ORTHOPAEDICS INTERNATIONAL

Part of the Medical Aid International Family

Orthopaedic Fragment Plating

Medical Aid International

Supporting Healthcare in Low Resource Environments

ORTHOPAEDICS INTERNATIONAL

Part of the Medical Aid International Family

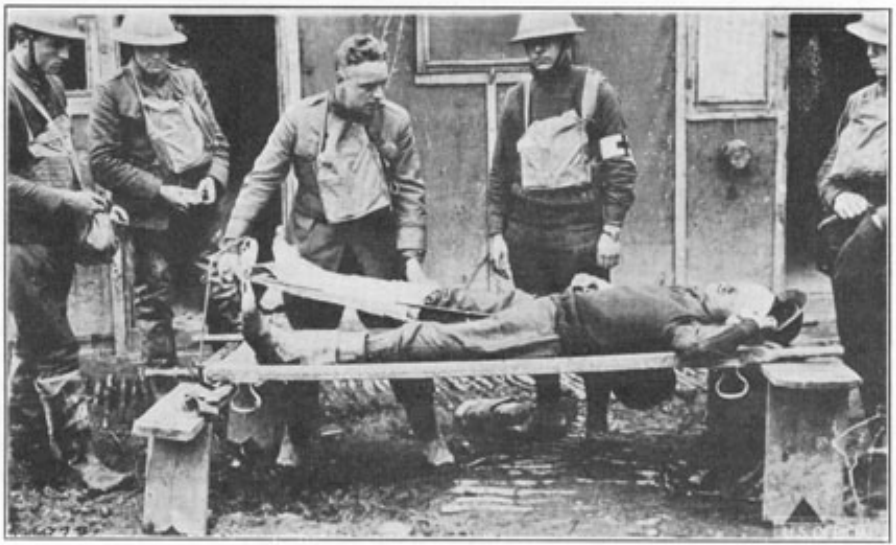


FIG. 14.—Adjusting improved splint on a litter patient, Broussey, France, April 20, 1918

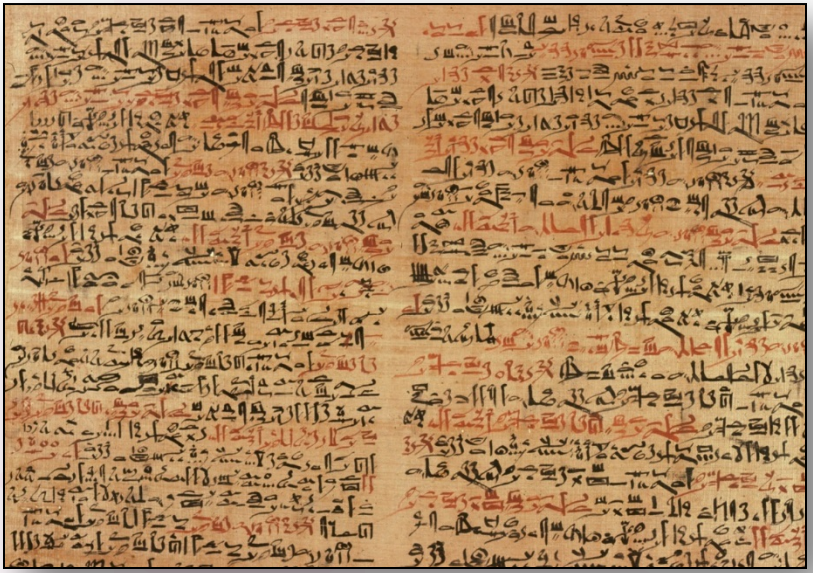
History and evolution of plating

Medical Aid International

Supporting Healthcare in Low Resource Environments

Egypt 2000BC – 3000BC

Earliest data…?



Imhotep (Edwin-Smith Surgical Papyrus)

describes reduction of fractures, immobilisation with splints and bandages.

Ancient fractures

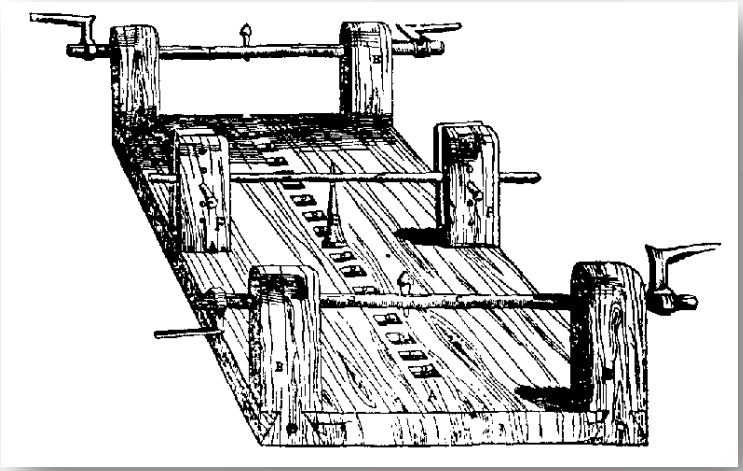
Fractured forearm with splint from a mummy of the 5th dynasty

Abydos, Egypt 1550BC-1070BC

Greece 430BC – 330BC

Hippocrates ‘Father of Medicine’

Hippocrates



Invented and constructed the first fracture table the Hippocratic Bench or Scamnum

