A BASIC INTRODUCTION TO DEFORMITY CORRECTION

Deformity

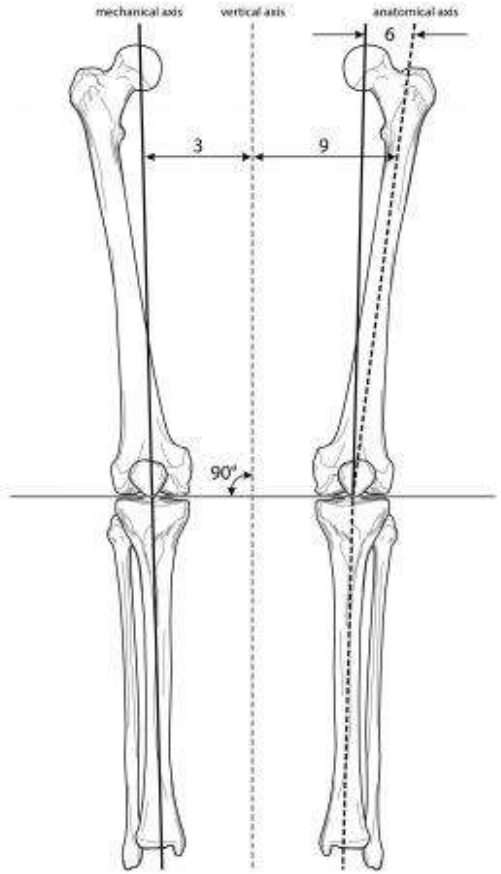
- A deviation from normal anatomy
- May be an abnormality in length, rotation, translation or angulation
- Consider : deficiency, malformation, contour, circumference and proportion.

Diagnosis

- Long, standing anteroposterior
lateral radiographs.

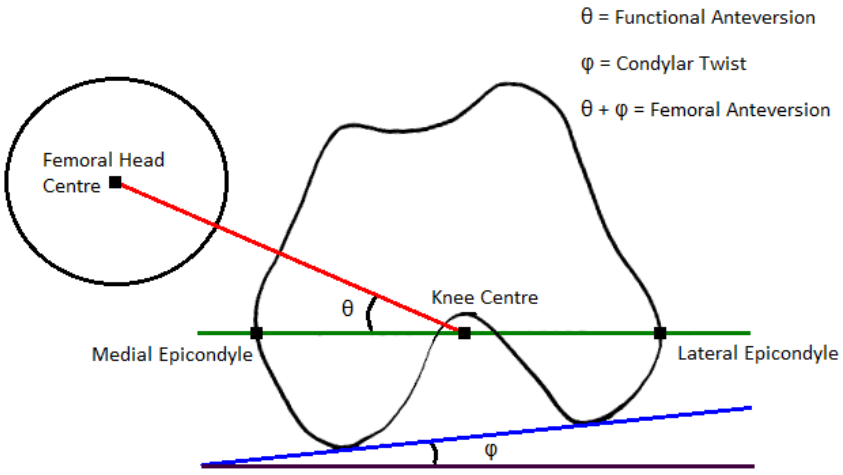
Consideration 1 – Joint Alignment

- In normal alignment, the hip, knee, and ankle joint centres are colinear.
- Frontal plane deformities lead to a mechanical axis deviation
- This primarily affects the knee but also affects the subtalar, ankle, and hip joints.
- Normally the line of weight-bearing force from the ankle to the hip joint passes through the medial tibial spine in the center of the knee.
- In mechanical axis deviation (MAD) it passes medial or lateral to the center of the knee.



Consideration 2 – Joint Orientation

- Each joint has a normal anatomical inclination to both the mechanical and anatomical axis of the limb segment
- In the tibia the mechanical and anatomical axes are the same, but in the femur they are different.
- The mechanical axis of the femur is defined as the line from the center of the hip to the centre of the knee. This usually sub tends a 6 degree angle to the anatomical axis of the femur, which runs from the piriformis fossa to the center of the knee joint.
- The knee joint line has been measured to be about 3° off the perpendicular such that the distal femur is in slight valgus and the tibial diaphysis in slight varus.



AXIS

- Each long bone has 2 axis :-

✓ Mechanical axis

✓ Anatomical axis.

MECHANICAL AXIS

- Straight line connecting the joint center points of the proximal & distal joints.

