

Principles of closed treatment of fractures – POP, traction and splints

ISRAR AHMAD

Associate Professor Orthopaedics

KGMC/HMC

FRACTURE

- A break or loss of continuity in the substance of a bone



Purpose of fracture management

- To achieve fracture union in correct alignment with preservation of function
- This is achieved by
 - Acceptable anatomical reduction of fracture
 - Maintenance of reduction by different methods(Stable fixation)
 - Rehabilitation

Principles of Fracture Treatment

- Reduction
- Immobilization

Reduction

- Closed reduction

Manipulation without exposure of fracture site

- Open reduction

Fracture site surgically exposed and anatomy restored under direct vision

Immobilization

1. Completely External :

Nothing directly in contact with bones (POP, Casts and splints)

2. External fixators:

Device is outside the body but has hold inside the bone with wires and screws

3. Internal Fixators:

Device inside the human body in contact with bone (Plates, I/M Nails and screws)

Closed fracture management (fracture site not exposed)

- Advantages:
 - Fracture haematoma not disturbed
 - No disturbance of vascularity of fracture fragments
 - Reduces chances of infection
 - Cost effective
- Disadvantages:
 - Uncomfortable
 - Complications

Indications of Closed Method

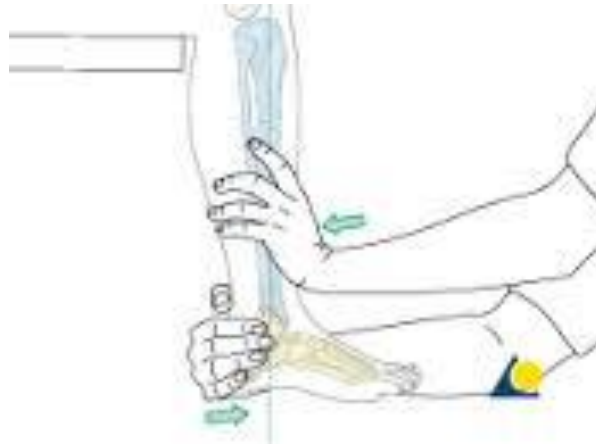
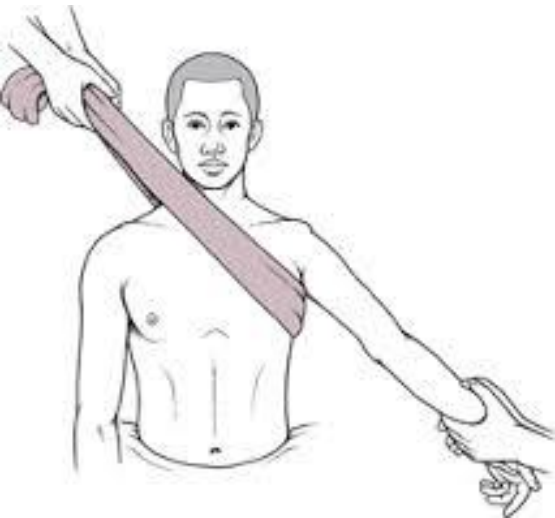
- Un-displaced fractures
- Displaced Fracture with stable pattern
- Patients unfit for anesthesia
- Fractures in children (green stick)

Fractures not suitable for closed treatment

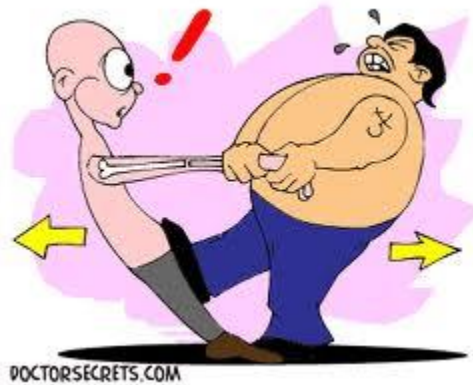
- Unstable fracture pattern
- Open fractures requiring frequent wound care
- Patients requiring early mobilization e.g. hip fractures and fractures of both upper limbs
- Displaced Peri-articular fractures

Closed Reduction

- Adequate analgesia and muscle relaxation
- Traction and counter traction(To overcome muscle spasm and correct length)
- Manual
- Gravity
- Traction table



Fracture reduction



- Manipulate to Correct/restore length,
- rotation, and angulation
- Check reduction

