

# IMPLANTS IN ORTHOPEDICS

Dr Santosh Borkar

MS ortho ,DNB,FCPS,D

ORTHO,MBBS

PROFESSOR

# IMPLANTS , INSTRUMENTS, PROSTHESIS

- IMPLANTS

- devices which are placed ( planted ) in the human body

- INSTRUMENTS

- devices which are used to perform surgical procedures

- PROSTHESIS

- when implants are used to replace a diseased/damaged part totally or partially

# PROPERTIES OF AN IMPLANT

- Modulus of elasticity of implant – close to that of bone

Eg :biodegradable implant are the closest  
among the alloys titanium is the closest

- Biocompatible
- Chemically stable
- Good ductility
- High fatigue resistnce
- High mechanical strength
- Non toxic
- Non carcinogenic

# IMPLANT SELECTION BASED ON TYPE OF FRACTURE

TYPE OF FRACTURE	ORDER OF IMPLANT PREFERENCE
TRANSVERSE	INTRAMEDULLARY INTERLOCKING NAIL PLATE FIXATION
OBLIQUE	INTRAMEDULLARY INTERLOCKING NAIL PLATE FIXATION
SPIRAL	PLATE FIXATION INTRAMEDULLARY INTERLOCKING NAIL
COMMINUTED	EITHER INTRAMEDULLARY INTERLOCKING NAIL OR PLATE FIXATION

# TYPES OF IMPLANT

- SURFACE IMPLANTS

Eg : plates and screw

- INTRAMEDULLARY IMPLANTS

Eg : nails

# A. SURFACE IMPLANTS

- Placed on the surface of bone
- Bear the load of axial stress

Eg :screws and plates

# SCREWS

- Device which converts rotational force into linear motion
- Used to fix surface implant to the bone
- Used to fix small bone fractures

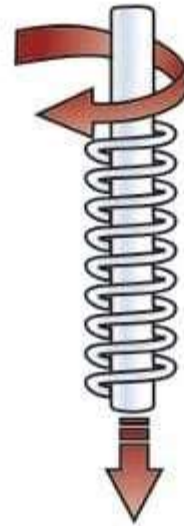
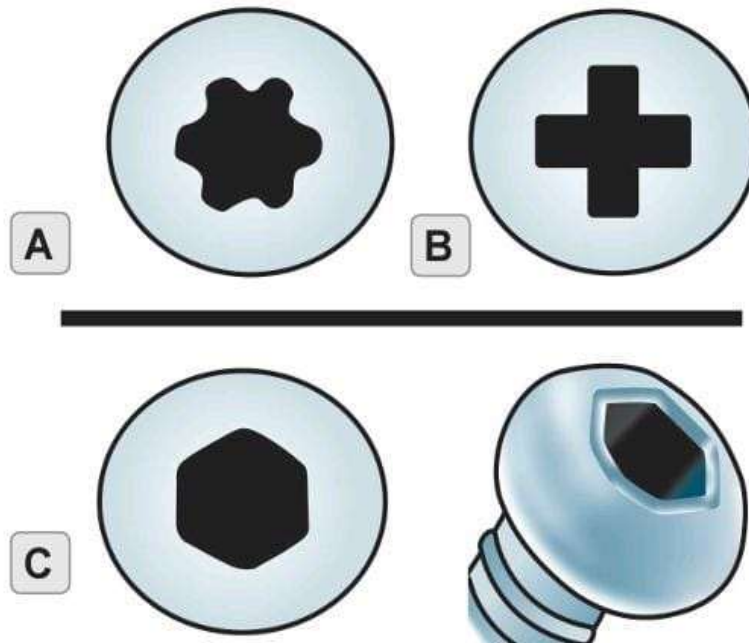
Eg : scaphoid and malleolus

- Multiple screws are used to fix larger fragments

Eg: fracture neck of femur

# PARTS OF SCREW

- Head (eg: torx, philips, hexagonal )
- Shank with threads
- Tip





# PITCH AND LEAD OF THE SCREW

- Pitch
  - distance between the threads of the screw
- Lead
  - distance which screw moves during one complete turn
- Pitch and lead are equal

# TYPES OF SCREWS

- CORTICAL SCREW
  - threads along the length of shank
  - smaller pitch



- CANCELLOUS SCREW:

- threads only distally

- smooth shank without threads extend proximally up to head of screw

- larger pitch



- **CANNULATED CANCELLOUS SCREW**
  - similar to cancellous screw
  - central canal for insertion of guidewire