Used bandaging technique using oil and wine

Hippocrates

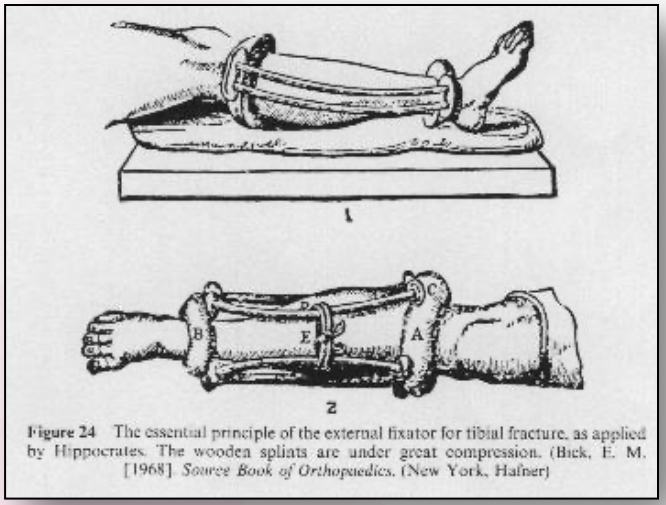


Figure 24 The essential principle of the external fixator for tibial fracture, as applied by Hippocrates. The wooden splints are under great compression. (Bick, E. M. [1968]. *Source Book of Orthopaedics*. (New York, Hafner)

Produced a volume in 'Corpus Hippocrates' on joints

Used splints for tibial fractures - External Fixation

First to use systematic and scientific approach

Romans 200BC - 100AD

Galen

Influential anatomist
Treated Gladiator fractures
Described support bandaging
First described Spica

The Dark Ages!

Islamic Empire 900AD - 1100AD

Ibn-Sina (Avicenna)
980-1037 AD

Al-Razi (Razes)
841-926 AD

Al-Zahrawi (Albucasis) 930-1013AD

Differentiated between different types of fractures: avulsion, crushing, penetrating reaching the membrane or superficial, hairline fractures.

Practised open reduction/ treated malunion

Used mill dust and eggs to make plaster casts

Guy de Chauliac - 14th Century

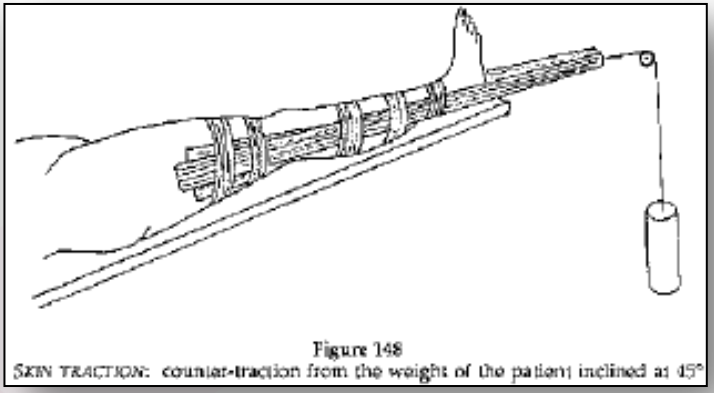
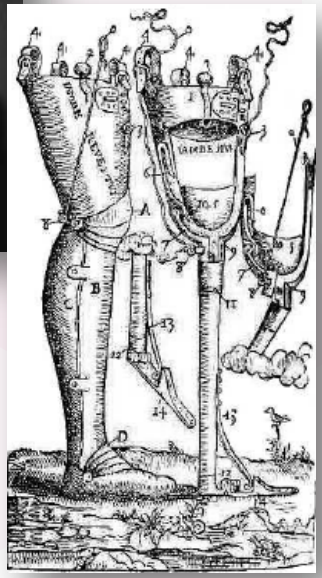


Figure 148
SKIN TRACTION: counter-traction from the weight of the patient inclined at 15°

Published 'Book of Fractures'

Prescribed isometric traction using weight, cord and pulley

Ambroise Paré - 16th century



Artificial limbs for soldiers

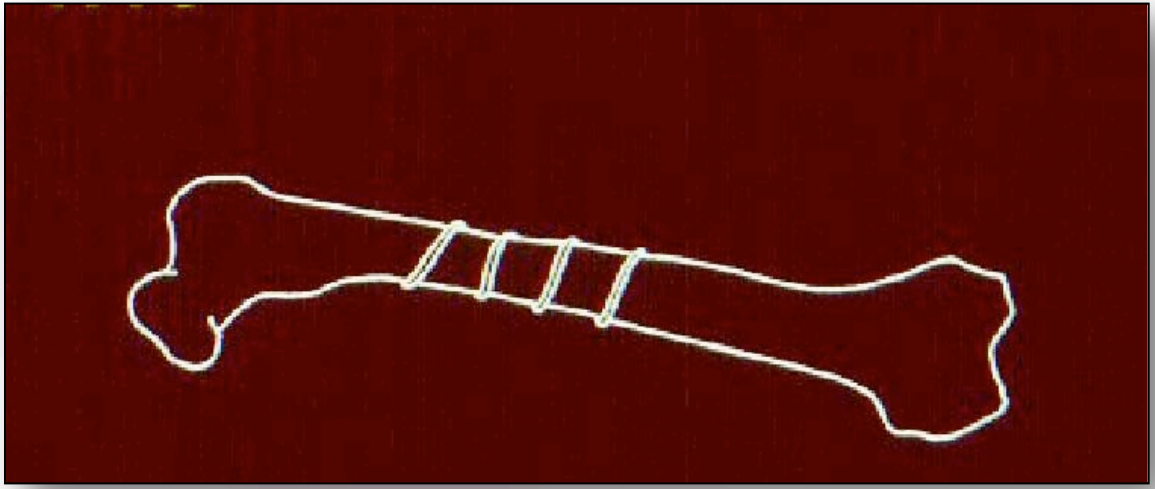
Master Barber Surgeon.

