Leg Length Discrepancy

- Assessment
- Prediction
- Aetiology

- Treatment

Mrs R Tate

Deformity

- Assessment
- Conditions

- Principles of correction
- Surgical options

Dr A Trees

Mr W Eardley

Dr A Trees

LLD

- When to correct?
  - ? Normal 600 military recruits 32% 0.5-1.5cm 4% >1.5cm
- Gait asymmetry > 2cm
- Compensation – only when discrepancy > 3%
  - Circumduction or flexion of longer leg
  - Vaulting over longer limb
  - Toe walking shorter limb

- > 2 - 2.5cm traditional ? Evidence
- > 5% contralateral limb (4cm) – demonstrable alteration gait

LLD Treatment Summary

Treatment	Indications	Contraindications
None	< 2cm	> 5% contralateral limb
Shoe lift / orthotics	> 2cm Toe-walkers	None
Epiphysiodesis	Predicted discrepancy > 2 cm	Discrepancy > 8 cm Inadequate growth remaining
Acute surgical shortening	Skeletally mature Femoral discrepancy 2-5 cm Tibial discrepancy 2-3 cm	Discrepancies requiring > 6 cm shortening
Acute surgical lengthening	Femoral discrepancy 2-4 cm Tibial discrepancy 2-3 cm	Risk neurovascular injury Poor bone quality
Gradual limb lengthening	Discrepancy > 4 cm LLD assoc with deformity requiring correction	Unstable joints Non compliant patient

Orthotics

- Any LLD can be managed with lift on or in shoe
- Rarely acceptable as long term solution
- No short or long term protective or mechanical benefits
- < 1 cm within shoe
- > 1 cm built onto sole of shoe
- Lifts > 8 cm difficult

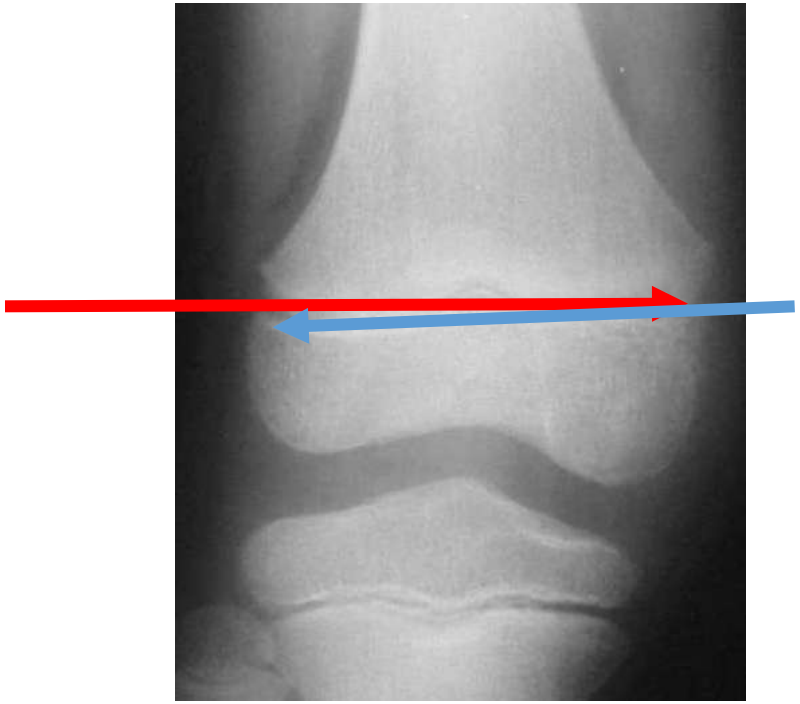
Shortening of longer leg

- Skeletally immature – growth remaining
  - Epiphysiodesis
    - Temporary
    - Permanent
- Skeletally mature
  - Long bone shortening

Epiphysiodesis

- Numerous techniques
- Complications
  - Undercorrection
  - Overcorrection
  - Angular deformity
- Timing is crucial