- MALLEOLAR SCREW

- has a conical sharp cutting tip

- Threads extend more proximally , almost upto  $\frac{1}{2}$  the length of shank

- used for fixation of malleolus



- SCAPHOID SCREW: (HERBERT SCREW)
  - Headless screw
  - threads of different pitch at both the ends
  - fixation of fracture scaphoid



- LOCKING SCREW OF L.C.P.
- Head has threads on it



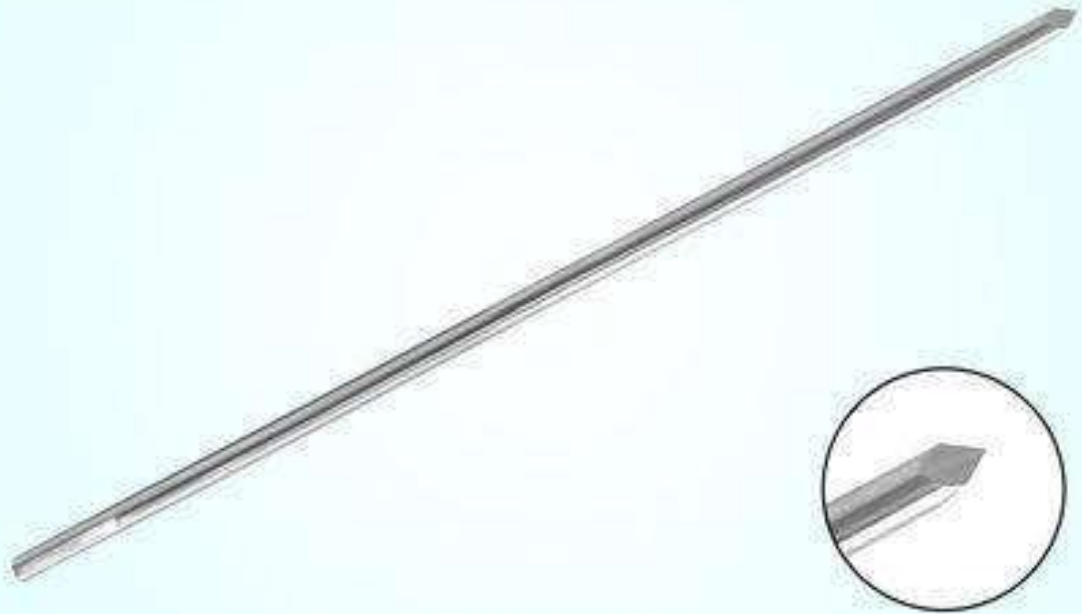
- LOCKING SCREW OF INTERLOCKING NAIL
  - Has threads throughout its length
  - Threads are of wider pitch and lesser width as compared to cortical screw





