



# ORTHOPEDICS

medpgnotes

**CONTENTS**

GENERAL ORTHOPEDICS ..... 8

    SKELETAL MATURITY ..... 8

    BONE AND FRACTURE ..... 8

    PATHOLOGICAL FRACTURE ..... 9

    STRESS FRACTURE ..... 9

    FRACTURE HEALING ..... 10

    COMPARTMENT SYNDROME ..... 11

GENETIC AND DEVELOPMENTAL DISORDERS OF BONE ..... 11

    GENERAL FEATURES OF DEVELOPMENTAL DISORDERS OF BONE ..... 11

    ACHONDROPLASIA ..... 12

    CLEIDOCRANIAL DYSTOSIS ..... 12

    OSTEOGENESIS IMPERFECTA ..... 12

    OSTEOPETROSIS ..... 13

FRACTURE CLAVICLE AND FRACTURE HUMERUS ..... 13

    FRACTURE CLAVICLE ..... 13

    FRACTURE NECK OF HUMERUS ..... 14

    FRACTURE SHAFT OF HUMERUS ..... 14

SHOULDER INJURIES ..... 15

    ANATOMY OF SHOULDER JOINT ..... 15

    FEATURES OF SHOULDER INJURIES ..... 15

    TESTS FOR SHOULDER INJURIES ..... 16

    MANAGEMENT OF SHOULDER INJURIES ..... 17

INJURIES AROUND ELBOW ..... 17

    GENERAL FEATURES OF ELBOW INJURIES ..... 17

    FRACTURE LATERAL CONDYLE OF HUMERUS ..... 18

    FRACTURE MEDIAL EPICONDYLE OF HUMERUS ..... 18

    SUPRACONDYLAR FRACTURE OF HUMERUS ..... 18

    VOLKMANN ISCHEMIC CONTRACTURE ..... 20

    MYOSITIS OSSIFICANS ..... 20

    FRACTURE OLECRANON ..... 21

FOREARM INJURIES ..... 21

    GENERAL FEATURES OF FOREARM INJURIES ..... 21

MONTEGGIA FRACTURE ..... 22

GALEAZZI FRACTURE ..... 22

FRACTURE BOTH BONE FOREARM ..... 22

COLLE’S FRACTURE ..... 23

COMPLICATIONS OF COLLE’S FRACTURE ..... 23

SUDECK’S OSTEODYSTROPHY ..... 23

CARPAL INJURIES ..... 24

SCAPHOID INJURIES ..... 24

LUNATE INJURIES ..... 25

HAND INJURIES ..... 25

GENERAL FEATURES OF HAND INJURIES ..... 25

BENNET FRACTURE ..... 25

GAME KEEPER THUMB ..... 26

MALLET FINGER ..... 26

INJURIES AROUND HIP ..... 26

GENERAL FEATURES OF INJURIES AROUND HIP ..... 26

POSTERIOR DISLOCATION OF HIP ..... 27

ANTERIOR DISLOCATION OF HIP ..... 28

PELVIC AND ACETABULAR FRACTURE ..... 28

FRACTURE FEMUR ..... 28

CLASSIFICATION OF FRACTURE FEMUR ..... 29

INTRACAPSULAR FRACTURE FEMUR ..... 29

EXTRACAPSULAR FRACTURE FEMUR ..... 31

SUBTROCHANTERIC FRACTURE OF FEMUR ..... 31

FRACTURE SHAFT OF FEMUR ..... 31

FAT EMBOLISM ..... 32

INJURIES AROUND KNEE JOINT ..... 33

GENERAL FEATURES OF INJURY AROUND KNEE JOINT ..... 33

FRACTURE PATELLA ..... 33

FRACTURES OF TIBIA AND FIBULA ..... 34

INJURIES AROUND ANKLE AND FOOT ..... 35

GENERAL FEATURES OF ANKLE AND KNEE INJURIES ..... 35

COTTON FRACTURE AND POTT’S FRACTURE ..... 35

FRACTURE TALUS ..... 35

FRACTURE CALCANEUM ..... 36

SPINAL INJURIES..... 36

    GENERAL FEATURES OF SPINAL INJURIES ..... 36

    ANATOMY OF VERTEBRA AND INTERVERTEBRAL DISC..... 37

    SPINAL FRACTURES ..... 37

    LEVELS OF SPINAL INJURIES ..... 38