Anatomical landmarks

C-Arm or Check X-ray in two views

- Immobilize joint above and below

With cast or splint



Immobilization

- POP – Slab/ Cast
- Traction

Splinting

- Non-circumferential – allows for further swelling
- May use plaster or prefab fiberglass splints
(plaster molds better)

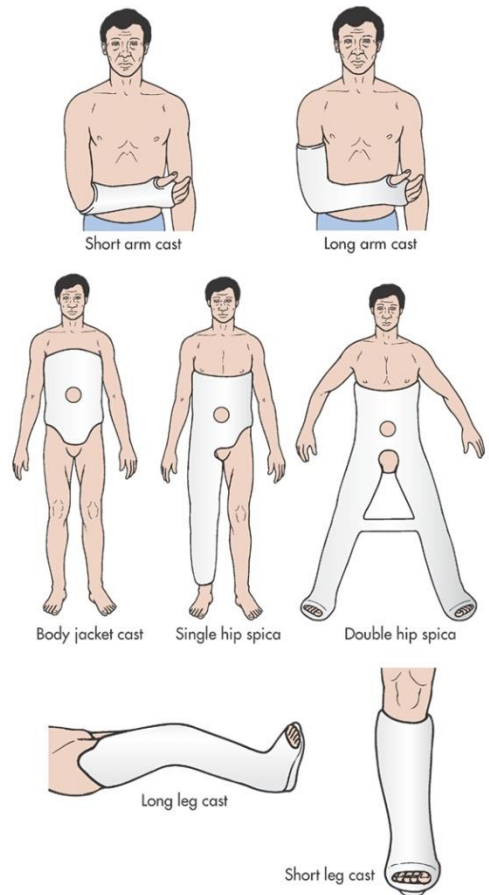


Common Splinting

- “Bulky” Jones
- Sugar-tong
- Coaptation
- Ulnar gutter
- Volar / Dorsal hand
- Thumb spica
- Posterior slab (ankle) +/- U splint
- Posterior slab (thigh)



Casts



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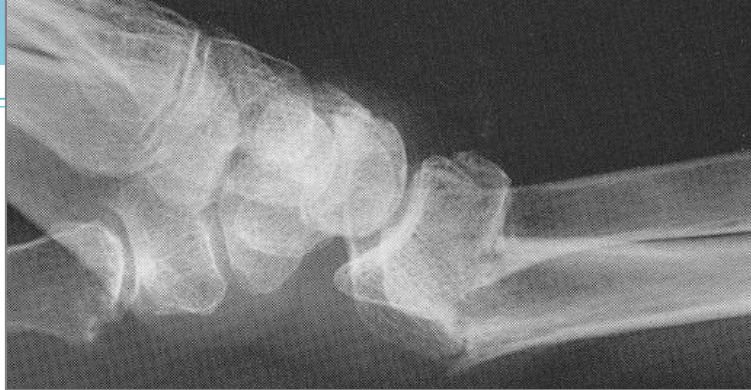
Plaster vs. Fiberglass

- Plaster

- Use cold water to maximize molding time

- Fiberglass

- More difficult to mold but more durable and resistant to breakdown
- Generally 2 - 3 times stronger for any given thickness



Short Arm Cast



Long Arm Cast

Follow up

- Regular visits and radiographs
- Early movement of joints and rehabilitation after removal of cast

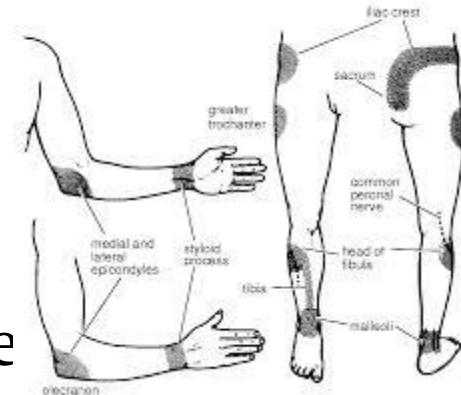
Causes of failure

- Selection of unstable fracture pattern
- Inadequate reduction
- Inadequate follow up