# STEINMAN PIN

Steinman Pin with Trocar Tip



# DENHAM PIN

Denham Threaded Pin



# SCHANZ PIN



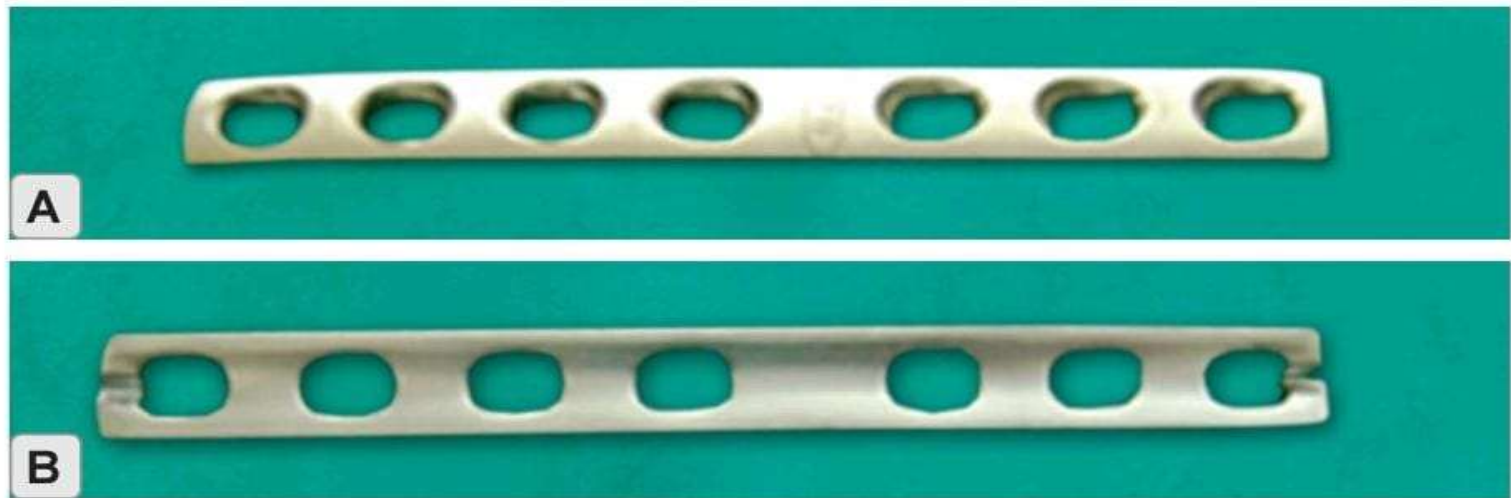
# PLATES

- Is a surface implant with holes
- Placed on surface of bone
- Fixed to the bone by screws
- Outer surface – convex
- Inner surface – concave
- To accommodate cylindrical structure of bone

# TYPES OF PLATE

- DYNAMIC COMPRESSION PLATE ( DCP )
- 1/3<sup>RD</sup> TUBULAR AND SEMI TUBULAR PLATES
- LIMITED CONTACT DYNAMIC COMPRESSION PLATE ( LC DCP )
- LOCKING COMPRESSION PLATE ( LCP )

- **DYNAMIC COMPRESSION PLATE ( DCP )**
  - Curvature equal to  $1/8^{\text{th}}$  of circle
  - Holes are equidistant from solid non fenestrated centre



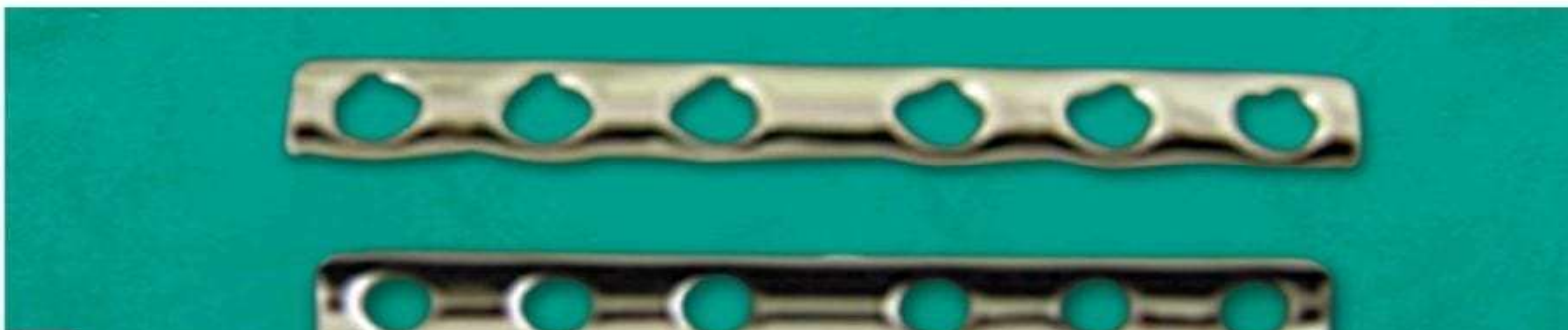
## 1/3<sup>RD</sup> TUBULAR AND SEMI TUBULAR PLATES