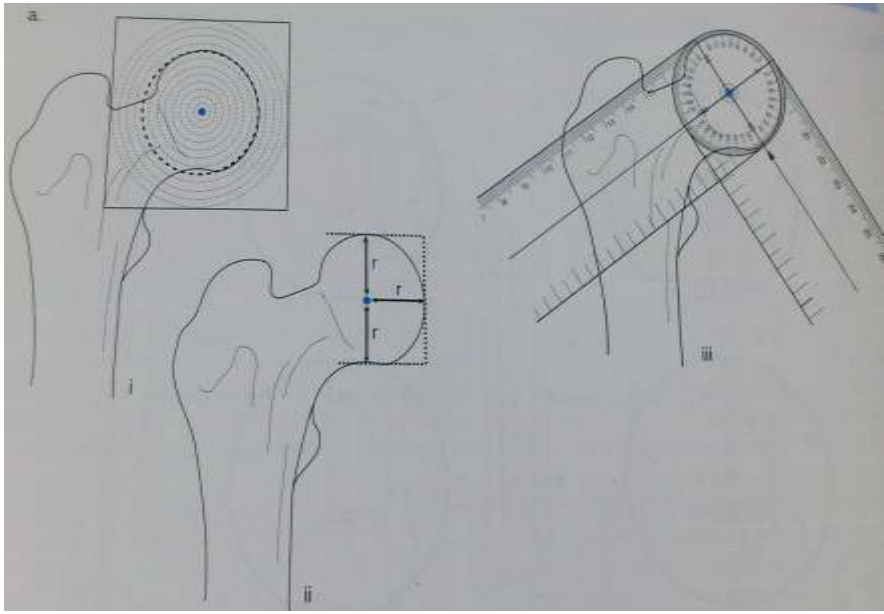
- Its always a straight line whether in frontal or sagittal plane.

ANATOMICAL AXIS

- Is mid diaphyseal line.
- Anatomical axis line can be straight (frontal) & curved (sagittal).

JOINT CENTER POINT

- Mechanical axis passes through the joint center point.