‘Father of modern surgery’

Described hip fracture treatment

Described fracture manipulation

1770 - France



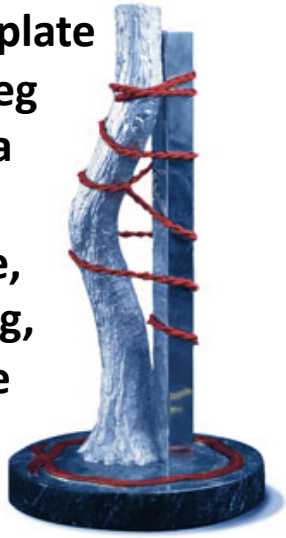
Mr Lapujode and Mr Sicre in Toulouse performed first brass cerclage wire procedure

Nicholas Andry - late 18th century

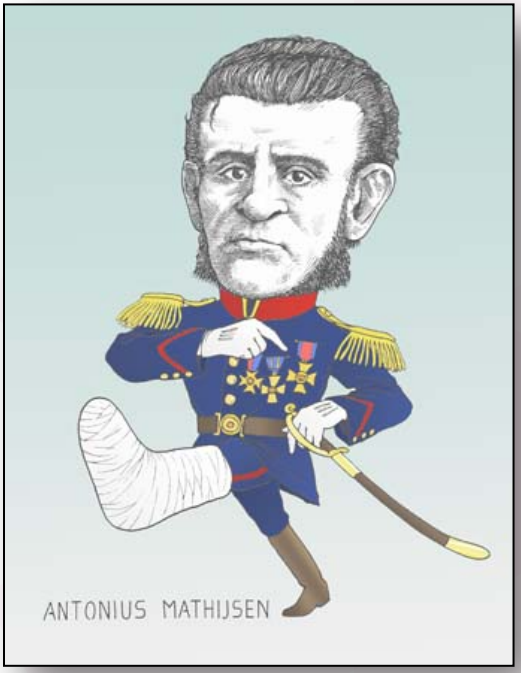
Translated Orthopaedia from Greek words

Ὀρθος, straight and Πάίδον, a child

‘to apply as soon as possible a small plate of iron on the hollow side of the leg and fasten it about the leg with a linen roller. In a word, the same method must be used in this case, For recovering the shape of the leg, as is used for making straight the crooked trunk of a young tree’



Antonius Mathijsen - mid 19th century



Dutch Army Surgeon

Required effective battlefield solution

Revived ancient Arabic treatment

Introduced roller bandages c.1852

Soaked in gypsum

Plaster of Paris

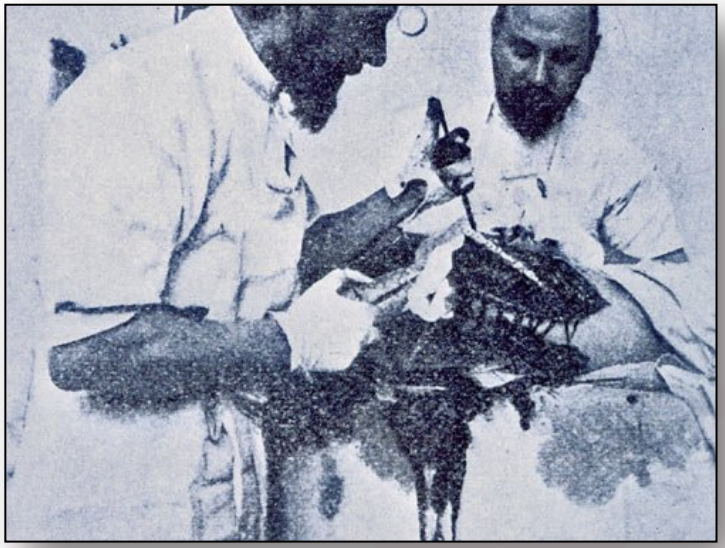
Hugh Arbuthnot Lane 1856-1943

1893 introduced steel screws

1905 Improved technique to include plates

These techniques are still in use today

Albin Lambotte 1866-1955

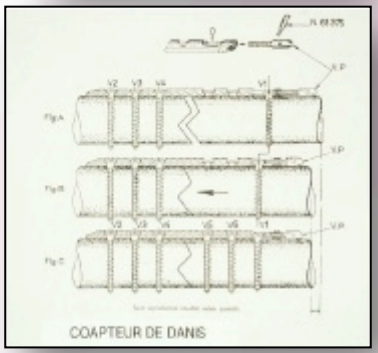


Produced his own implants

Osteosynthesis

Used plate fixation

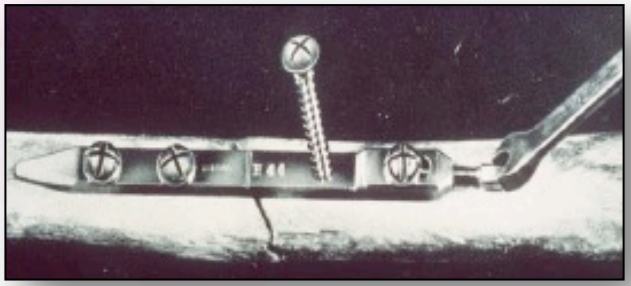
Robert Danis 1880-1962



Pioneer in compression plating

Stimulus for founding of AO 1958

AO Foundation (Arbeitsgemeinschaft für Osteosynthesefragen) 'Association for the study of questions of surgical fracture fixation'