- Permanent – percutaneous physeal ablation
  - II guidance
  - Drills / curettes – destroy physis
  - No hardware
  - Physeal undulations, AP, peripheral, central



- Stapling / ‘8’ plates
  - Reversible
  - Growth resumes after metalwork removal
    - Only if perichondrial ring preserved

- Transphyseal screws
  - Metaizeau

Acute shortening

- Skeletally mature / insufficient growth remaining
- Shorten longer leg – remove bone & fix
  - Nail / plate
- Single stage procedure
- Tibial or femoral – symmetrical knee height
- Complications
  - Lower than lengthening
  - Higher than epiphysiodesis
  - Muscle weakness – hamstrings & quads
    - Limits shortening to 5 cm

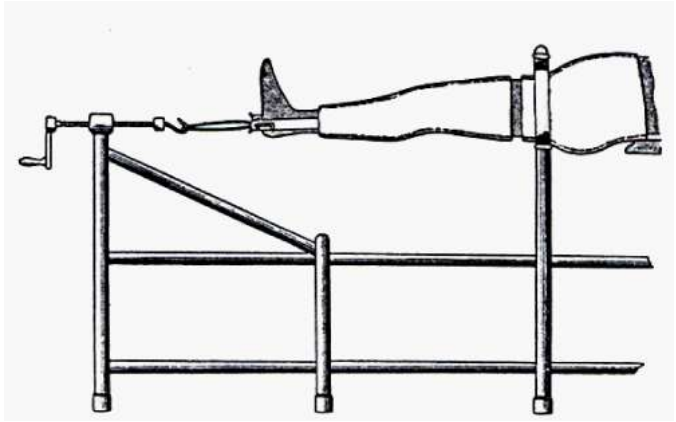
Lengthening

- Growth stimulation
    - Experimental

- Surgical lengthening
    - Acute or gradual
    - Aim – maximise function
    - Indications
        - Predicted LLD > 4 cm (relative)
        - Associated angular deformities requiring correction

History

- Codivilla



- Wagner 1972
- Ilizarov
  - Gradual distraction
    - Across physis – chondrodiatasis
    - After corticotomy – callotasis
- Hueter-Volkmann Law
    - compression forces inhibit growth
    - tensile forces stimulate growth

Acute lengthening

- Osteotomy over im nail / plate
- Complications +++
  - Femoral / sciatic nerve injury
  - Femoral artery occlusion
  - Reflex sympathetic dystrophy
  - Delayed union
  - Non union
  - Implant failure

Gradual lengthening

- Chondrodiatasis
  - Physeal distraction
  - Skeletally immature

  - Complications
    - Pain+++
    - Infection
      - Intraarticular pins ➡ septic arthritis
    - Subsequent physeal closure