    BLADDER INVOLVEMENT IN SPINAL INJURIES ..... 39

    SPINAL SHOCK AND BULBOCAVERNOUS REFLEX..... 39

    MANAGEMENT OF SPINAL INJURIES..... 40

    DISC PROLAPSE ..... 40

    LOW BACK PAIN ..... 41

SPORTS INJURIES AND LIGAMEN TOUS INJURIES ..... 41

    GENERAL FEATURES OF LIGAMEN TOUS INJURIES ..... 41

    CRUCIATE LIGAMENT INJURY..... 42

    MENISCEAL INJURIES ..... 43

    COLLATERAL LIGAMENT INJURIES..... 43

PEDIATRIC ORTHOPEDICS ..... 44

    FRACTURES IN CHILDREN ..... 44

    EPIPHYSEAL INJURIES IN CHILDREN ..... 44

    PSEUDOARTHROSIS..... 44

    GENERAL FEATURES OF PEDIATRIC HIP PROBLEM ..... 45

    COXA VARA ..... 45

    SYNOVITIS ..... 45

    PERTHE’S DISEASES ..... 45

    SLIPPED CAPITAL FEMORAL EPIPHYSIS ..... 46

    CONGENITAL DISLOCATION OF HIP ..... 46

    DEVELOPMENTAL DYSPLASIA OF HIP..... 47

    GENERAL FEATURES OF PEDIATRIC KNEE PROBLEM ..... 47

    GENU VARUM ..... 48

    GENU VALGUM ..... 48

    BLOUNT’S DISEASE..... 48

    CHONDROMALACIA PATELLA ..... 48

    NAIL PATELLA SYNDROME ..... 48

    GENERAL FEATURES OF PEDIATRIC SPINAL PROBLEMS..... 48

KLIPPEL FEIL SYNDROME..... 49

SPRENGEL SHOULDER..... 49

SPINA BIFIDA..... 49

TORTICOLLIS..... 49

VERTEBRA PLANA..... 50

SCOLIOSIS..... 50

CTEV..... 50

AVASCULAR NECROSIS AND OSTEOCHONDRITIS..... 51

AVASCULAR NECROSIS..... 51

OSTEOCHONDRITIS..... 52

REGIONAL PAIN SYNDROME..... 52

GENERAL FEATURES OF REGIONAL PAIN SYNDROME..... 52

SPONDYLOLYSIS..... 53

SPONDYLOLISTHESIS..... 53

PAINFUL ARC SYNDROME..... 53

TENNIS ELBOW..... 54

DE QUERVAIN DISEASE..... 54

DUPYtren’S CONTRACTURE..... 54

TRIGGER FINGER..... 55

GANGLION..... 55

HALLUX VALGUS..... 55

INFECTIVE DISEASES OF BONE..... 55

GENERAL FEATURES OF INFECTIVE BONE DISEASE..... 55

OSTEOMYELITIS..... 56

BRODIE’S ABSCESS..... 57

BONE TUBERCULOSIS..... 57

PSOAS ABSCESS..... 59

SEPTIC ARTHRITIS..... 60

CAFFEY’S DISEASE..... 60

BONE TUMORS..... 60

GENERAL FEATURES OF BONE TUMORS..... 60

BONE CYST..... 61

OSTEITIS DEFORMANS..... 62

CHORDOMA..... 63

OSTEOMA..... 63

ENCHONDROMA ..... 64

OSTEOCHONDROMA..... 64

OSTEOCLASTOMA ..... 64

ADAMANTINOMA ..... 65

CHONDROBLASTOMA ..... 65

CHONDROSARCOMA..... 65

HEMANGIOMA OF BONE ..... 66

EWING’S SARCOMA ..... 66

OSTEOSARCOMA..... 67

SYNOVIAL SARCOMA..... 68

FIBROUS DYSPLASIA ..... 68

NON OSSIFYING FIBROMA ..... 68

RHABDOMYOSARCOMA ..... 68

SOFT TISSUE SARCOMA..... 69

POLYTRAUMA ..... 69

FEATURES OF POLYTRAUMA..... 69

MANAGEMENT OF POLYTRAUMA ..... 69

CRUSH SYNDROME ..... 69

COMPOUND FRACTURE ..... 69

AMPUTATION..... 70

NERVE INJURIES ..... 71

GENERAL FEATURES OF NERVE INJURIES..... 71

BRACHIAL PLEXUS INJURY ..... 72

AXILLARY NERVE INJURY ..... 73