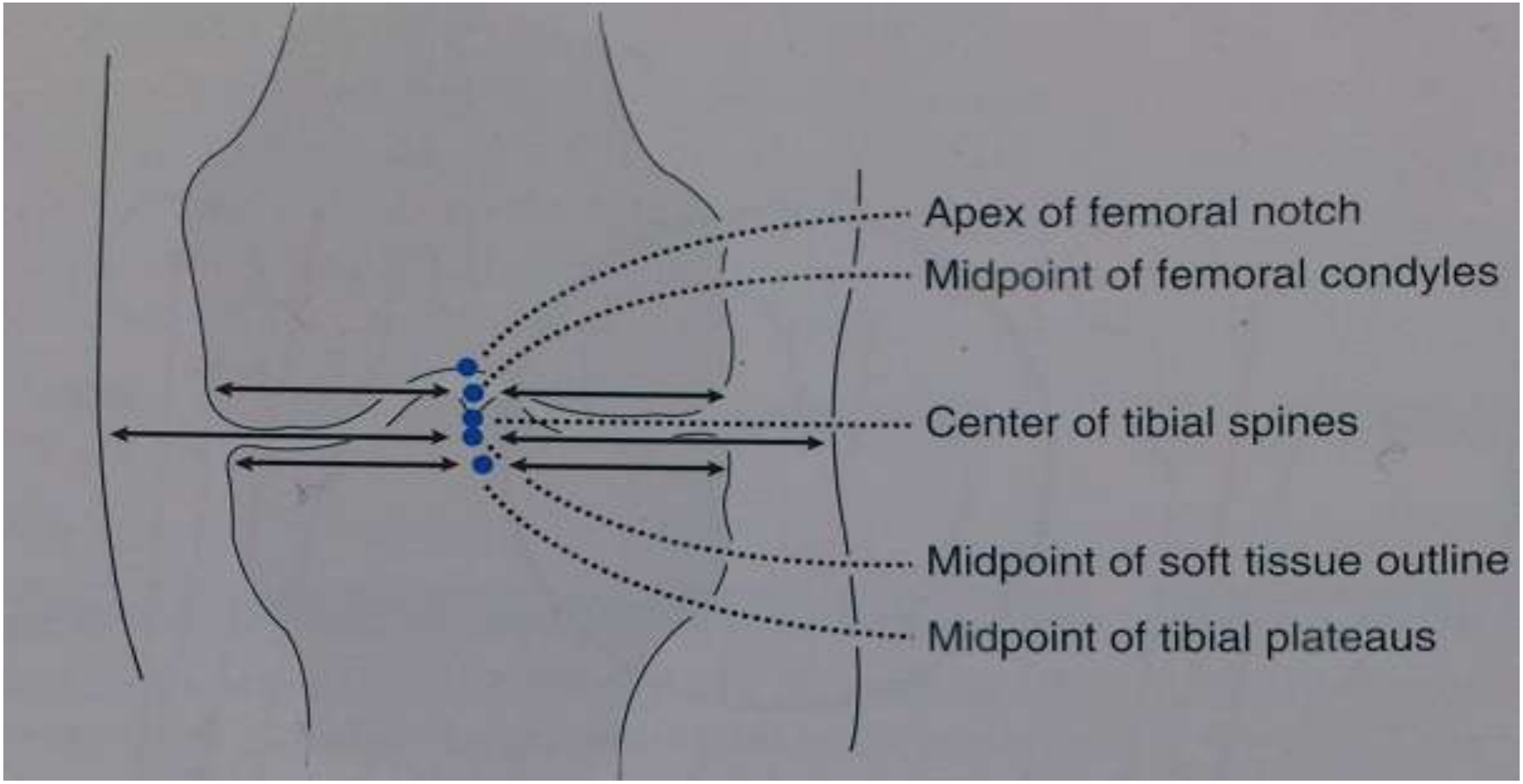


- HIP

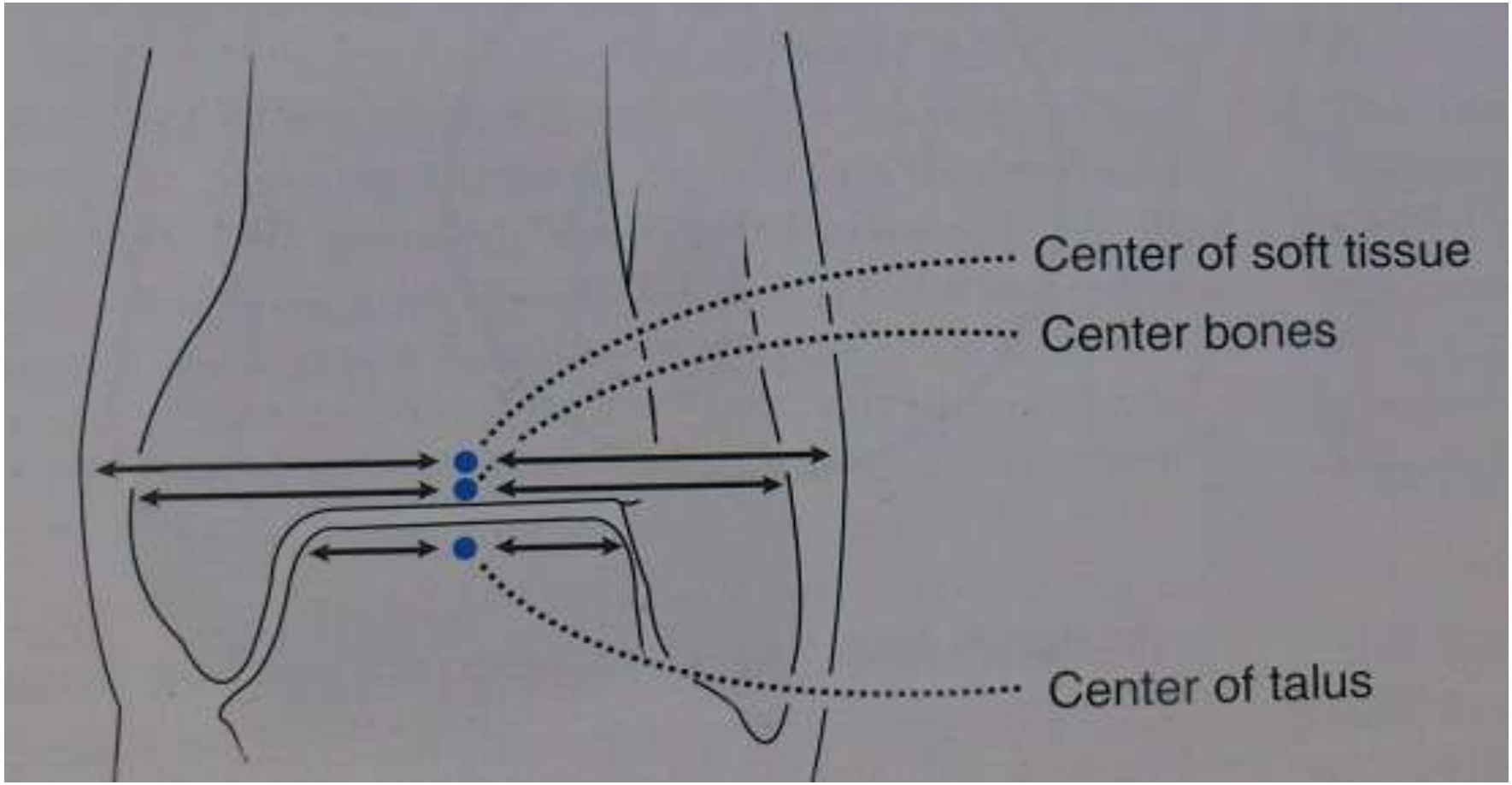
✓ Mid point of femoral head.