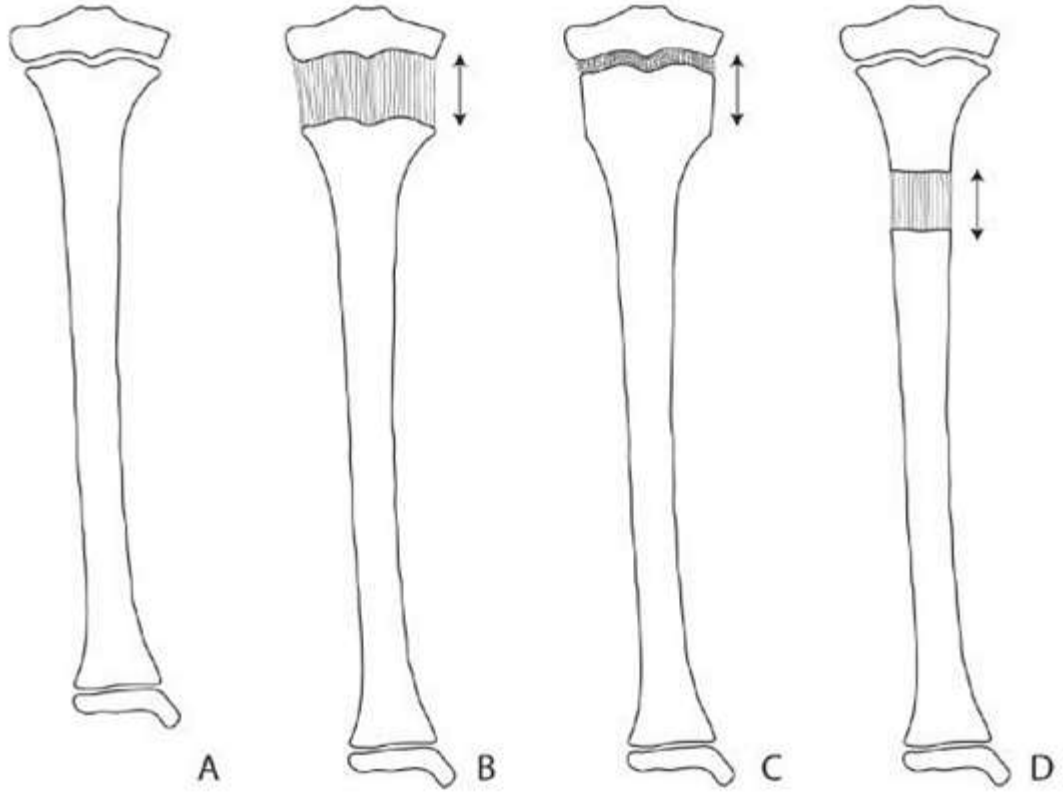
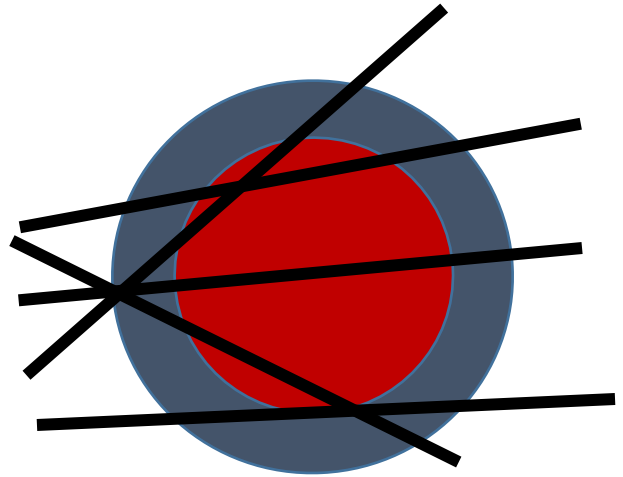
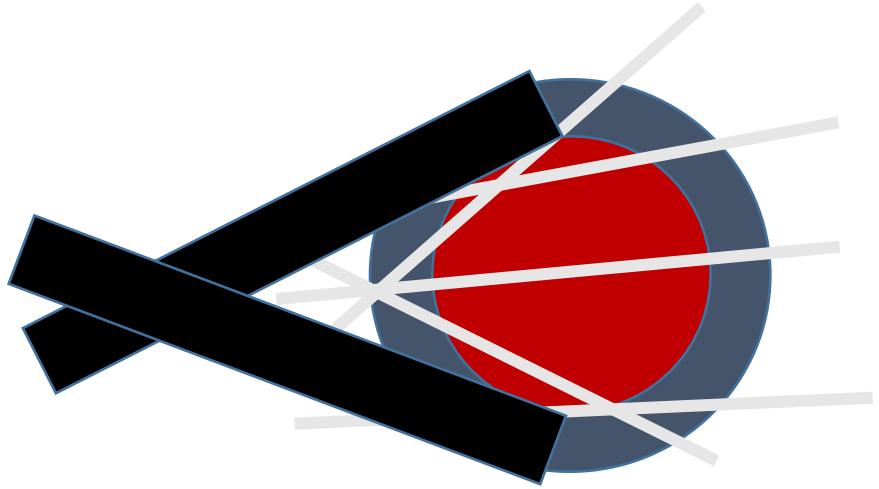