Professor Maurice Muller 1918-2009

Founder AO member

First to use hex in screw head

Developed compression hole 1963

Pre contoured plates - 2001

LISS plate introduced - 2001

L ess

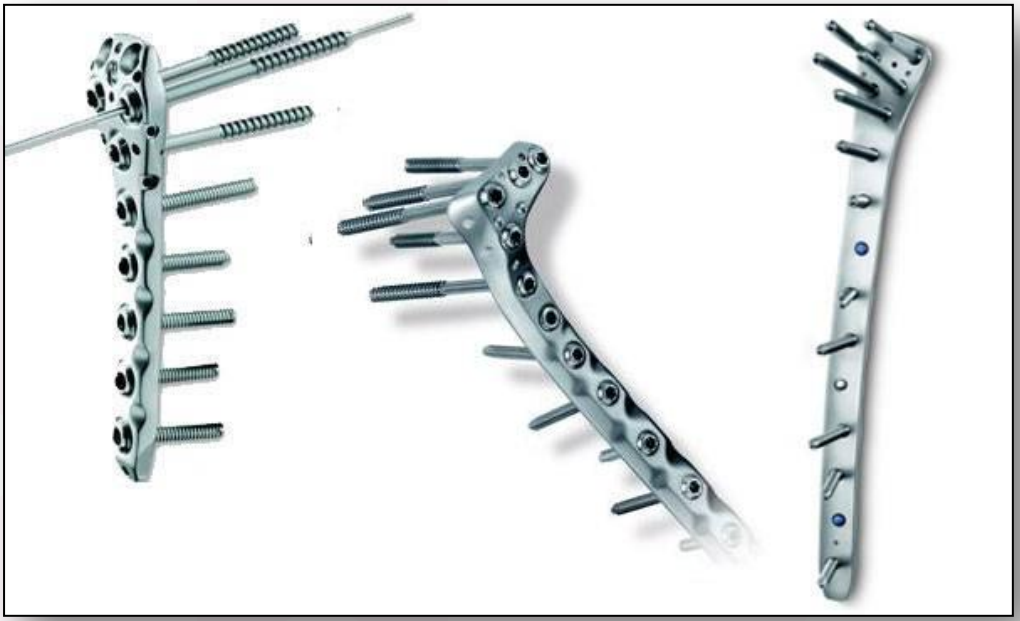
I nvasive

S tabilisation

S ystem

Fragment locking plates - 2006

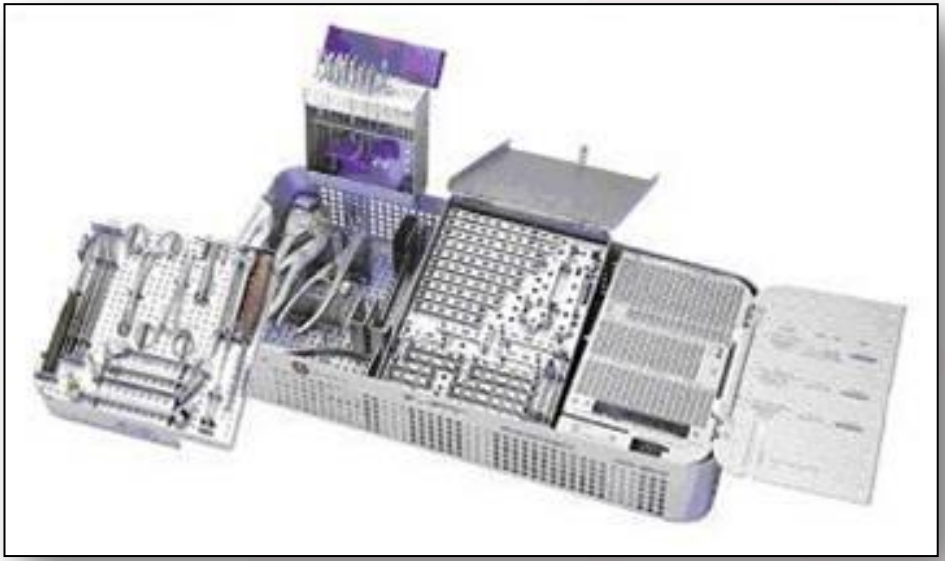
Polyaxial locking plates - 2006



Non **C**ontact **B**ridging - **NCB**

ORTHOPAEDICS INTERNATIONAL

Part of the Medical Aid International Family



Fragment plating training

Medical Aid International

Supporting Healthcare in Low Resource Environments

What is a fracture?

A fracture is a soft tissue injury complicated by the presence of a broken bone.