-Used to fix fracture in supportive bones like ulna and fibula  
and fibula

SEMITUBULAR PLATE



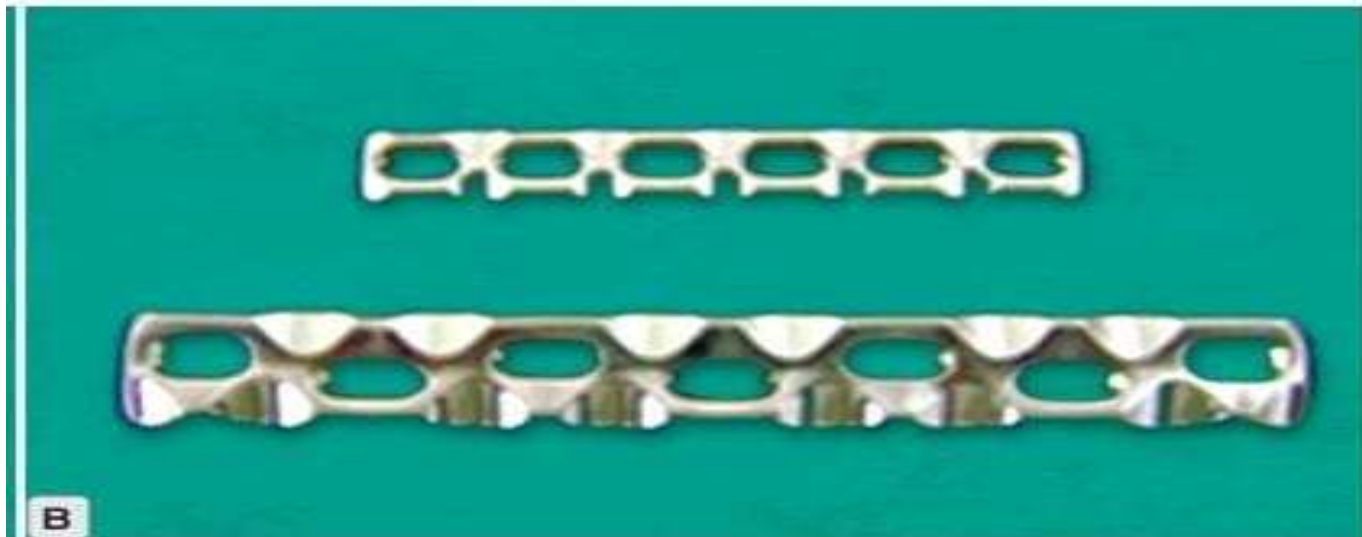
1/3 TUBULAR PLATE



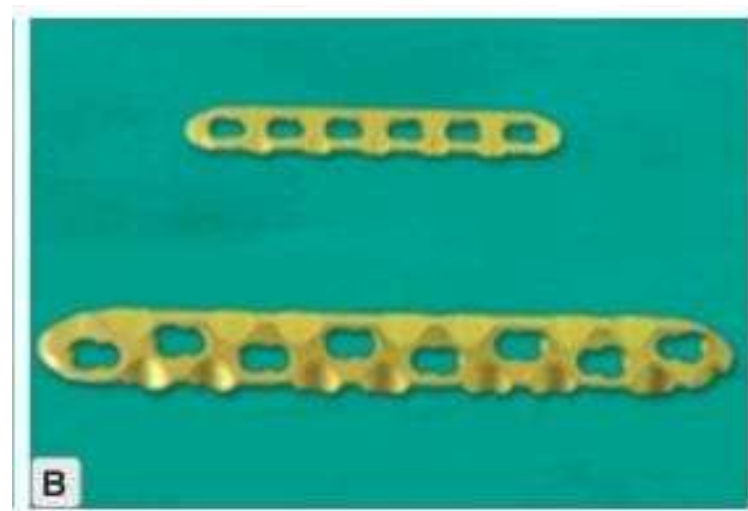
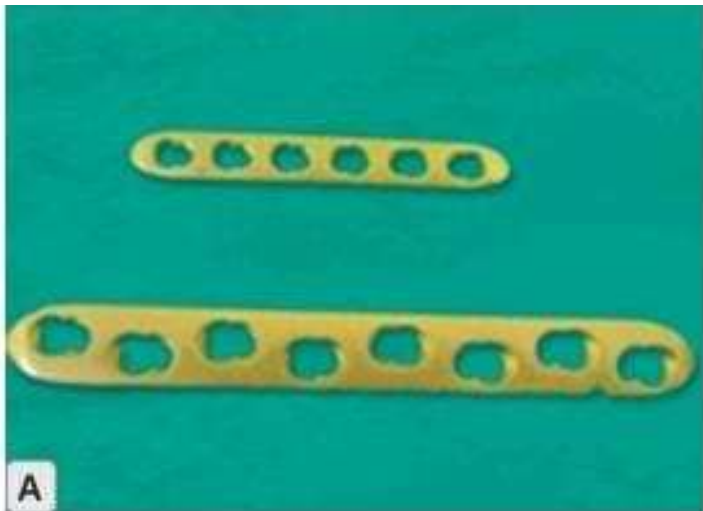
- **LIMITED CONTACT DYNAMIC COMPRESSION PLATE ( LC DCP )**
  - Grooves on concave surface ( for blood vessels to grow )
  - Holes distributed evenly