MUSCULOCUTANEOUS NERVE INJURY ..... 74

ULNAR NERVE INJURY ..... 74

RADIAL NERVE INJURY ..... 75

POSTERIOR INTEROSSEOUS NERVE INJURY ..... 76

MEDIAN NERVE INJURY..... 77

CARPAL TUNNEL SYNDROME ..... 77

LOWER LIMB NERVE INJURY ..... 78

TARSAL TUNNEL SYNDROME ..... 79

TENSOR FASCIA LATA ..... 79

POST POLIOMYELITIS ..... 79

ORTHOPEDIC PROCEDURES ..... 80

    JOINT REPLACEMENT SURGERY ..... 80

    BONE GRAFT ..... 80

    TRACTION..... 80



## KEY TO THIS DOCUMENT

Text in normal font – Must read point.  
Asked in any previous medical entrance  
examinations

**Text in bold font** – Point from Harrison's  
text book of internal medicine 18<sup>th</sup>  
edition

*Text in italic font* – Can be read if  
you are thorough with above two.



GENERAL ORTHOPEDICS

SKELETAL MATURITY

For growth of bone, which term is most appropriate	Apposition
A newborn is noted to have large head and short limbs. On further examination, short broad fingers, small face and low normal length are noted, trunk appears long and narrow, to confirm diagnosis	Obtain skeletal radiographs
Retardation of skeletal maturity caused by	CRF, hypothyroidism, PEM
Infantile proportion in adult	Morquio disease, Achondroplasia, Hypothyroidism, Constitutional dwarfism
Hyperostosis is associated with	Hypothyroidism, vitamin A intoxication, radiation osteoma

BONE AND FRACTURE

The term orthopedics was coined by	Nicholas Andrey
Major mineral of bone	Hydroxyapatite
Strength of bone	Collagen
Structural support to bone is provided by	Collagen
40 nm gap in between tropocollagen molecule in collagen which serve as the site of bone formation is occupied by	Calcium
Marker of bone formation	Serum alkaline phosphatase, Serum osteocalcin, Serum peptide of type I procollagen
Marker of new bone formation	Alkaline phosphatase
Marker of bone resorption	Urine total free deoxypyridinoline, serum and urine cross linked N telopeptide, serum and urine cross linked c telopeptide
Bone resorption is enhanced by	PGE2
NOT a bone resorption marker	Osteocalcin
<b>Cimey Mader classification for</b>	<b>Viability of bone</b>
Osteoclast	Derived from monocyte, Resorption of bone
Osteoclast is derived from	Monocyte
<b>C fos is associated with</b>	<b>Osteoclastic activity</b>
Osteoblasts produce	Collagen
<b>Osteoprotogerin is secreted by</b>	<b>Osteoblast</b>
Osteoblast give rise to	Osteoblast
Osteocalcin is secreted by	Osteoblast
Osteoblast activity is suppressed by	Corticosteroids
MC cause of bone disease in India	Nutritional deficiency
Normal bone remodeling in response to stress was described by	Wolff
5' nucleotidase activity increased in	Bone disease
Lytic lesion in skull	Multiple myeloma, Metastasis from ca bronchus, Thalassemia

