Historical Milestones in Orthopaedic Implant Development
Anesthetics

• Nitrous oxide
  – Humphrey Davy, 1800
  – Horace Wells, 1844

• Ether
  – Crawford Long, 1842
  – W.T.G. Morton, 1846

• Chloroform
  – Sir James Simpson, 1847
Sir Joseph Lister
(1827-1912)
Visualization

• Wilhelm Konrad Roentgen (1845-1923)
• Discovery of x-rays: 1895
  – Nobel Prize, 1901
• Fluoroscopy: Thomas A. Edison, 1896
• X-ray tube: William D. Coolidge, 1913
Suitable Materials

- Traditional Materials
  - Gold, silver, lead, aluminum: too weak
  - Iron, steel, copper, nickel, zinc: adverse response

- Stainless steel (18-8): 1926

- Vitallium: 1929
  - Tantalum: 1936

- Titanium & its alloys
  - Maurice Down, 1947
Pre-Implant Era War Experience

- Ollier (1870)
  - Immobilization
  - Plaster of Paris

- Friedrich (1898)
  - Proved efficacy of debridement of dead tissue
  - Earlier practice, empirically
Sir Robert Jones
(1857-1939)
War Experience

• Joseph Truetta
  – Debridement/immobilization (1936)
  – Laboratory studies of bone healing
  – Blood flow in bone
Hansman’s Bone Plate (1886)
Bone Suture Stabilization Inserts (Koenig, 1905)
Albin Lambotte
Forceps and Bone Plates (Lambotte)
Intra-articular Fracture Fixation Constructs
(Lambotte)
Lambotte Brass Plates & Screws
E.W. Heygroves (1916)
Sir William Arbuthnot Lane
(1856-1942)
Broken Lane Plates
William O’Neill
Sherman
ca. 1880
Sherman Plates
Metallic Internal Fixation

- Roux-Lane bent wire
- Jacoel corrugated steel staple
- Schede-Brun plain steel staple
- Lambotte spikes
- Lambotte screws
Intuitively-Based Fracture Fixation Constructs (ca. 1920)
Redundant usage of Lane Plates
The Era of Disfavor

- 1920’s → 1950’s
- High incidence of bone destruction, delayed union, non-union
- Confusion re: failure & corrosion of metals
- Confusion re: fracture healing biomechanics
Heygroves’ “Long Steel Strut” (1921)
Heygroves’ Splint
for
Gunshot Injuries
Burghard’s Screws
Marius N. Smith-Petersen
(1886-1953)
Nicholas Senn

Decalcified Bone Ferrule
Intramedullary Nails

Küntscher, 1940
Küntscher’s 1st IM Nailing
Development of Femoral Intramedullary Nailing
Nails for Proximal Femur Fractures
Compression Plating
(Danis, 1947)
The Swiss Era

• 1951: Müller – Allgower – Willener
  – Scientific/clinical collaboration

• 1954: Straumann Institute
  – Fabrication of implants

• 1958: Arbeitsgemeininschaft fur Osteosynthesefragen
  – Fifteen Swiss surgeons (AO)
Standardized Instrumentation Set

(AO, 1958)
Cornerstones of AO Technique

• “Technique of Internal Fixation of Fractures” (1965)
  – Rigid compression to achieve primary bone union
  – Use of austenitic stainless steel
  – Pre-threading of screw holes
  – Reduced-shear thread profile
  – Dynamic compression plate (1973)
  – AO Documentation Center (Berne)
Dynamic Compression Plate
(Müller)
Standardized Fracture Documentation (AO)
Articular Joint Reconstruction and Replacement

- Interpositional arthroplasty
  - Chulmsky (1880’s: tin, zinc, silver, rubber, fascia)
  - Jones (1895: gold foil)
Interpositional Cups (Pyrex)
Medullary Fixation

• Medullary fixation
  – Gluck (1891)
    • Ivory implants: hip, finger, thumb
    • Experimented with cement fixation
Moore-Bohlman
Upper Femur
(1941)
THA Precursors
McKee THA, circa 1940
McKee-Farrar
Total Hip Prosthesis
Development of Early Devices for Hip Arthroplasty
Sir John Charnley
(1911-1982)