1. COMMON TERMINOLOGIES IN ORTHOPAEDICS

- **Flexion and extension** are joint movements in the sagittal plane, most easily imagined in hinge joints like the knee, elbow and the joints of the fingers and toes.
- **Abduction and adduction** are movements in the coronal plane, away from or towards the midline.
- **Lateral rotation and medial rotation** are twisting movements, outwards and inwards, around a longitudinal axis.
- **Pronation and supination** are also rotatory movements, but the terms are applied only to movements of the forearm and the foot.
- **Circumduction** is a composite movement made up of a rhythmic sequence of all the movements. It is possible only for ball-and-socket joints such as the hip and shoulder.

VARUS DEFORMITY

- Varus means that the part distal to the joint is deviated towards the midline.

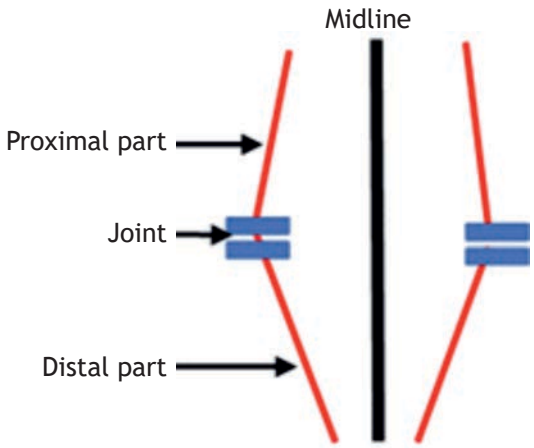


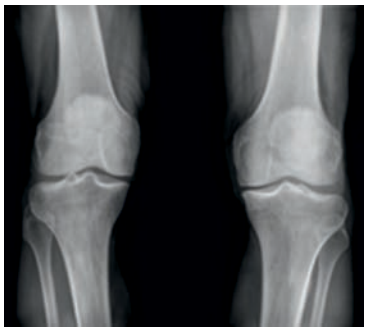
Fig. 1.1a: Line diagram showing varus deformity

- In the case of knee joint, the part distal to the joint is the leg component; when it is deviated towards the midline, it is called genu varum or bow legs (varus deformity of the knee).
- It is an angular deformity in which the apex of the deformity is deviated away from the midline.

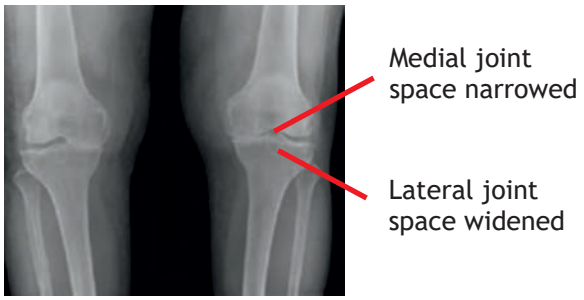
Normal knee Genu varum

Fig. 1.1b: Genu varum

- In case of osteoarthrosis of the knee joint, medial joint space is narrowed and the lateral joint space is widened which result in the varus deformity.



Normal knee



Osteoarthrosis of knee

Fig. 1.1c: Radiograph showing varus deformity in osteoarthrosis of knee

- In case of elbow joint, the part distal to the joint is the forearm component; when it is deviated towards the midline, it is called cubitus varus (varus deformity of the elbow).

Carrying angle: Normal elbow joint is 5–15 degrees in valgus.

Normal elbow

Cubitus varus

Fig. 1.2a: Cubitus varus

- In malunited supracondylar fracture of humerus, the distal forearm component is deviated towards the midline which results in the varus deformity.