✓ Longitudinal diameter of

KNEE


Apex of femoral notch
Midpoint of femoral condyles
Center of tibial spines
Midpoint of soft tissue outline
Midpoint of tibial plateaus

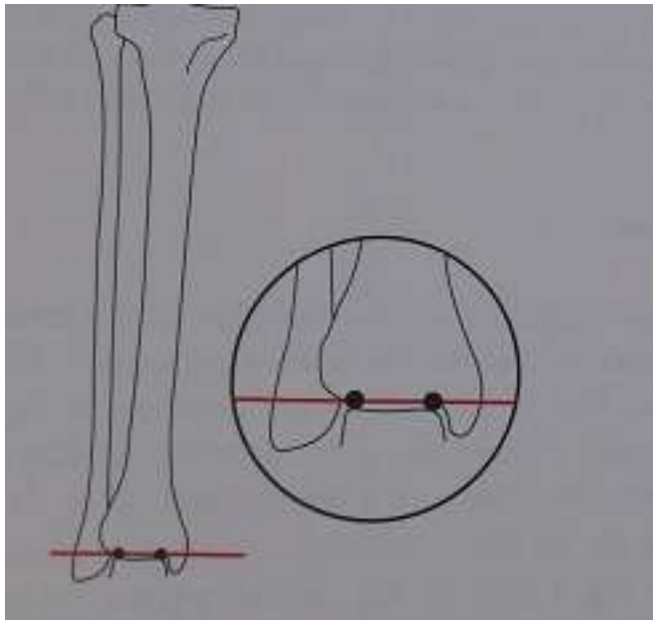
ANKLE



JOINT ORIENTATION LINE

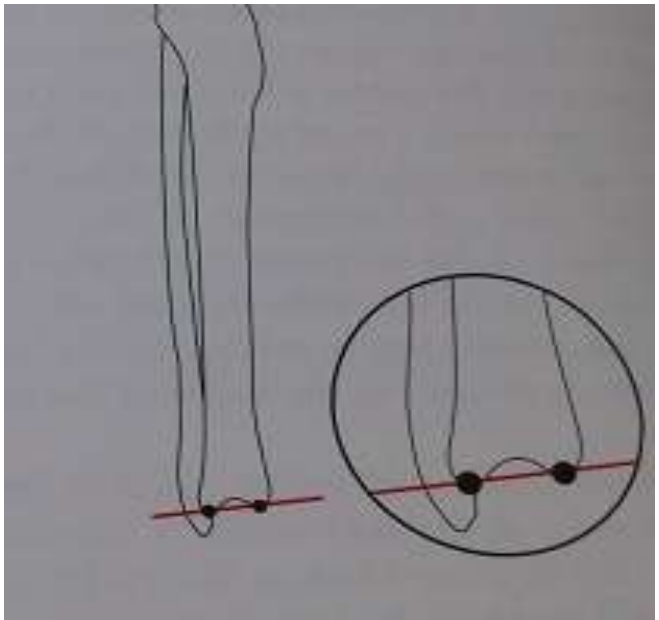
- Line representing the orientation of a joint in a particular plane /projection.

- ANKLE



✓ Frontal : along the flat subchondral line of tibial plafond.

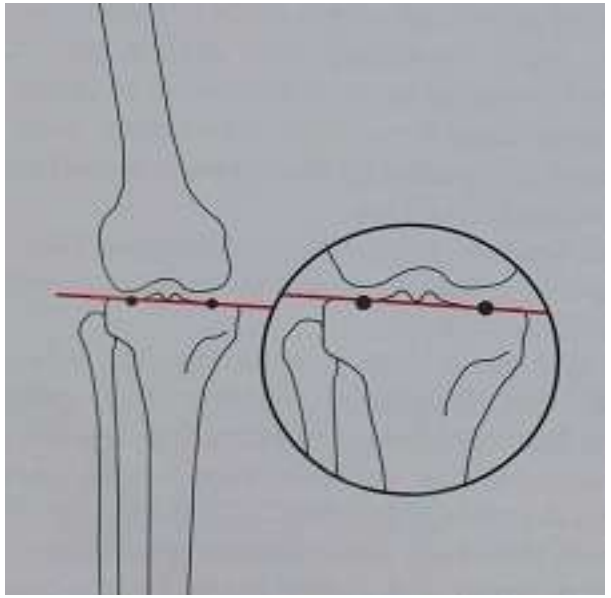
✓ Sagittal : line from distal tip of posterior lip to tip of anterior lip.

