July/ 2024

Department of Health Research
Ministry of Health and Family Welfare, Government of India

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Standard Treatment Workflow (STW)

ANKLE FRACTURES

ICD-10-S82

DEFINITION

Classically called the 'Malleolar fractures', these are fractures of distal tibia/fibula or both

MECHANISM OF INJURY

- High-energy trauma in young patients (RTA)
- Low-energy twisting injuries in elderly

Management of patient as per ATLS protocols

Presentation:

- Pain, swelling, deformity at the ankle

PHYSICAL EXAM

Inspect

- Look circumferentially to rule-out an open fracture

Palpate

- Tenderness at the ankle
- Rule out compartment syndrome when pain + on passive stretching of toes

Assess

- Any differences in pulse examination between extremities – Suspected vascular injury
- Inability to move toes actively – Suspected Tendon injury/nerve injury
- Dislocated ankle

→ A. Airway and cervical spine
B. Breathing and ventilation
C. Circulation and haemmorhage control
D. Disability and neurological status
E. Exposure and environment control

→ Open fracture STW

→ Fasciotomy and external fixator application

→ Urgent reduction and immobilization

INVESTIGATIONS

RADIOGRAPHS

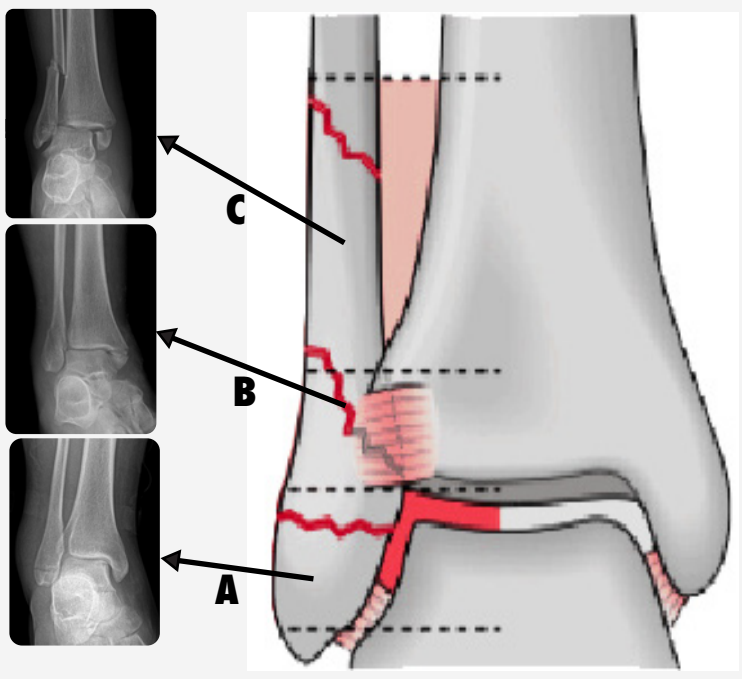
- AP View (up to knee joint to look for high fibula fractures)
- Lateral View
- Mortise view
- Stress views - Weight-bearing and external rotation stress views in suspected syndesmotic injuries

CT SCAN (DESIRABLE)

- Detailed assessment of fracture patho-anatomy
  - To look for suspected posterior malleolar fracture
  - To look for impaction
- Preoperative planning for operative approaches and fixation techniques