The successful treatment of the fracture is determined by the treatment of the soft tissues.

Synthes AO Fracture Fixation Course 2008

The 4 goals of fracture fixation

1. Anatomic Reduction

2. Stable Fixation

3. Preservation of blood supply and handling of soft tissue

4. Early mobilization of the patient

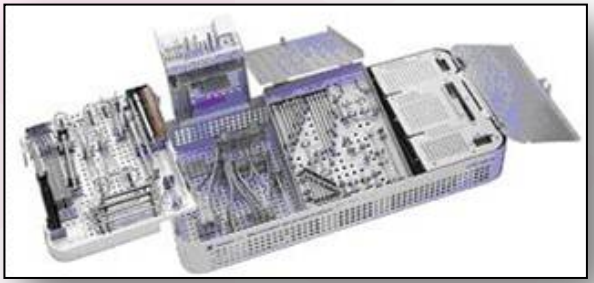
Mini Fragment Set

General indications: Foot and Hand

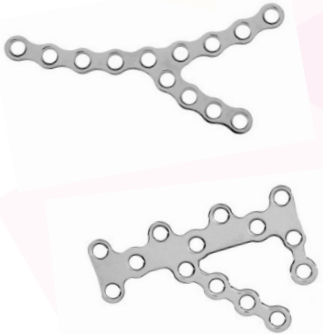
Screws 1.5/ 2.0/ 2.7mm diameter

Hex or Cruciform head options

Self tapping



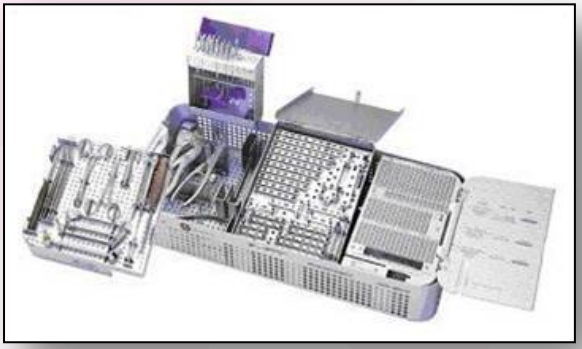
Small Fragment Set

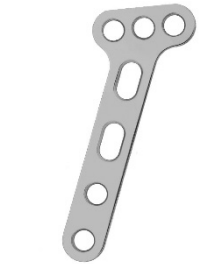


General indications: Hand, Forearm, Foot, Ankle and Fibula

Screws 3.5mm/ 4.0mm

Self tapping





Large Fragment Set

General indications : Femur, Tibia, Humerus

Screws 4.5mm and 6.5mm

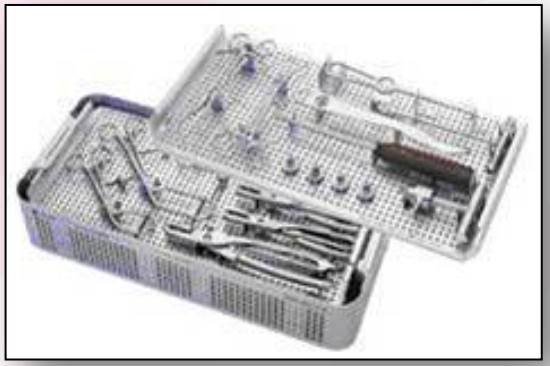
Self tapping

Pelvic Fragment Set

Includes reduction clamps for manipulation of pelvic fractures

Screws 3.5/ 4.5/ 6.5mm sizes

Self tapping



Types of Screw

Cortical

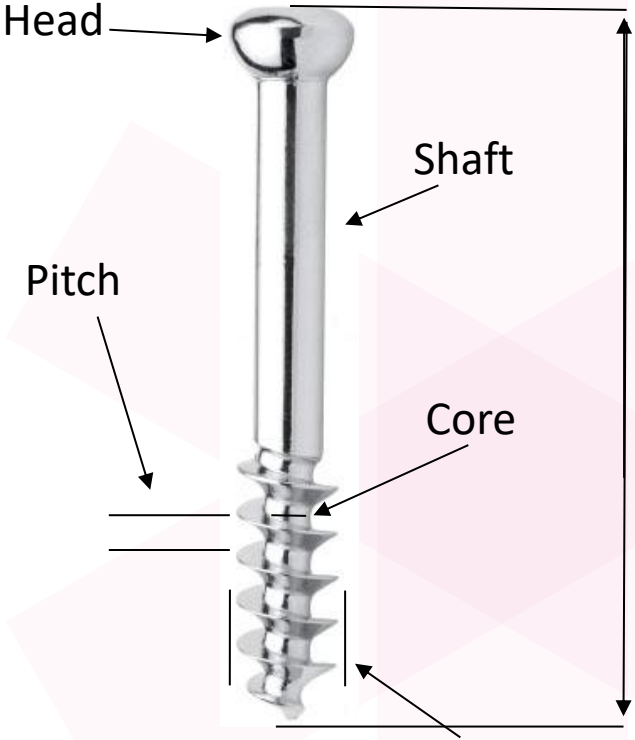
Cancellous

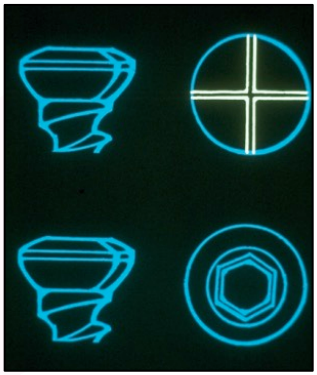
Screw functions

1. To fix plates to bone

2. As ***Lag Screws*** to compress bone fragments

Anatomy of Screws





Cruciform

Hex

Self tapping flute

Cortical Screws