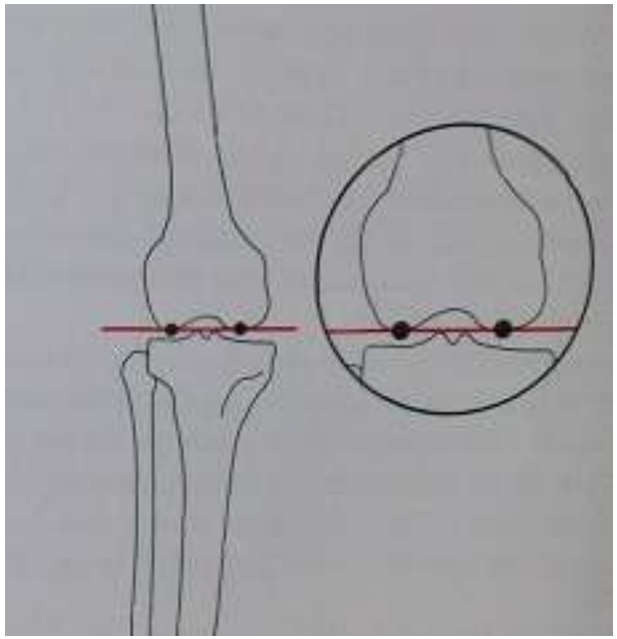


KNEE

- FRONTAL : along the subchondral line of tibial plateau.

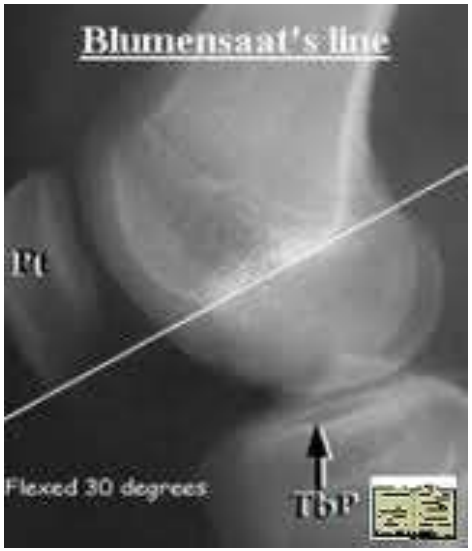
✓ Line tangential to most distal point on the femoral condyle.

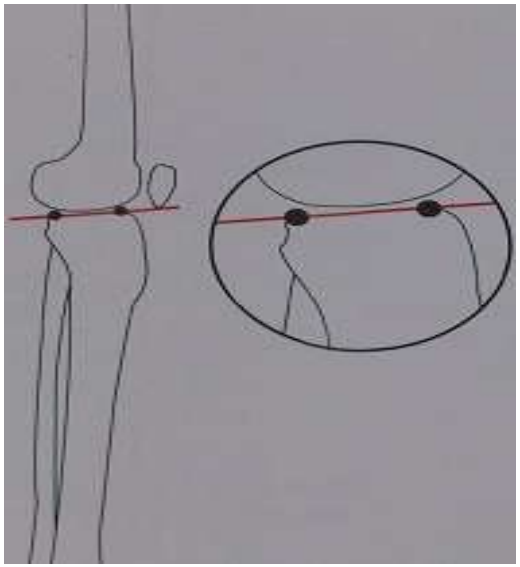


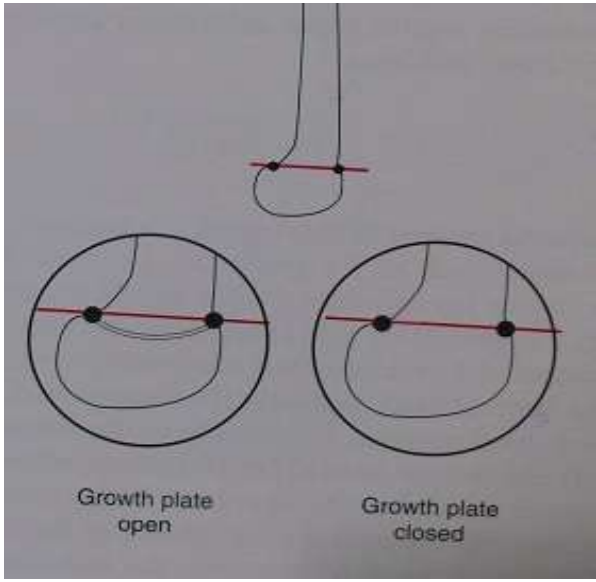


- SAGITTAL : along flat subchondral line of plateau.