Complications of Casts & Splints

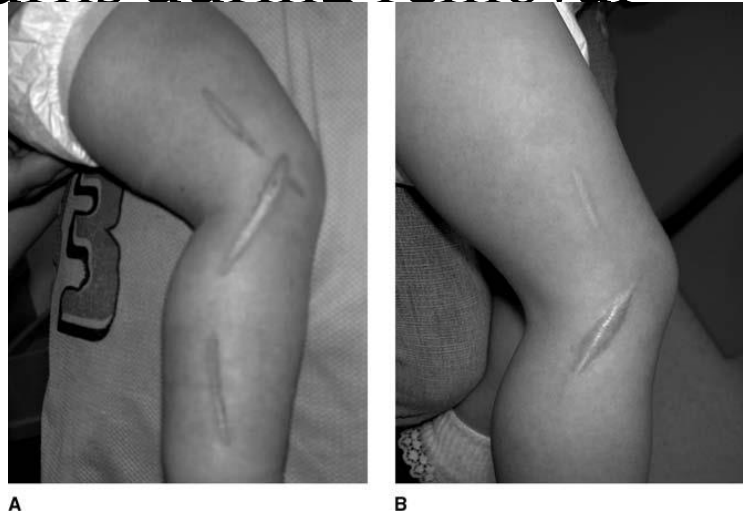
- Loss of reduction
- Pressure necrosis –
may occur as early as 2 hours
- Tight cast → compartment syndrome
Univalving = 30% pressure drop
Bivalving = 60% pressure drop
Also need to cut cast padding

ALWAYS PAD THESE PARTS OF A LIMB



Complications of Casts & Splints

- Thermal Injury - avoid plaster > 10 ply, water >24° C, unusual with fiberglass
- Cuts and burns during removal



Keloid formation as a result of an injury during cast removal. From Halanski M, Noonan KJ. J Am Acad Orthop Surg. 2008.

Complications of Casts & Splints

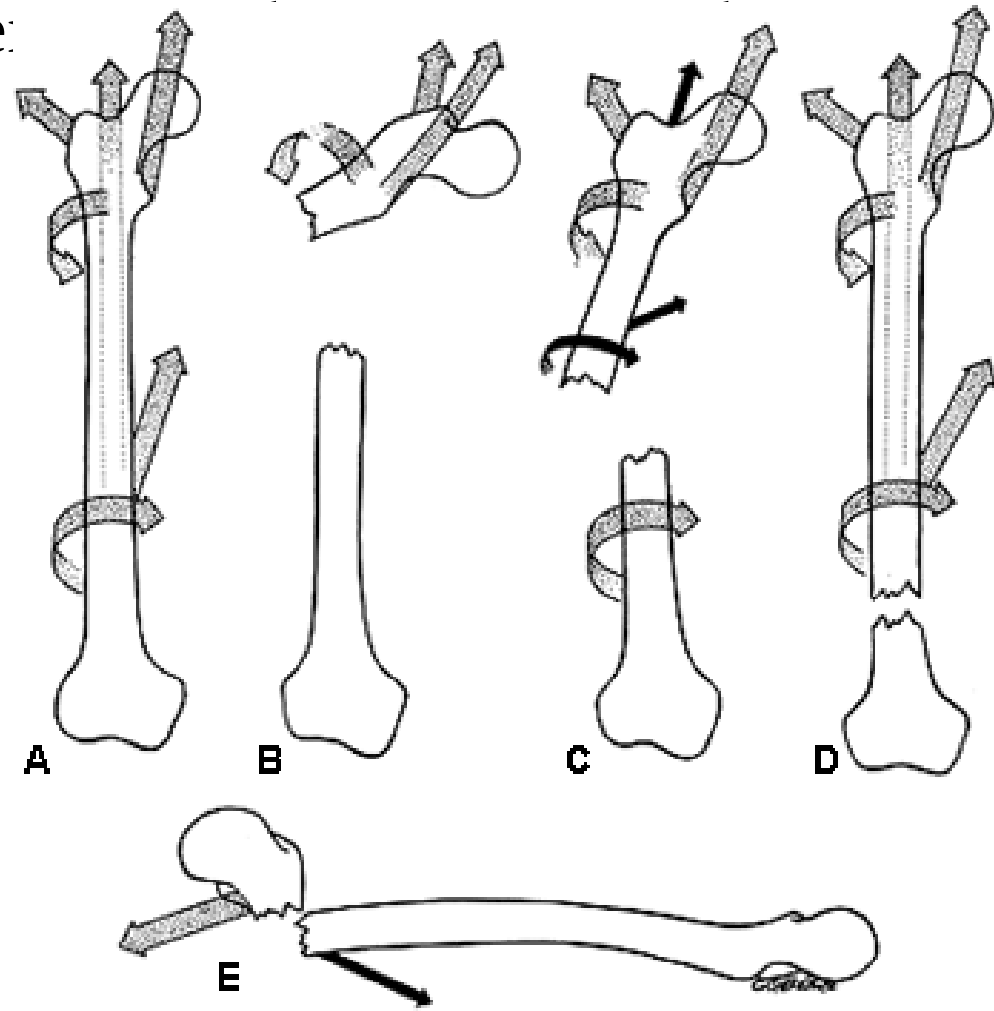
- DVT/PE - increased in lower extremity fracture
 - Ask about prior history and family history
 - Birth Control Pills are a risk factor
 - Indications for prophylaxis controversial in patients without risk factors
- Joint stiffness
 - Leave joints free when possible (ie. thumb MCP for below elbow cast)
 - Place joint in position of function