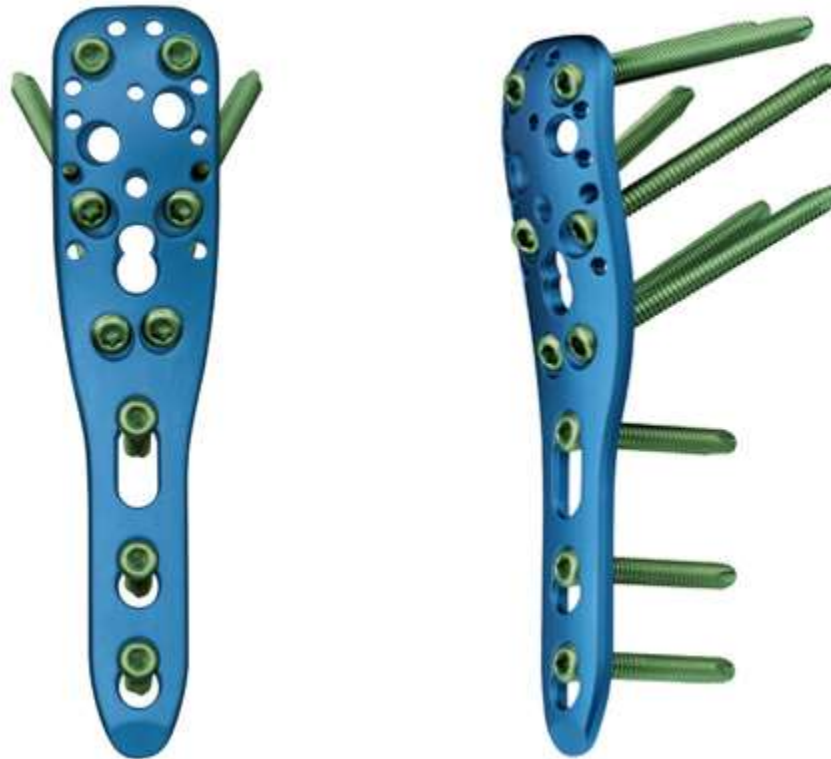
# LIMITED CONTACT DYNAMIC COMPRESSION PLATE



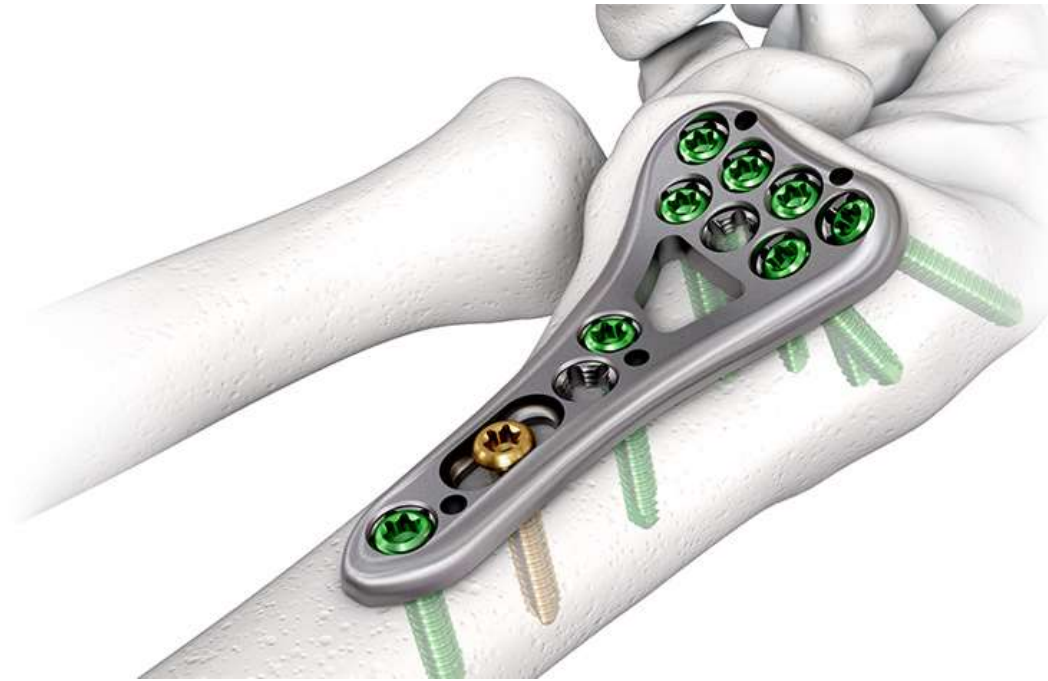
- LOCKING COMPRESSION PLATE ( LCP )  
-used to fix fractures in osteoporotic skeleton