✓ Line connecting 2 points where the condyles meet the metaphysis.

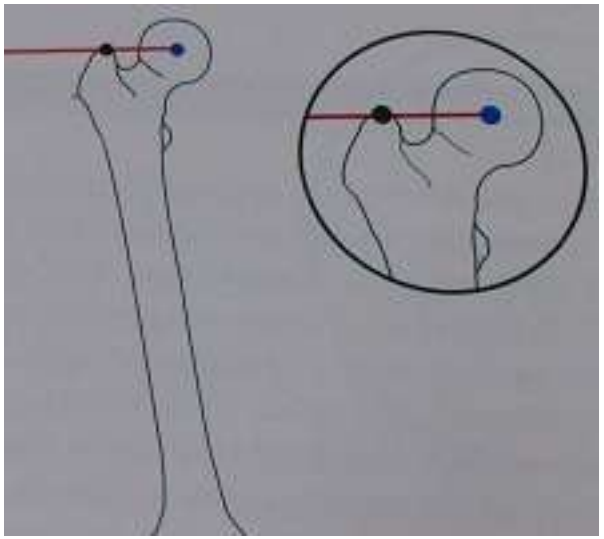


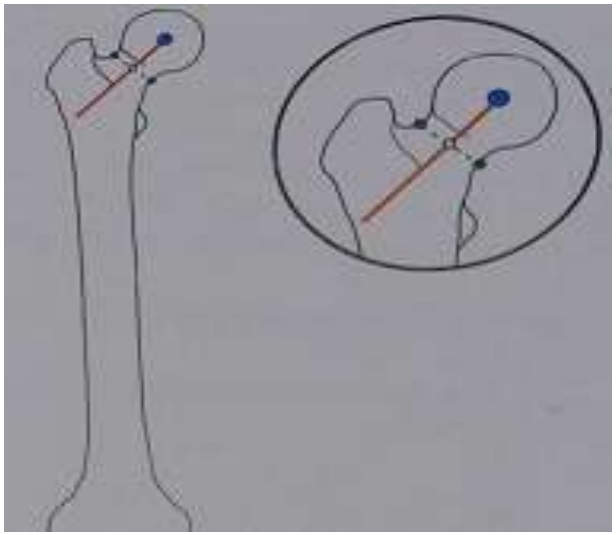




HIP

- FRONTAL : from tip of greater trochanter to center of femoral head.