Traction

- Skin traction
- Skeletal traction

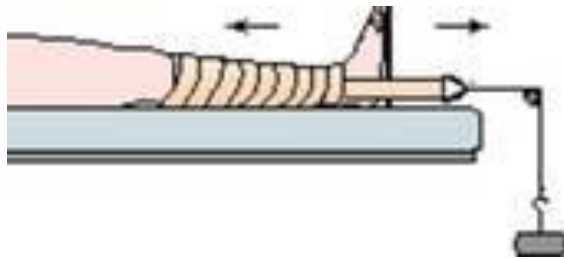
Principles

- To align the distal fragment
- fragment
- Longitudinal Traction
- Counter traction
- Rotation
- Angulation



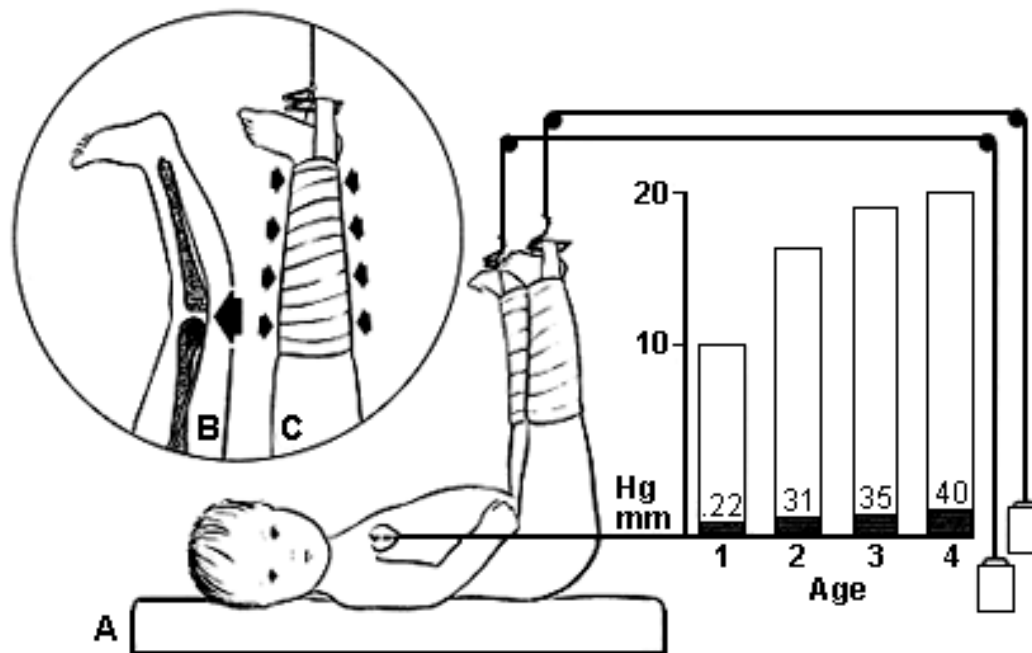
Skin traction technique

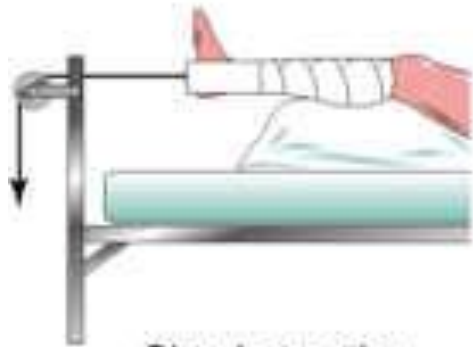
- Shaving
- Tincture benzoin co
- Pressure points
- Traction kits/ sticking plaster
- Weight