Topical fluoride	Conversion of hydroxyapatite to fluoroapatite by replacing OH ions
Epiphyseal injuries are common in	Children
On 3 phase 99Tm MDP bone scan. bone lesion showing least osteoblastic activity	Fibrous cortical defect
Technitium used for bone scintigraphy	99 TcDPA
Estimation of Rate of newly synthesized osteoid material mineralization estimation can be estimated by	Tetracycline labeling
<i>Wolf's law</i>	<i>Change in bone density in response to functional forces</i>
Essential feature in diagnosis of fracture bone	A partial or complete loss of continuity of bone
Most consistent finding of fresh fracture	Crepitus
Pathognomic sign of traumatic fracture	Crepitus
<i>Sure sign of fracture</i>	<i>Abnormal mobility</i>
Direct impact on bone will produce	Transverse fracture
<i>Transverse fracture</i>	<i>Makes an angle of 30* with horizontal line</i>
Pediatric orthopedics	Comminuted fractures are rare, thick periosteum, soft bone
Compound fracture with 1 cm opening in skin	Grade 1
Most serious complication of compound fracture	Infection
Given most priority in case of fracture	Open fracture, Dislocated fracture
Clinical union of fracture	4 – 12 weeks
<b>Assessment of fracture risk</b>	<b>FRAX</b>
Fracture disease can be prevented by	Physiotherapy
Usual treatment of fracture involving articular surface	Arthrodesis, Excision, Skeletal traction, Internal fixation, POP slab
Management of long bone fracture	Intramedullary nailing, Compression plate, External fixation
Operative procedure 'microfracture' is done for	Osteochondral defect of femur
Maximum bleeding	Artery caught between fractured ends of bones
Action of intramedullary K nail	Three point fixation
Open reduction and internal fixation is NOT indicated in	Compound fracture

**PATHOLOGICAL FRACTURE**

MC cause of pathological fracture	Secondary deposits
Pathological fracture occurs in	Metabolic bone disease, Osteosarcoma, Bone cyst, Radiation, Osteoporosis, Osteomalacia
Commonest cause of pathological fracture is generalized affection	Osteoporosis
NOT a cause of pathological fracture	Anemia, Osteochondroma, Fluorosis
Mirel's criteria is developed for evaluation of	Risk of pathological fracture
Treatment of choice for pathological fracture	Internal fixation

**STRESS FRACTURE**

Commonest site of March fracture	Involves shaft of 2 <sup>nd</sup> and 3 <sup>rd</sup> metatarsal
Complaints of pain at posteromedial aspect of both legs	Stress fracture

in an army recruit after 6 months training, acute point tenderness and pain aggravated by physical activity	
Fatigue fracture (stress fracture) are commonly seen in	Metacarpal
Usual site of stress fracture	Second metatarsal
March fracture	Fracture of 2 <sup>nd</sup> metatarsal
NOT a very important cause of non union	Stress at fracture site due to muscle spasm
Stress fracture does NOT involve	Tibia
Stress fracture is treated by	Cast immobilization

## FRACTURE HEALING

<b>Osteoclast mediated resorption of bone in</b>	<b>Howship lacunae</b>
<i>Bone apposition is best in growing bone in</i>	<i>Epiphysis</i>
Bone apposition is best in normal adults in	Osteoblastic activity in howship lacuna
Bone apposition is best in fractured bones in	Subperiosteal cambian layer
<i>Structure responsible for production of majority of new bone following fracture</i>	<i>Periosteum</i>
<i>MC fracture healing method</i>	<i>Indirect fracture healing</i>
<i>Staging of indirect fracture healing by</i>	<i>Hunter</i>
<i>Primary bone healing</i>	<i>No external callus, no hematoma</i>
<i>Healing by primary intention</i>	<i>Fixed internally with rigid fixator</i>
Provisional callus	14 days
Thick and hard bone like callus	8 weeks
Callus is seen in	Bone healing
Fracture healing is characterized by	Callus formation
Healing of fractured bone is affected by	Micromovement, Muscle interposition, Hypoxia, Bone fragments
Factors promoting callus formation	Micromovements between fracture fragments, Appropriate approximation of fragments
Callus induction is hampered in	Hypoxemia, Fractured fragments of bone, Muscle interposition in between fractured fragments, Early mobilization
Initial stage of clinical union of bone is equivalent to	Woven bone
Last step in fracture healing	Remodeling
Most important factor in fracture healing	Immobilization
Time necessary for healing of fracture depends on	Age of patient, location of fracture, type of fracture. Degree of damage to soft tissue
NOT true about bone remodeling	Osteoclastic activity at compression site
Osteoclastic activity at	Tension site
<i>Minimum time to label as non union</i>	<i>9 months</i>
MC cause of non union	Inadequate immobilization
Factors facilitating non union	Periosteal injuries, Absence of nerve supply, Chronic infection
Non union of fracture due to avascularity	Fracture neck of femur, scaphoid, patella
Non union is a complication of	Scaphoid fracture
Delayed union of fracture of a bone following a surgical treatment	Infection, Inadequate circulation, Inadequate immobilization
In some old fractures, cartilaginous tissue forms over fractured bone ends within a cavity in between	Delayed union