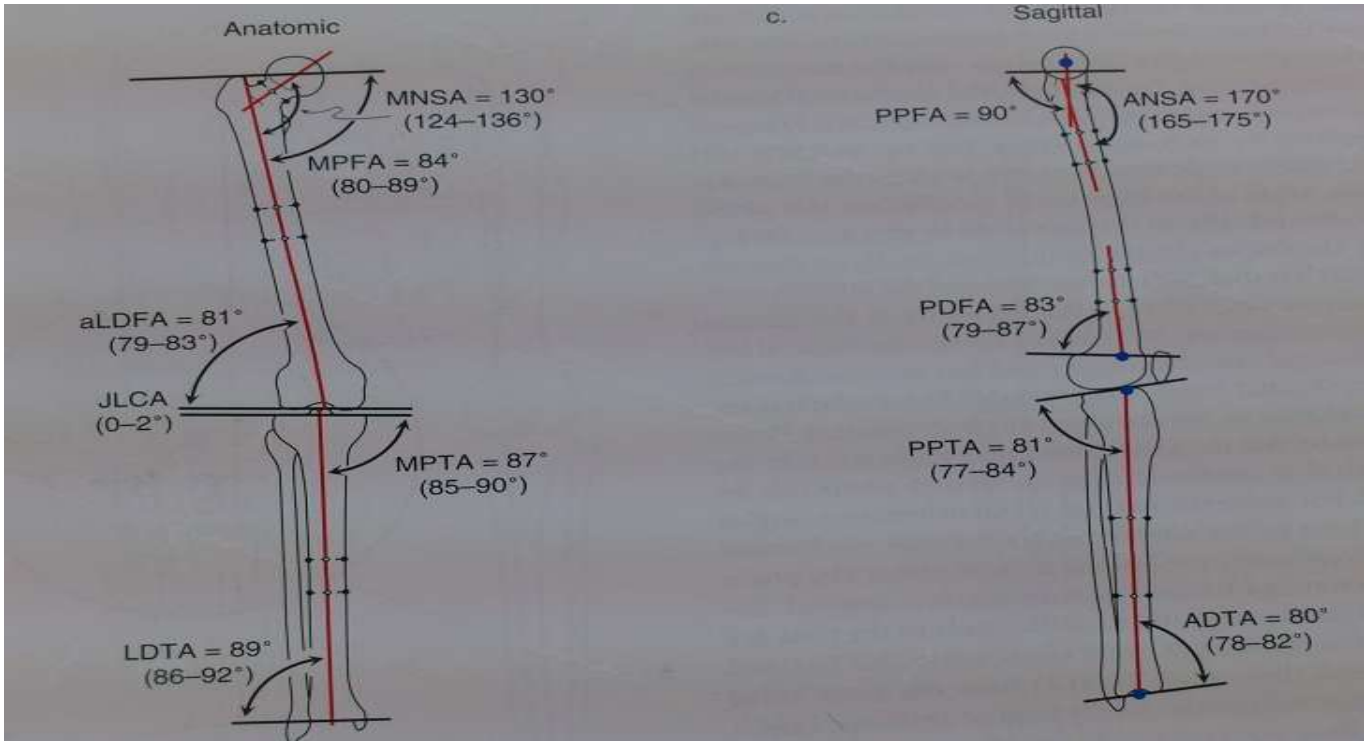




JOINT ORIENTATION ANGLES

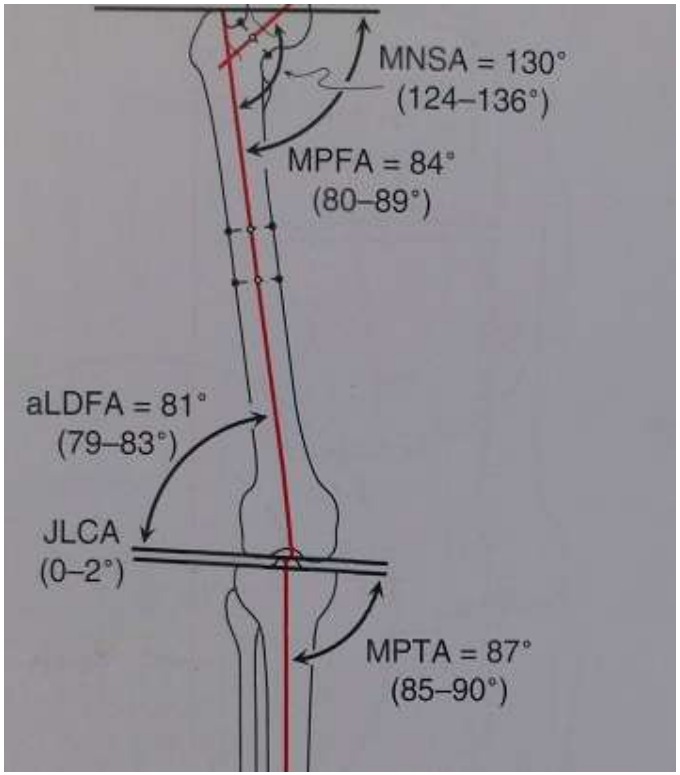
- Angle formed between joint line & axis.

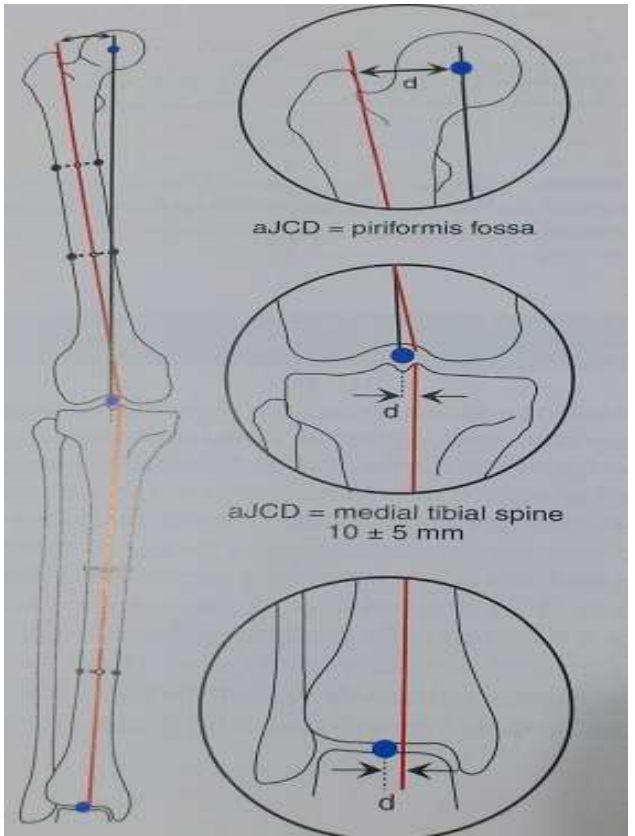
- Each axis & joint line form 2 angles.