Cortical bone is hard, deep threads are not required for a secure hold

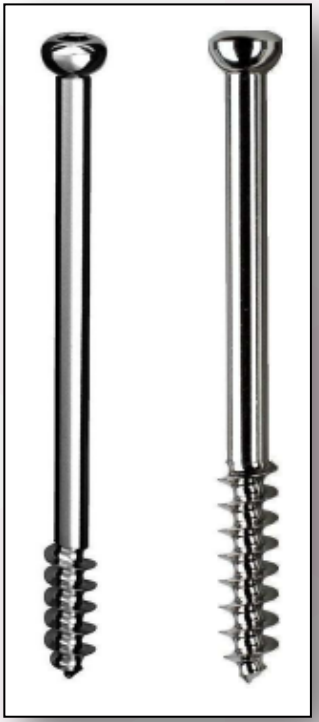
Cortical screws have a finer pitch

Cortical screws have a shallower thread and smaller outer diameter

Design minimises insertion torque

Self tapping screws available

Types of Screw



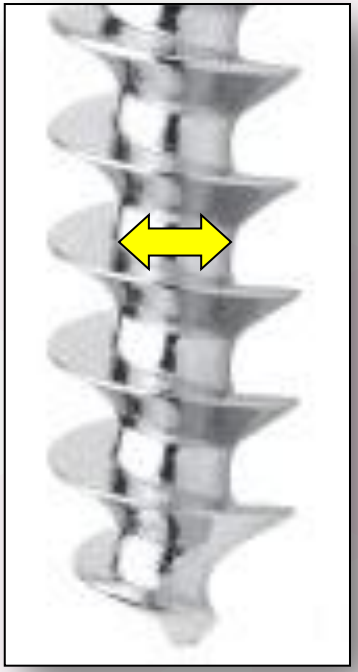
Screws have deeper threads and coarser pitch, engages better in softer cancellous bone

Surface area of screw which is in contact with the bone is maximised increasing screws holding power

Due to softer bone, screw only requires minimum torque to insert

Possible to lag fracture

Screw Core Diameter

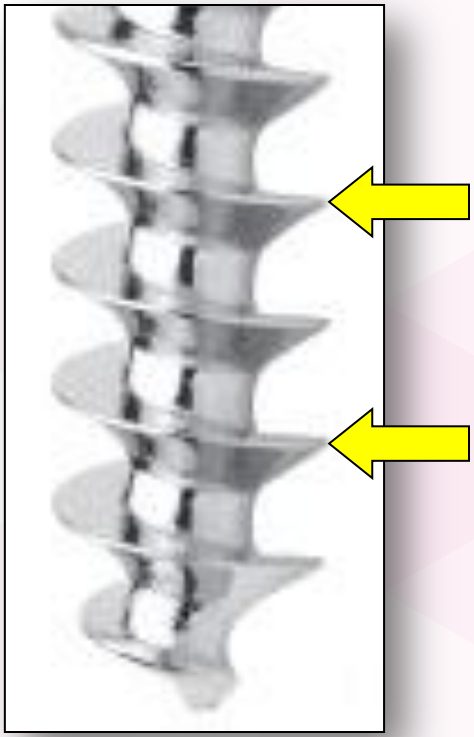


Core diameter relates directly to screw shear force resistance

Larger core = stronger screw

Larger core = more bone removal

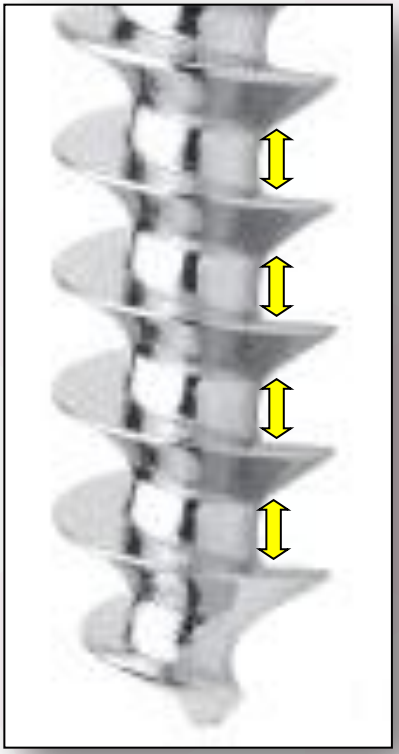
Screw threads



Total surface area of threads on bone determines pull-out strength

Deeper threads provide much better purchase

Screw thread pitch



Distance between screw threads

Each screwdriver rotation advances screw into bone equivalent distance to that of the screw pitch

This dimension is primary determinant of amount of torque required for insertion

Fine pitch requires less torque than a coarse thread screw as it will not travel as far with each turn of the screwdriver