# Philos plate



# DISTAL RADIUS PLATE



# T plate



# WIRES

- SS WIRE

- Stainless steel

Used for fixation of comminuted fracture ,  
tension bandwiring ,circlage wiring



## B. INTRAMEDULLARY IMPLANTS

- Placed in medullary canal of bone
- Shares the stress of axial loading

# TYPES OF INTRAMEDULLARY IMPLANT

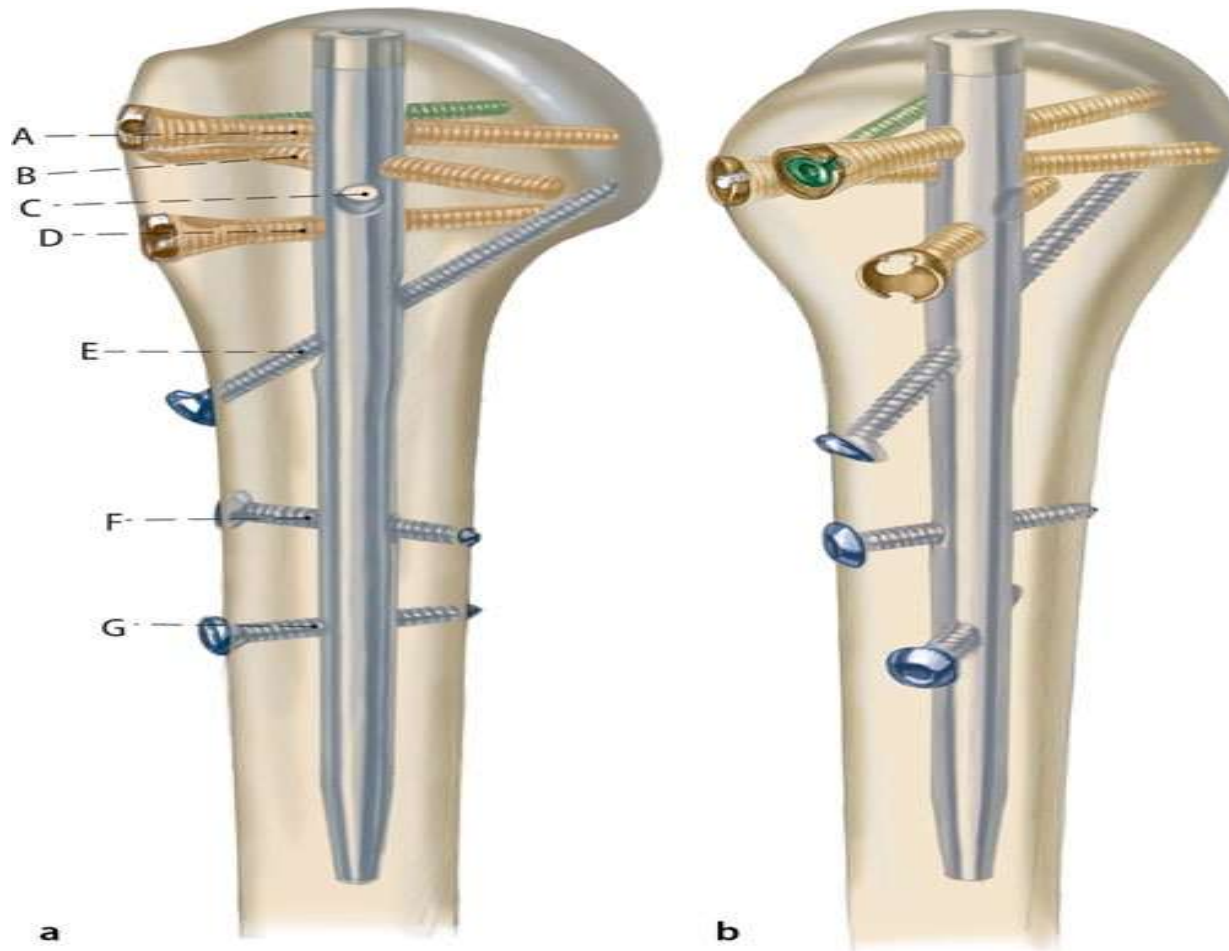
- RIGID NAILS
- HOLLOW NAILS
- ELASTIC NAILS



# RIGID NAILS

- solid rod with no central canal
- used in open fracture and comminuted fracture

# Proximal humerus nail



# FEMUR NAIL



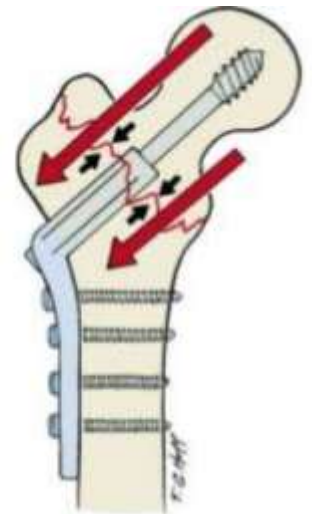
# PROXIMAL FEMORAL NAIL



# Dynamic hip screw



- Controlled collapse
- Dynamic action reduces incidence of screw cut out and penetration of screw into hip joint