Fig. 9.1 Schematic drawings demonstrating normal tibia (A) and different distraction osteogenesis techniques: distraction epiphysiolysis (B), chondrodiatasis (C) and callotasis (D)

Corticotomy (osteotomy) & Callotasis

- Controllable
- Gradual distraction of fracture callus
- Low-energy corticotomy of long bone
  - Preservation of soft tissue envelope
  - Drill holes & osteotome
    - Preserve im blood supply
    - Avoid bone necrosis (heat)



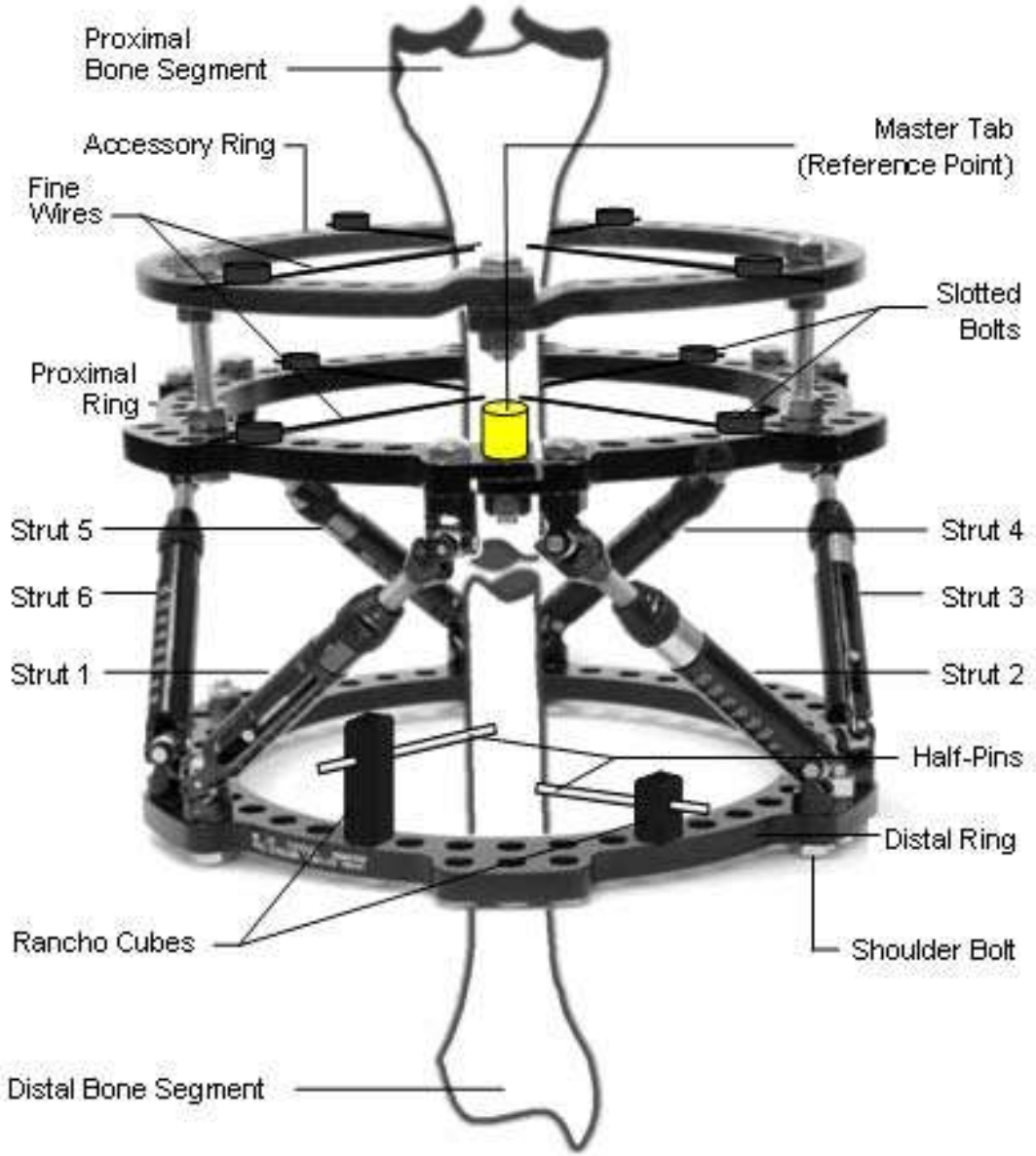


- Initial latent period
  - Fracture callus develops at corticotomy site
  - Soft tissues stabilise
  - Blood supply reconstitutes
- Gradual distraction
  - Until desired length achieved
    - Or max due to soft tissue constraints
    - 1mm / day tolerable to callus & soft tissues