- Angle between joint orientation line on opposite side of same joint is joint line convergence angle.

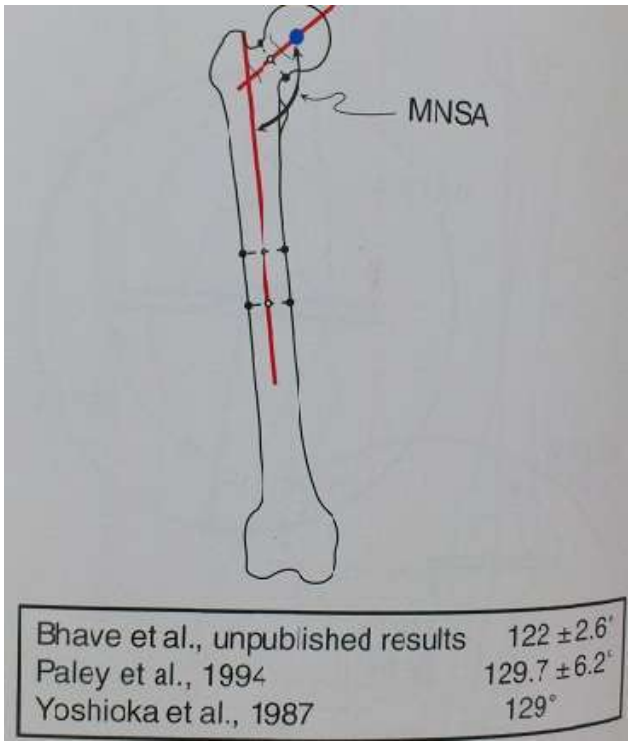
- Distance between anatomical axis & joint center point is anatomical axis to joint center distance.

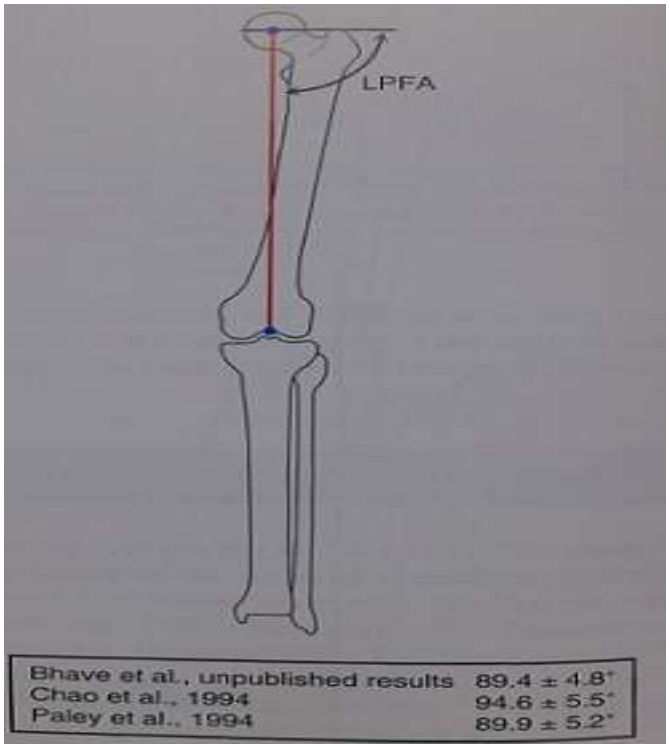




HIP JOINT ORIENTATION

- Initially neck shaft angle was used.
- NSA normal value 125^{o}-131^{o}.
- Line from tip of greater trochanter to femoral head center.





KNEE JOINT ORIENTATION

- Tibia has slight varus relative to mechanical axis.

- Distal femur is in slight valgus.