# Tibia nail



# Nail curves

- **Angle of herzog :**
  - 11° bend in AP direction at junction of upper 1/3<sup>rd</sup> and lower 2/3<sup>rd</sup> of tibia nail
- Mismatch in radius of curvature –
  - Distal anterior cortical perforation
  - more reaming required during insertion



# ELASTIC NAILS

- Thin solid rods
- Used in paediatric long bone fracture and in elderly, osteoporotic long bone fracture

Eg : K nail , rush nail



# Tens nail



4mm



3.5mm



3mm



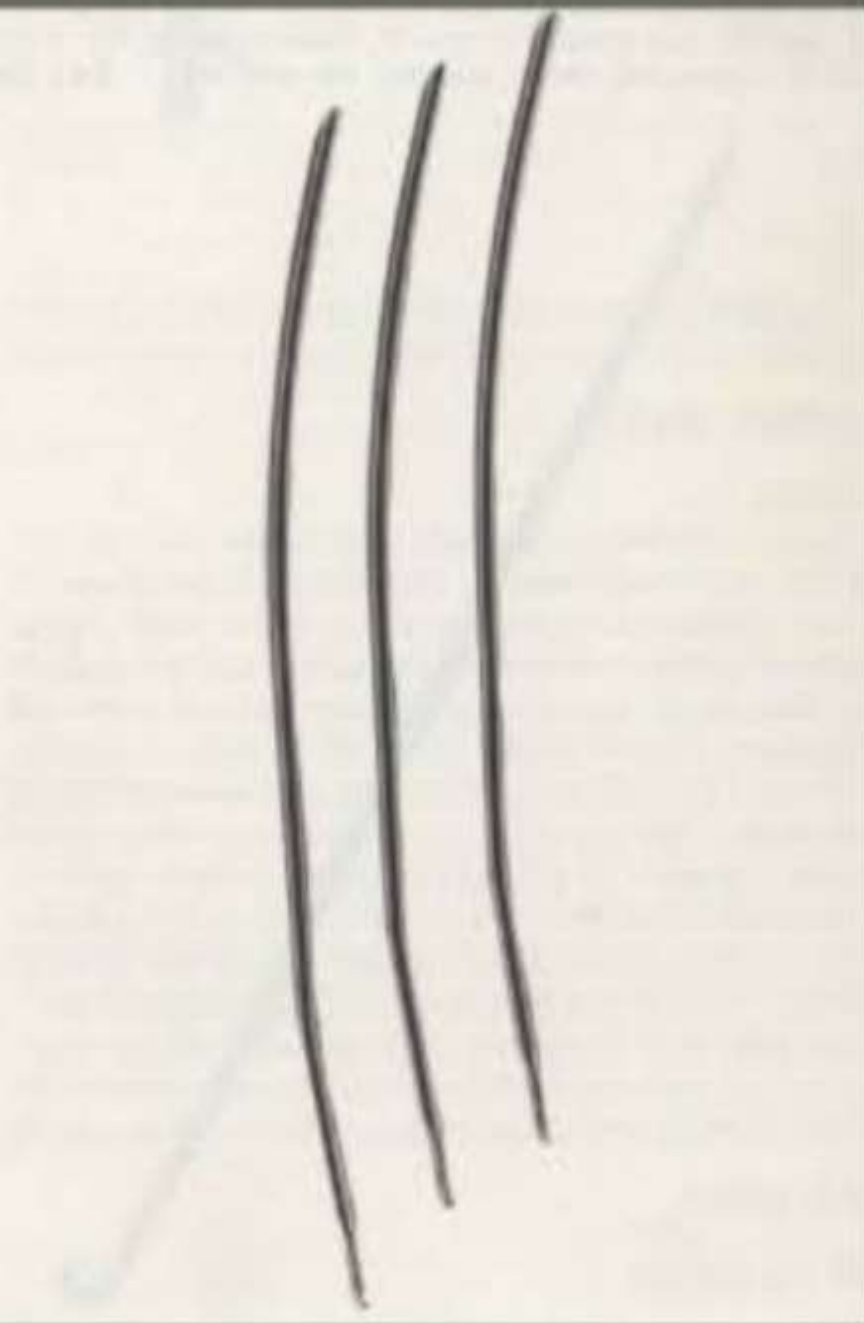
2.5mm



2mm

# K nail





Ender Nails, which are solid pins with an oblique tip and an eye in flange at the other end, were originally designed for percutaneous, closed treatment of extra capsular hip fractures