      - 4 X 0.25mm increments
- Limb maintained in lengthened state until adequate consolidaton of new bone has occurred
  - Metaphyseal osteotomies heal more quickly than diaphyseal

Complications

- Nerve / vessel injury
    - At time of device application
    - Neuropraxia with lengthening
- Incomplete osteotomy
- Premature consolidation
- Poor regenerate bone formation
- Joint subluxation
    - Monitor for contractures
    - Maintain ROM
- Pin site infection
- Psychological
    - Prolonged intense treatment
    - Pain
- Scars, weakness, asymmetry

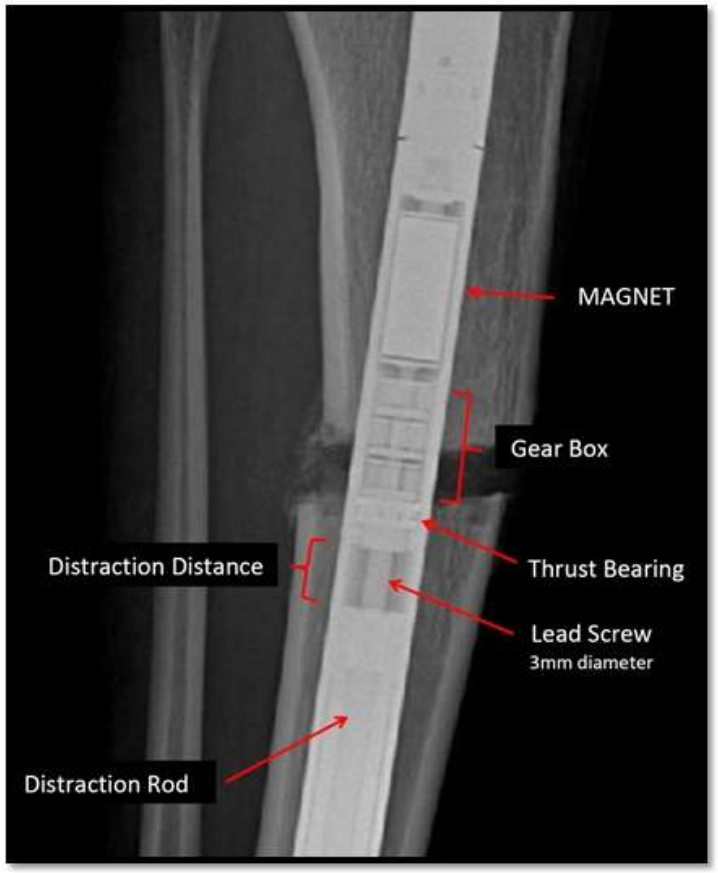
- External fixation



- IM fixation


Intramedullary Nail


External Remote Controller (ERC)


MAGNET
Gear Box
Distraction Distance
Thrust Bearing
Lead Screw
3mm diameter
Distraction Rod

Questions

Coffee