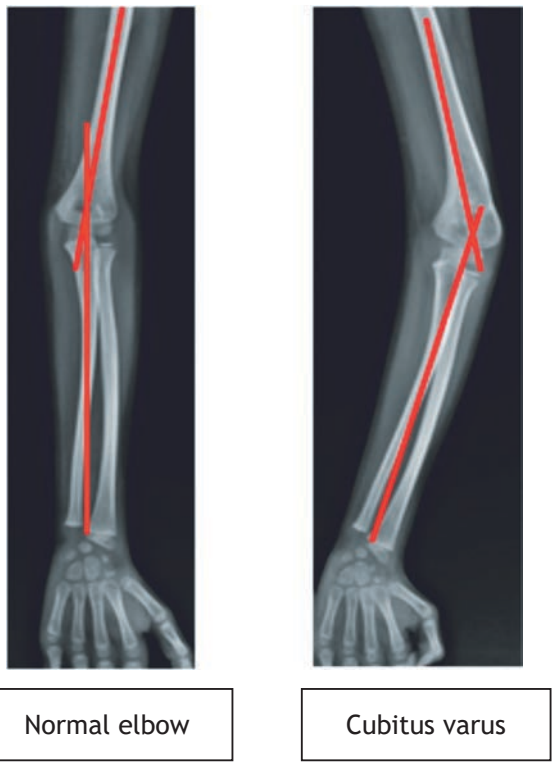


Fig. 1.2b: Radiograph showing varus deformity of elbow

VALGUS DEFORMITY

- Valgus means that the part distal to the joint is deviated away from the midline.

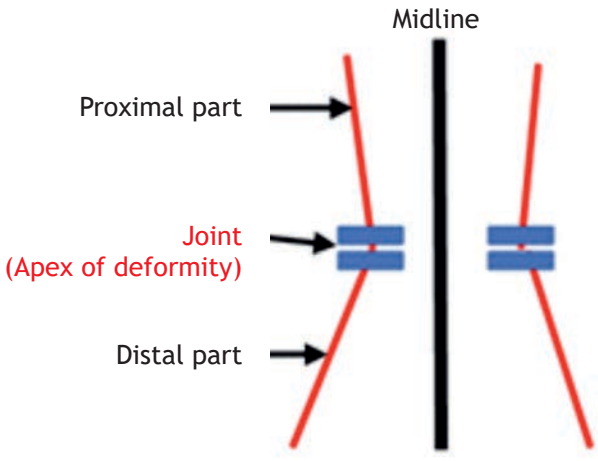


Fig. 1.3a: Diagram showing valgus deformity

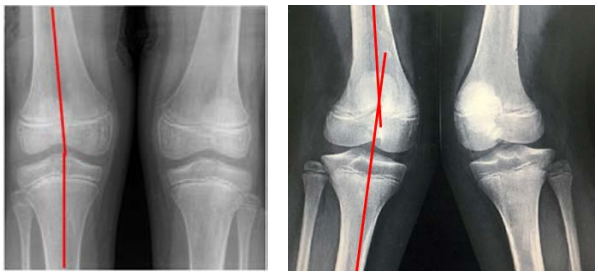
- In case of knee joint, the part distal to the joint is the leg component; when it is deviated away from the midline it is called genu valgum (valgus deformity of the knee).

- It is an angular deformity in which the apex of the deformity is towards the midline.

Normal knee Genu valgum

Fig. 1.3b: Genu valgum

- In case of distal femoral epiphyseal injuries pertaining to the lateral side, there is overgrowth of the medial side leading to valgus deformity.



Normal knee Genu valgum

Fig. 1.3c: Radiograph showing valgum deformity of knee

- In case of elbow joint, the part distal to the joint is the forearm component; when it is deviated away from the midline, it is called cubitus valgus (valgus deformity of the elbow).

Normal elbow Cubitus valgus

Fig. 1.4a: Cubitus valgus

- In nonunion fracture of lateral humeral condyle, the resulting deformity is cubitus valgus.

Normal elbow Cubitus valgus

Fig. 1.4b: Radiograph showing valgus deformity of elbow

Etiology

Genu varum

1. **Physiological:** Before 2 years of age.
2. **Pathological:**
   - **Degenerative cause**: Osteoarthrosis of knee
   - **Post-traumatic**: Injury to proximal tibial physis pertaining to medial side
   - **Metabolic disorder**: Nutritional rickets
   - **Idiopathic**: Blount's disease
   - **Hereditary**: Hypophosphataemic rickets, hereditary multiple exostosis
   - **Congenital deformity**: Tibial hemimelia

Genu valgum

1. **Physiological:** Before 6 years of age (more common type).
2. **Pathological:**
   - **Inflammatory**: Rheumatoid arthritis
   - **Post-traumatic**: Malunited fracture of proximal tibia, lateral epiphyseal injury
   - **Metabolic disorders**: Rickets, renal osteodystrophy
   - **Congenital**: Hypoplasia of lateral femoral condyle

Cubitus varus

- **Traumatic:** Malunion of supracondylar fracture, physeal growth arrest of medial humeral epiphysis
- **Hereditary:** Multiple osteochondromatosis

Cubitus valgus

- **Traumatic:** Non-union lateral humeral condyle fracture
- **Hereditary:** Nail patella syndrome

Kyphosis and lordosis

- Seen from the side, the normal spine has a series of curves: Convex posteriorly in the thoracic region (kyphosis), and convex anteriorly in the cervical and lumbar regions (lordosis).
- Normal lordosis is lost in muscle spasm.