containing clear fluid	
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COMPARTMENT SYNDROME

<i>Normal intramedullary pressure</i>	<i>10 - 20 mm Hg</i>
Acute compartment syndrome is commonly caused by	Fracture
Compartment syndrome	Pain on passive stretch is reliable sign, Fasciotomy is earliest management, Interstitial pressure > capillary pressure, Hyperaesthesia
Characteristic feature of acute compartment syndrome	Acute pain on employing the stretch test, Normal pulse, Venous occlusion
Late sign of Compartment syndrome	Absence of distal pulses
Which passive movement cause pain in deep posterior compartment syndrome	Dorsiflexion of foot
NOT relevant in compartment syndrome	Exercise
NOT true about acute compartment syndrome	Normal sensation distally
Compartment syndrome is treated by	Fasciotomy
A patient develops compartment syndrome following manipulation and plaster for fracture both bones of leg. Best treatment	Do operative decompression of fascial compartment

GENETIC AND DEVELOPMENTAL DISORDERS OF BONE

GENERAL FEATURES OF DEVELOPMENTAL DISORDERS OF BONE

Bony dysplasia is due to	Faulty development
Increased Bone density of X ray is seen in	Fracture and collapse of cancellous bone, Increased periosteal thickening of trabeculae, Periosteal reaction, Avascular necrosis, Paget's disease, osteomyelitis
Wormian bone	Osteogenesis imperfecta, Cretinism, Rickets
<i>Wormian bone</i>	<i>Hypophosphatasia, Down syndrome, Kinky hair disease</i>
Morquio disease	Spinal kyphosis, Subnormal/normal intelligence, Excessive excretion of keratosulphate in urine, Dwarfism
Phocomelia	Defect in development of long bones
Madelung deformity involve	Wrist
Candle wax appearance	Melorrheostosis
<b>Melorrheostosis</b>	<b>Autosomal recessive</b>
Windswept deformity	Bruton's disease
<b>Camurati Engelmann disease</b>	<b>Progressive diaphyseal dysplasia</b>
<b>Hyperostosis corticalis generalisata</b>	<b>Von Buchem disease, severe form is sclerosteosis</b>
<b>Osteopoikilosis</b>	<b>Spotted bones, autosomal dominant</b>
<b>Primary hypertrophic osteoarthropathy</b>	<b>Also known as pachydermaperostitis, Touraine solente Gole syndrome</b>
<i>Histological feature of neuropathic</i>	<i>Presence of osteochondral fragments</i>

<i>arthropathy</i>	<i>embedded with the synovium</i>
<i>Multiple epiphyseal dysplasia is often misdiagnosed as</i>	<i>Legg Calve Perthe disease</i>

**ACHONDROPLASIA**

Achondroplasia	Autosomal dominant, Shortening of limbs
Achondroplasia	Rhizomelic shortening of limbs, trident hand, tomb stone iliac bones
A short statured patient brought with X ray showing flattened vertebra with beak.	Achondroplasia
Trident hand	Achondroplasia
Champagne glass pelvis	Achondroplasia
NOT true about Achondroplasia	Mental retardation
NOT a radiographic features of Achondroplasia	Acral osteolysis

**CLEIDOCRANIAL DYSTOSIS**

<b>Cleidocranial dysplasia</b>	<b>RUNX2</b>
Cleidocranial dystosis	Wide foramen magnum, Absence of clavicles, Coxa vara
A 9 year old child has high arched palate and has shoulders meeting in front of chest	Cleidocranial dystosis
Absent lateral one third of clavicle	Cleidocranial dystosis
Radiological features of cleidocranial dysostosis seen in	Skull, Clavicle, Pelvis