Skin Traction

- In children as definitive treatment – Gallows traction





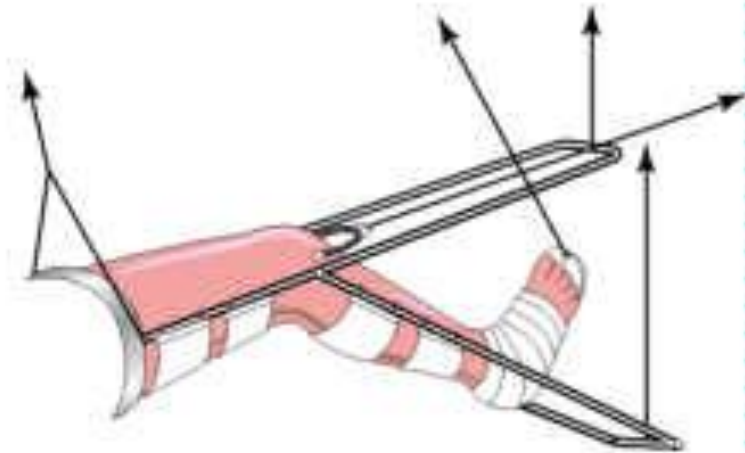
Simple traction



Hamilton Russell traction



Gallow's traction



Balanced skeletal traction

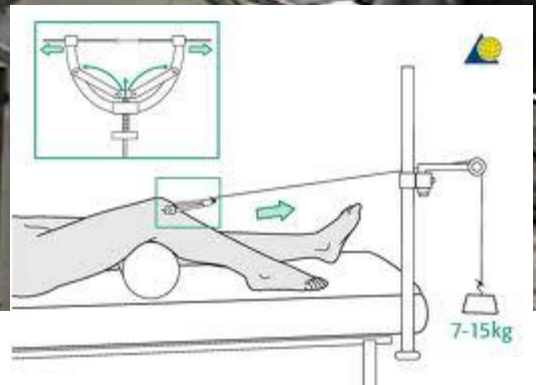
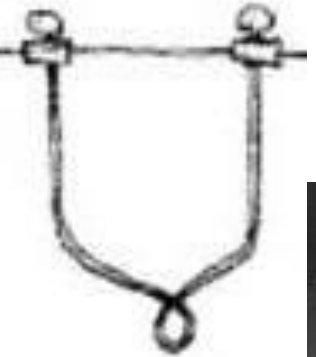
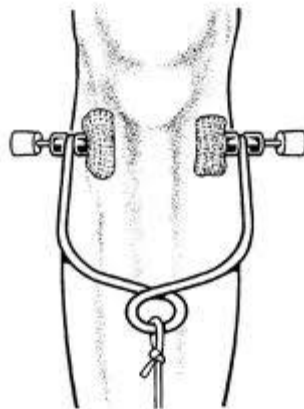


