Rehabilitation</td>
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Second World War 1939-1945
Second World War 1939-1945

- Plastic surgery now a recognised surgical specialty
- Building on principles established in the First World War
- Dental surgeons still integral in the management of maxillofacial injuries
- Re-establishment of face and jaw units
• Rigidity still an issue for bony healing
• Single jaw appliances viz. cast cap splints with localising plates
• External fixation devices
• Advent of sulphonamides and later penicillin
The Big Four
Cast Cap Splints
Facial orthopaedics
External pin fixation
Kiwi ingenuity 1941

Major innovations by war

• WW1

  • Establishment of face and jaw units
  • Protection of airway
  • Wound toilet and debridement
  • Early fixation and immobilisation by intraoral appliances and wiring
  • Pedicle flap and soft tissue reconstruction
  • Early successes in bone grafting
Major innovations by war

• WW2
  • Consolidation of WW1 principles
  • Antimicrobial therapy
  • Intraosseous wiring
  • External pin fixation
  • Craniofacial suspension/head frame
  • Cancellous chip bone grafting
Major innovations by war

• Korean War
  • Routine primary closure of facial wounds
  • Routine open reduction of facial skeletal fractures
  • Direct wiring techniques
  • The “Oral surgeon” comes of age
  • Helicopter CASEVAC
Major innovations by war

• Vietnam War

• Field surgery essentially unchanged
• MEDEVAC vs. CASEVAC
• Rapid evacuation to larger hospital facilities for definitive care
• Use of IMF, wire suspension, head frames
• Early routine use of stainless steel plates for ORIF of facial fractures
Progress post-Vietnam

- Better antibiotics
- Better trauma protocols
- Better Internal fixation devices
- Better understanding of biological and healing processes

And then there was Iraq
and Afghanistan …
THE BEST CARE ANYWHERE

ROLE 3

MULTI NATIONAL HOSPITAL
HFN injuries in Afghanistan

- Extremity injuries up to 2/3rds of all injuries seen in combat AO
- HFN injuries 26-36%
  - 16% in WW1
  - 4% in WW2
  - 16% overall incidence 1914 - 1986

Why is there an increase in HFN injuries in modern warfare?

HFN injuries in Afghanistan

• Effectiveness of modern CBA
• Mechanism of injury
  ▪ Explosive fragment injuries more common than GSW
    • IEDs, RPGs, mines and munitions
• Lack of facial protection
Lessons learnt

• Damage Control Surgery
  ▪ Airway
  ▪ Bleeding
  ▪ Blindness

• IMF and external pin fixation
• Definitive management for local nationals
• Going back to basic surgery that works
Going back to basics
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