**OSTEOGENESIS IMPERFECTA**

Osteogenesis imperfecta is due to	Abnormal collagen defect Defective osteoid formation
Osteogenesis imperfecta is due to defect in	Collagen
Osteogenesis imperfecta	Usually green stick fracture, Fracture frequency decreases during puberty, Fracture seen in intrauterine life and during parturition
Osteogenesis imperfecta	Blue sclera, Lax ligament, Osteoporosis
Osteogenesis imperfecta	Deafness, Laxity of joints, Fragile fracture
Osteogenesis imperfecta	Brittle bone disease, Autosomal dominant, Associated with otosclerosis, Defect in collagen type I
<i>Bilateral symmetrical idiopathic fractures</i>	<i>Osteogenesis imperfecta</i>
Multiple fractures with wormian bone are seen in children of	Osteogenesis imperfecta
Colour of Sclera in Osteogenesis Imperfecta	Blue
<b>Blue sclera is associated with</b>	<b>Type I, II and III forms of osteogenesis impercta</b>
Bilateral symmetrical fractures	Osteogenesis imperfecta
NOT true about osteogenesis imperfecta	Impaired healing of fracture
NOT seen in osteogenesis imperfecta	Bilateral hip dislocation, Cataract
Prenatal determination of osteogenesis imperfecta is done by	Abnormal pro alpha chain

OSTEOPETROSIS

<b>Types of osteopetrosis</b>	<b>Malignant osteopetrosis (autosomal recessive), benign type I and type II osteopetrosis (autosomal dominant), carbonic anhydrase II deficiency (autosomal recessive)</b>
A 3 year old male presented with progressive anemia, hepatosplenomegaly and osteomyelitis of jaw with pathological fracture, X ray shows chalky white deposits on bone	Osteopetrosis
10 year old child, predisposition to fractures, anemia, hepatosplenomegaly and a diffusely increased radiographic density of bones	Osteopetrosis
Childhood osteopetrosis is characterized by	Multiple fracture, Hepatosplenomegaly
Characteristic of osteopetrosis	Pancytopenia, Compression of cranial nerve, Mandibular osteomyelitis
Marble bone disease	Osteopetrosis
<b>Marble bone or Marble brain disease is associated with</b>	<b>Type I distal RTA</b>
Alberg Schonberg disease	Osteopetrosis (type II)
Bone in bone appearance	Osteopetrosis
NOT true about osteopetrosis	Abnormally slow rates of fracture healing
<b>Diagnosis of osteopetrosis</b>	<b>Increased osteoclast derived TRAP</b>
<b>Treatment of osteopetrosis</b>	<b>Bone marrow transplantation</b>

FRACTURE CLAVICLE AND FRACTURE HUMERUS

FRACTURE CLAVICLE

Clavicle	First bone to ossify, Ossify in membrane, Breaks at junction of medial 2/3 <sup>rd</sup> and lateral 1/3 <sup>rd</sup>
Fracture clavicle due to	Fall on outstretched hand
<i>MC site of fracture clavicle</i>	<i>Junction of middle and outer third</i>
Fracture clavicle	Commonly occurs between insertion of coracoclavicular and costoclavicular ligaments, May jeopardize blood supply to overlying skin
Clavicular fracture	Lateral part fracture is more stable, malunion Is common, commonest bone in body to fracture
Common injury to baby	Fracture clavicle
MC bone fractured during birth	Clavicle
Nerve injured in fracture clavicle	Supraclavicular nerve
<i>MC nerve injured in medial cord of brachial plexus</i>	<i>Medial cord of brachial plexus</i>
<i>MC vessel injured in fracture clavicle</i>	<i>Subclavian vessels</i>
MC complication of fracture clavicle	Malunion
NOT true about fracture clavicle	No treatment is required
NOT true about fracture clavicle	Usually requires careful reduction
<i>X ray view for fracture clavicle</i>	<i>45* lordotic view</i>