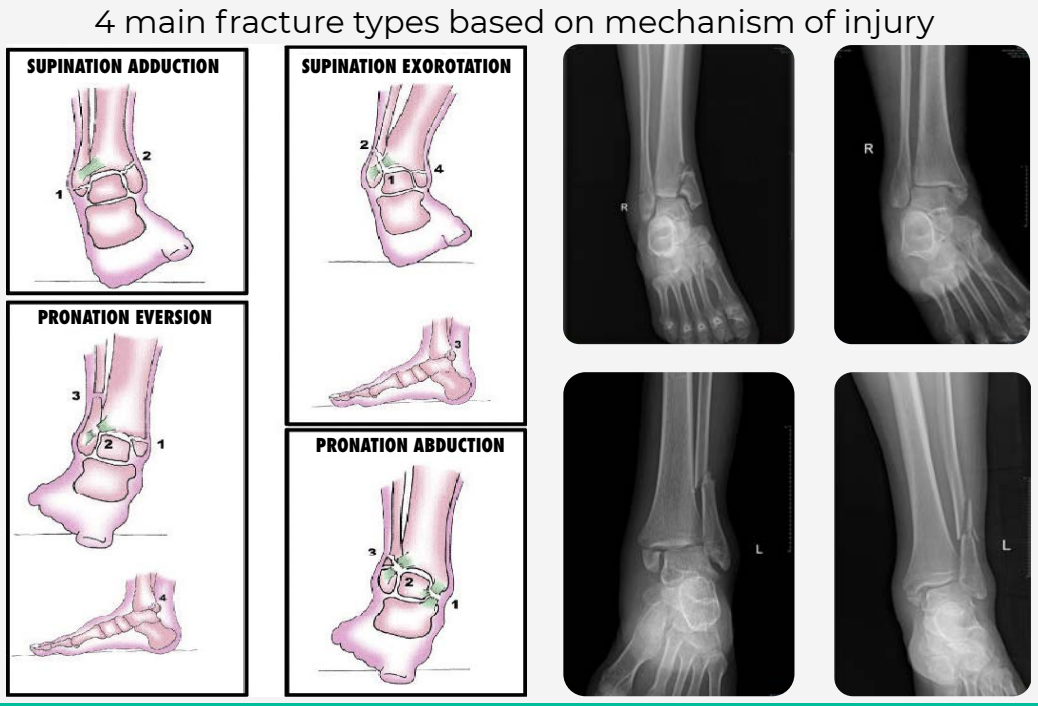
CLASSIFICATION

WEBERS CLASSIFICATION



LAUGE HANSEN CLASSIFICATION

4 main fracture types based on mechanism of injury



MANAGEMENT

GOALS OF TREATMENT

Restoration of joint stability

- Anatomical reduction of the articular surface
- Maintenance of ankle joint and medial clear space
- Assess and manage the syndesmotic joint

IMPLANT OPTIONS

Choice of implant is related to

- Fracture pattern
- Degree of displacement
- Familiarity of surgeon

Fibula (Lateral malleolus)

- Anti-glide plating
- Anatomical locking plates
- Screw/K-wire/TENS

Medial Malleolus

- Screws – ensure proximity to strong bone tibia plafond
- Tension band wiring
- Anti-glide plating (SAD injury)

Posterior malleolus

- Cancellous cannulated screws
- Buttress plating

Syndesmosis

- Screws
- Tightrope

Ankle spanning Ex-fix – for temporary splintage

Open fractures

Waiting for soft tissues to settle until definitive surgery

Ankle fracture → **At primary centre** → ATLS management
Limb elevation/ice packs/splintage

At secondary centre

- Active bleed
- Suspected compartment syndrome
- Open fracture
- Simple fracture

→ **Refer to secondary centre**

- Stop the bleed
- Debride for open fracture
- Fasciotomy if warranted for impending compartment syndrome
- External fixator application
- CT scan for detailed assessment

- Vascular injury
- Complex fracture dislocation
- Multi system injury
- Tendon injury

→ **Refer to tertiary centre**

At tertiary centre

- B/K Slab/Cast for stable syndesmotic/infrasyndesmotic injuries
- Open reduction internal fixation for simple fractures

- If final fixation not possible
- Complex fracture dislocation
- Vascular repair warranted
- Multi-system injury
- Tendon injury

→ **Refer to tertiary centre**

- HDU/ICU management for multi-system injury
- Fasciotomy if required
- Vascular repair

Final fixation once swelling subsides/ blisters resolve/patient physiologically fit

Ankle fracture
→ X-Ray

Ankle dislocated → Closed Reduction, check X-ray → Assess need for external fixator – Skin condition/ swelling/blisters/compartment syndrome

No dislocation → Unstable fracture → Assess need for external fixator – Skin condition/ swelling/blisters/compartment syndrome