Insertion technique

Drill

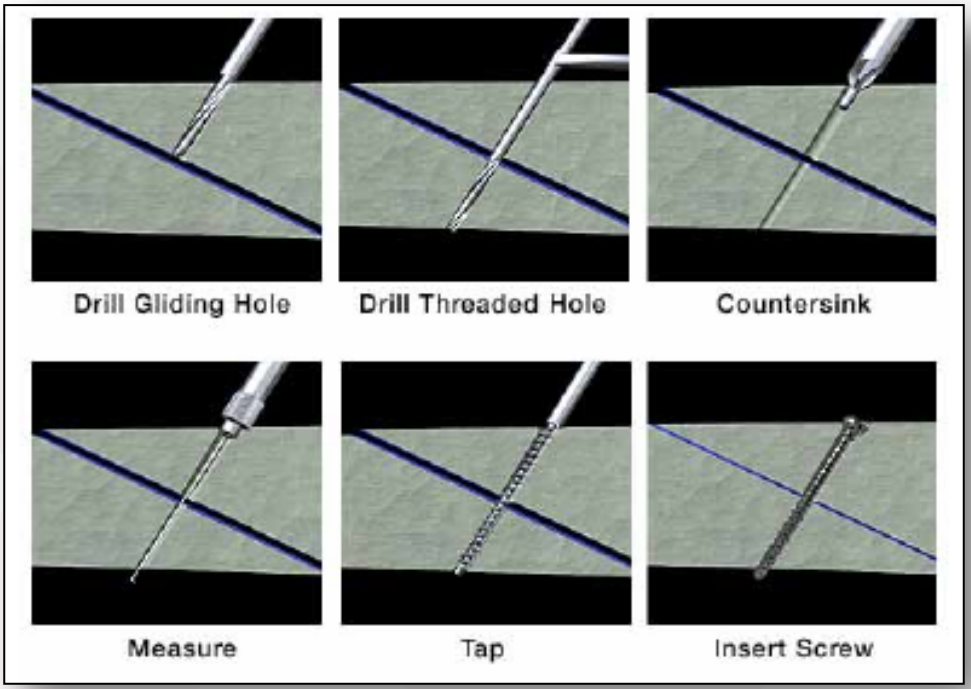
Countersink

Measure

Tap

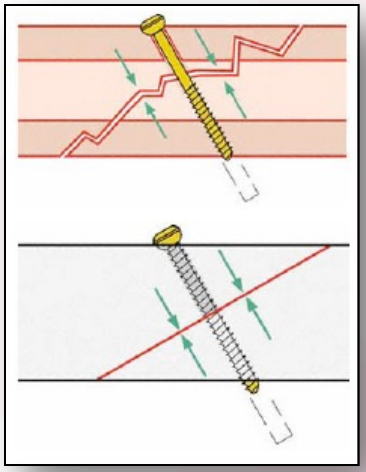
Screw

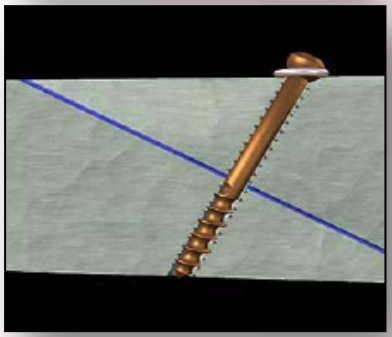
Cortical Lag Screw insertion technique



Result = Interfragmentary Compression

Cancellous Screw insertion technique





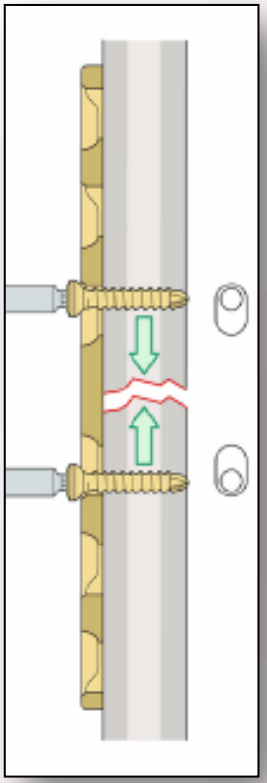
Countersinking is not required

Washer can be used to spread forces of the screw head over a greater surface area