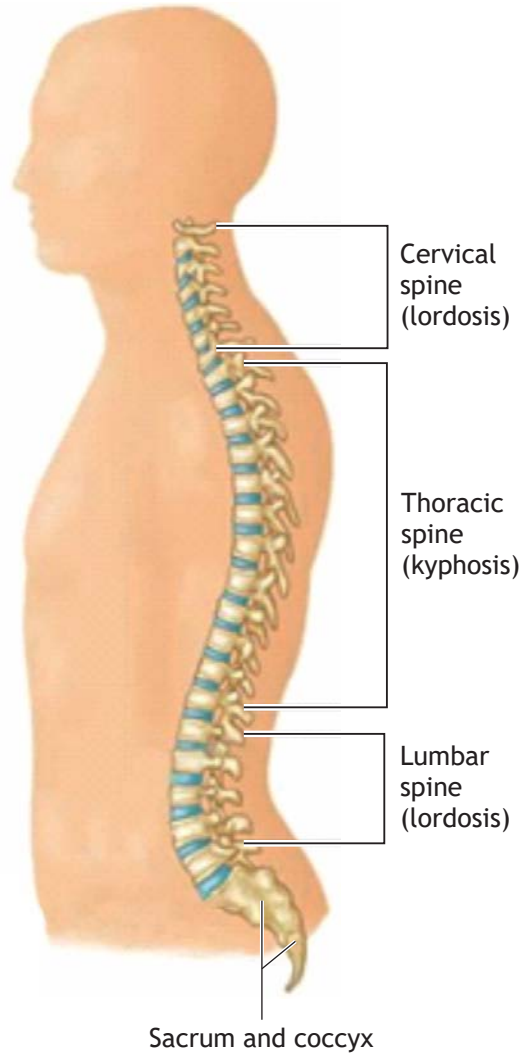


Fig. 1.5: Normal curvature of the spine

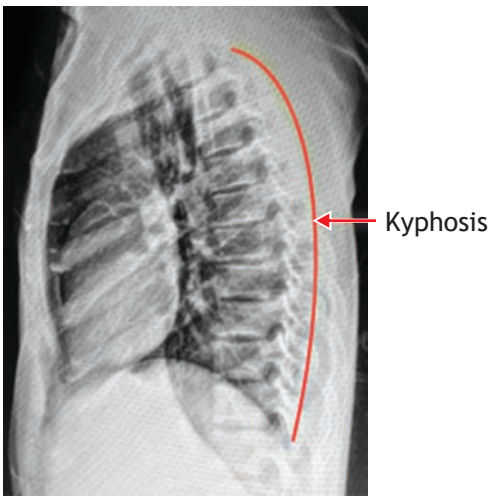
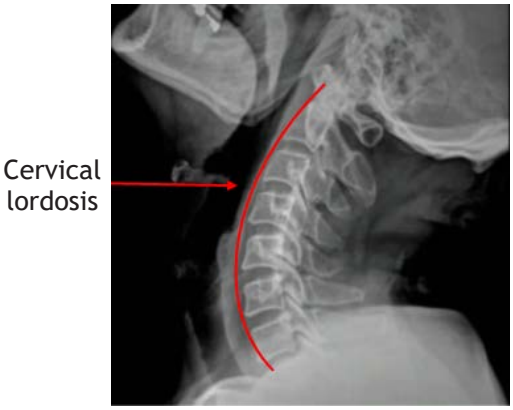


Fig. 1.6: Kyphosis of thoracic spine



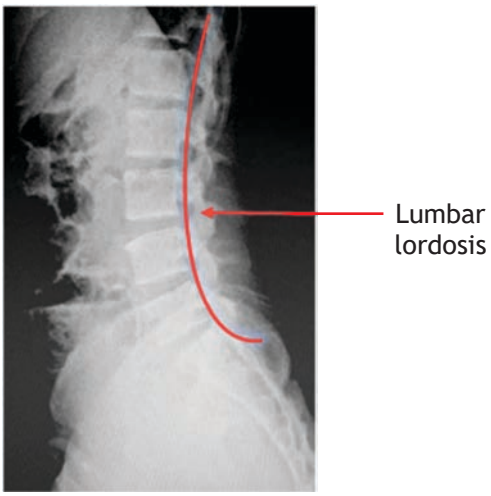


Fig. 1.7: Cervical and lumbar lordosis

SCOLIOSIS

- Scoliosis is the lateral deviation of the normal vertical line greater than 10 degrees of the spine when measured on a radiograph.