# Rush nail



# PROSTHESIS

- when implants are used to replace a diseased/damaged part totally or partially
- Eg: Austin moore prosthesis  
Thompson prosthesis
- Both are used for # neck of femur for REPLACEMENT HEMIARTHROPLASTY

# A-M PROSTHESIS AND THOMPSON PROSTHESIS

- AUSTIN-MOORE PROSTHESIS:
  - FENESTRATIONS are present in stem of A-M prosthesis for ingrowth of bone---- self locking process
  - Used when calcar femorale is sufficient
- THOMPSON PROSTHESIS:
  - used when calcar femorale is deficient
  - used with bone cement

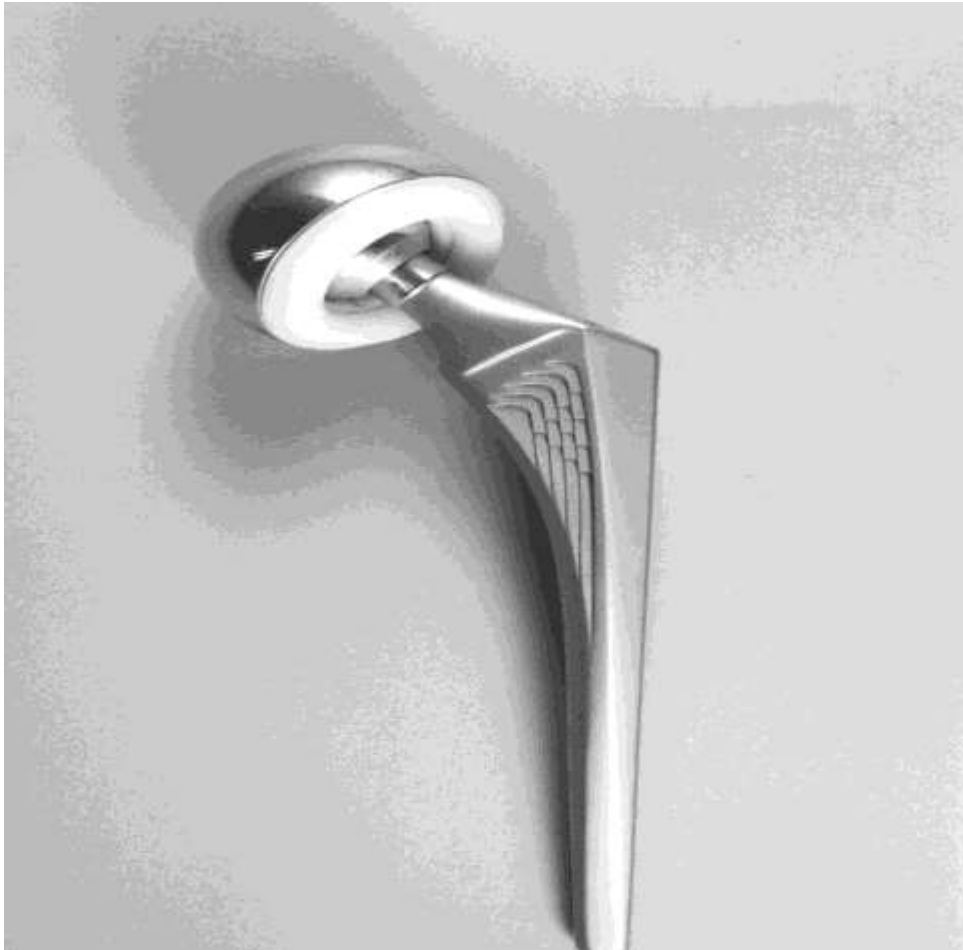
AUSTIN-MOORE



THOMPSON

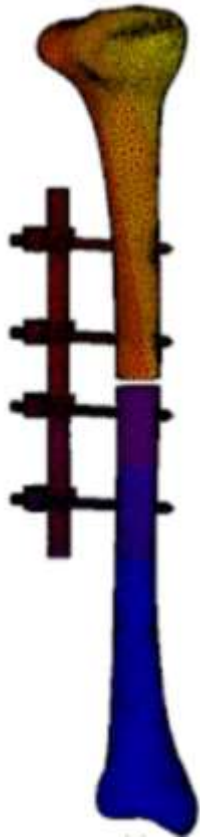


# Bipolar hemiarthroplasty prosthesis





# External fixator



Thank you !!