Interfragmentary compression

Lag Screw Workshop

Compression plating



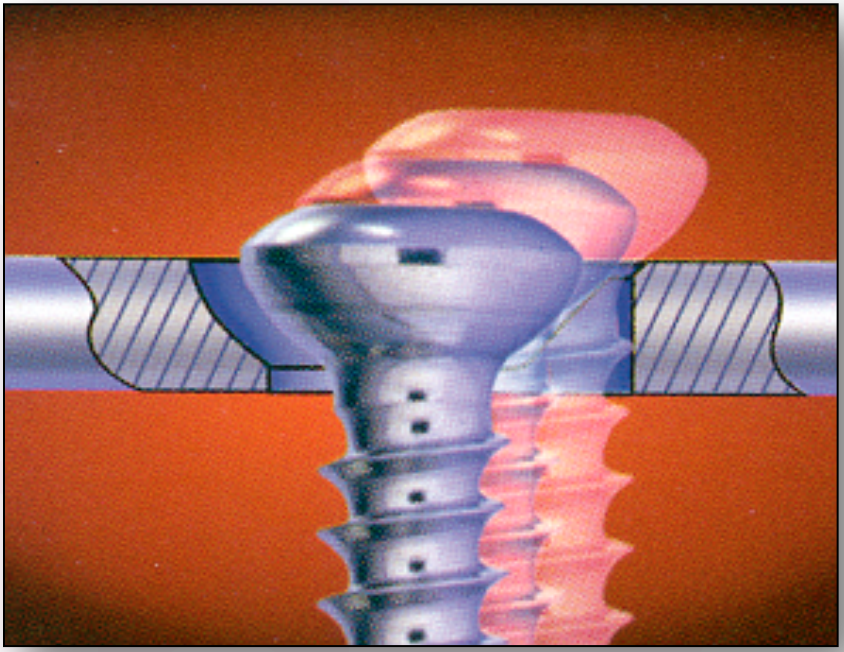
Transverse or short oblique fractures

Exerts compression in the direction of the long axis of the bone

Widely used in fracture management

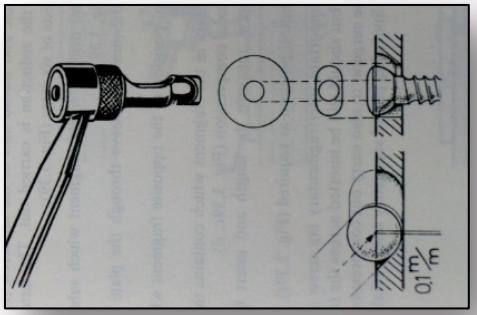
Approx. 1mm axial compression across fracture gap

Compression plating



Spherical, sliding-slope plate hole design

Compression plating technique



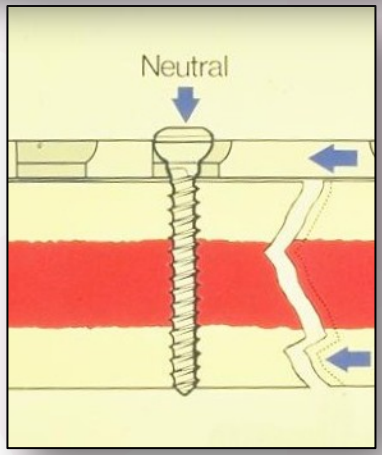


Plate is positioned over the fracture site

In the first plate hole, the drill guide is used in the Neutral position

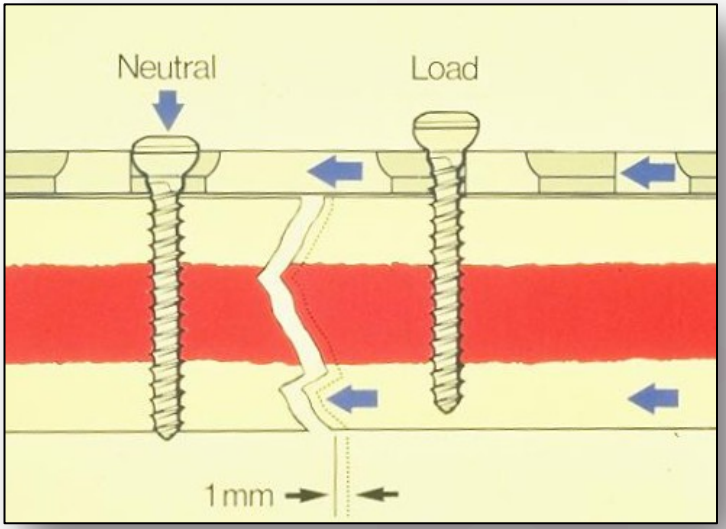
The hole is drilled

Screw Length is measured

The hole is tapped (if necessary)

The first screw is inserted, but not tightened completely

Compression plating technique



The second screw should be located on the opposite side of the fracture - as close as possible to the fracture site

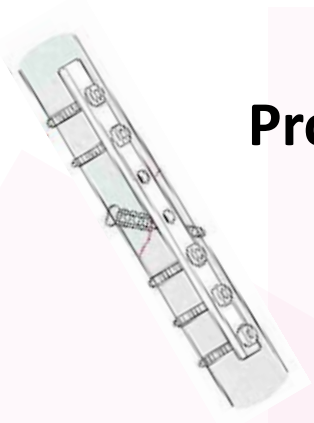
The drill guide is used in the load position

The hole is drilled/ measure

Insert screw and tighten each in turn to achieve compression

Compression plating workshop

Plate types and their functions



Protection/ Neutralization Plating

Diaphyseal fractures

Supplements lag screw fixation

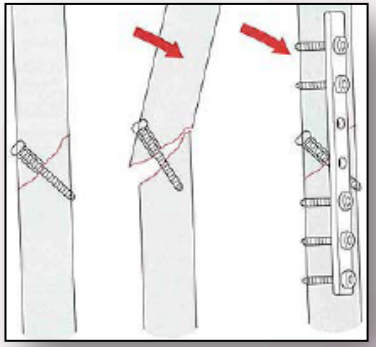
Buttress Plating

Epiphyseal and Metaphyseal fractures

Supplements lag screw fixation

Prevents axial deformity due to shearing or bending

Neutralisation/ Protection plating



Lag screw alone will not stand forces and will require plating

Increases fixation strength

Less chance of failure

Narrow, broad and semi tubular

Thank you


Medical Aid International
Supporting Healthcare in Low Resource Areas
ORTHOPAEDICS
INTERNATIONAL
Part of the Medical Aid International Family