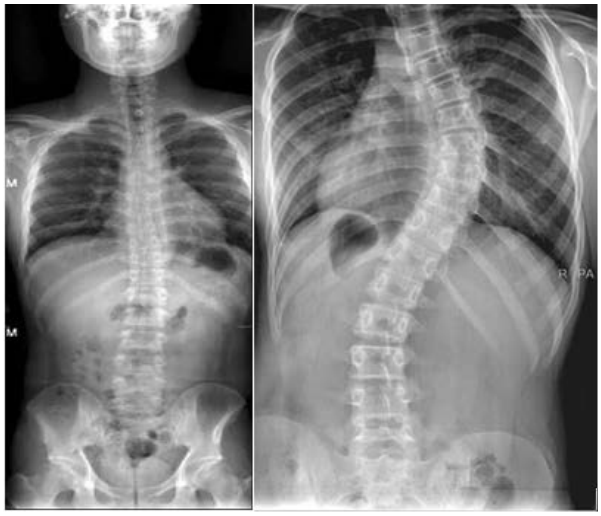
- Side of deformity is described with reference to convexity.
- The position and direction of the curve are termed thoracic scoliosis, lumbar scoliosis, convex to the right or convex to the left.

Types of Scoliosis

1. **Postural scoliosis**: When the patient sits, the curve disappears.
2. **Structural scoliosis**: Noncorrectable deformity

Causes of Scoliosis

1. **Idiopathic**: Most common
2. **Congenital scoliosis**: Hemivertebrae
3. **Neuromuscular scoliosis**: Muscular dystrophy, cerebral palsy
4. **Degenerative scoliosis**: Osteoporosis



Normal spine versus scoliosis

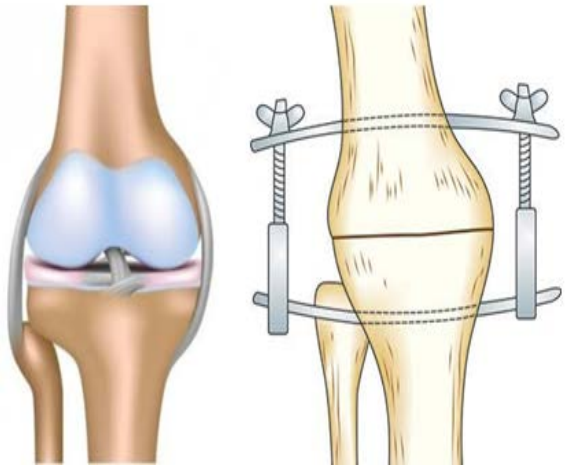
Fig. 1.8: Scoliosis

FIXED DEFORMITY

- **Joint in a particular plane of movement cannot be brought to neutral position.**
- For example, the knee joint may be fixed in certain amount of flexion, and further flexion is possible, but the knee will not go to neutral position. Hence the opposite movement (extension) cannot be done. This is known as fixed flexion deformity of the knee.
- Similarly, in fixed abduction deformity, adduction will not be possible since the joint cannot be brought to neutral position. Hence the opposite movement (adduction) cannot be done.
- In fixed adduction deformity abduction will not be possible since the joint cannot be brought to neutral position. Hence the opposite movement (abduction) cannot be done.

ARTHRODESIS AND ANKYLOSIS

- Surgical fusion of a joint is called 'arthrodesis'.
- The articular surfaces of the two bones of the joint are taken out and the bones are fused to achieve bony union.



Normal knee joint Arthrodesis of knee

Fig. 1.9: Arthrodesis of knee

- Pathological fusion of a joint is called 'Ankylosis'.
- Ankylosis is of two types
  - Bony ankylosis
  - Fibrous ankylosis

Bony Ankylosis

- It is a painless condition.
- There is no movement possible because the trabeculae of one bone crosses the joint and continues with the trabeculae of the other bone.
- It occurs as a complication in acute suppurative conditions like septic arthritis.

Normal knee

Bony ankylosis

Fibrous Ankylosis

- It is a painful condition.
- There will be only a jog of movement (jog—a slight shake of movement, which is not measurable).
- Example: Tuberculous arthritis.