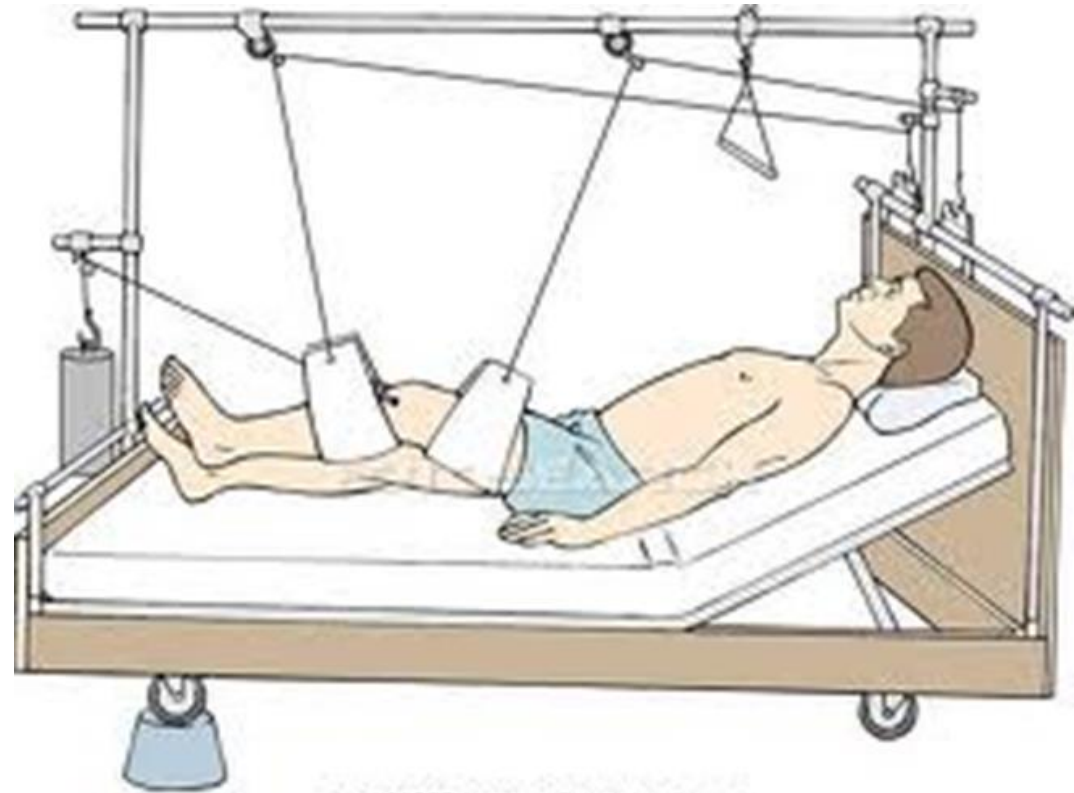
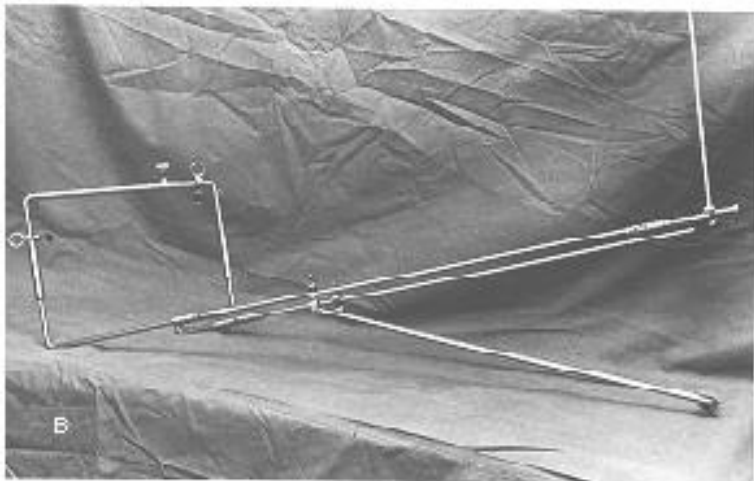
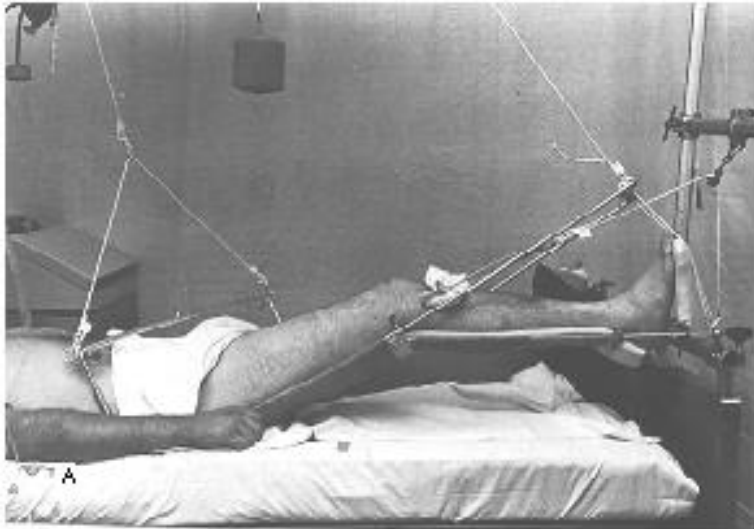
Skeletal Traction

- Temporary
- Definitive

Technique of Skeletal Traction

- Steinmann pins; Denham Pin K wire
- Bohler's stirrup
- Cord
- Proximal Tibia
- Distal femur
- Calcaneum
- Weight
- Traction – Counter traction





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Balanced Skeletal Traction

- Allows for suspension of leg with longitudinal traction
- Allows multiple adjustments for optimal fracture alignment

Complications

- Mal-union
- Over distraction – Non union
- Stiffness of joints
- Prolonged recumbency
- Pin tract complication
- Skin
- Time
- Repeated X-rays
- Cost



Thank You