Open reduction internal fixation should be performed only after appearance of "wrinkle sign"

Open reduction & internal fixation after CT scan

- Isolated Medial/Lateral malleolar fractures → Single approach MM-Antero-medial with screws LM - Lateral approach with antiglide plate/anatomical plate
- Bimalleolar fractures → Dual approach Fix simple fracture first (Usually fibula) Fix the second fracture (MM) **check syndesmotic stability** If unstable – Fix with screws (2 preferable)/tightrope
- Trimalleolar fracture

Plan approach after CT assessment
Dual approach
Try to fix – 2 malleoli (LM + PM/MM + PM) from a single approach as per surgeon comfort, third malleolus by another approach

Non weight bearing mobilisation and exercises should be initiated early. Hip, knee, toes ROM during cast application and ankle ROM after removal of plaster

Stable fracture (Syndesmosis intact Medial joint space maintained in stress views) → B/K Slab

Review in out patient department at 5-7 days

Re-assess the fracture reduction whether satisfactory
- No → Open reduction & internal fixation after CT scan
- Yes → Convert to cast and keep for 6 weeks

ABBREVIATIONS

AP: Antero-posterior
ATLS: Advanced Trauma Life Support
HDU: High Dependency Unit
ICU: Intensive Care Unit
LM: Lateral malleolus
MM: Medial Malleolar
PM: Posterior Malleolus
ROM: Range of Motion
RTA: Road Traffic Accident
SAD: Supination Addiction
TENS: Titanium Elastic Nail System

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☛ TIMELY REFERRAL AS PER RESOURCE SETTING

July/ 2024

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Standard Treatment Workflow (STW)

DISTAL FEMUR FRACTURES

ICD-10-S72.402A

DEFINITION

A break in the metaphyseal-diaphyseal junction of the femur and/or involving articular surface of the knee

MECHANISM OF INJURY

- High-energy trauma in young patients (RTA)
- Low-energy fragility fracture in elderly

Management of patient as per ATLS protocols

Presentation:

- Pain, swelling, deformity above the knee joint

Physical Exam

- Inspect
  - Look circumferentially to rule-out an open fracture
- Palpate
  - Tenderness at the distal thigh
  - Rule out compartment syndrome when pain on passive stretching of toes
- Assess
  - Any differences in pulse between extremities - vascular injury
  - Look for associated injuries (especially floating knee)

A. Airway and cervical spine
B. Breathing and ventilation
C. Circulation and Hemmorhage control
D. Disability and Neurological status
E. Exposure and Environment control

Open fracture STW

Fasciotomy and external fixator application

INVESTIGATIONS

RADIOGRAPHS

- AP View
- Lateral View - Look for coronal plane fractures (Hoffa's fracture)

CT SCANS

- Detailed assessment of fracture pathoanatomy - intra-articular and Hoffa component especially(Type B & C).Desirable -3D Reconstruction.
- Preoperative planning for operative approaches and fixation techniques

CLASSIFICATION

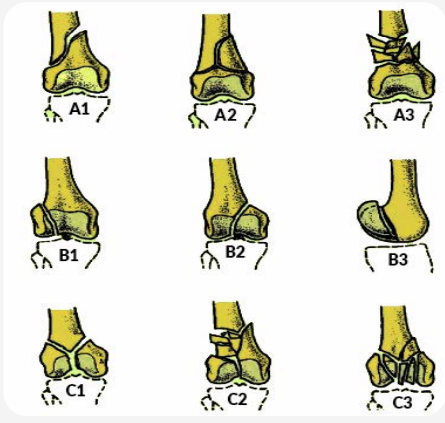
AO/OTA Classification of Distal Femur Fractures

Type A: extra-articular fracture

- **A1:** Simple
- **A2:** Metaphyseal wedge and/or fragmented wedge
- **A3:** Metaphyseal complex

Type B: partial articular fracture

- **B1:** Lateral condyle, sagittal
- **B2:** Medial condyle, sagittal
- **B3:** Frontal



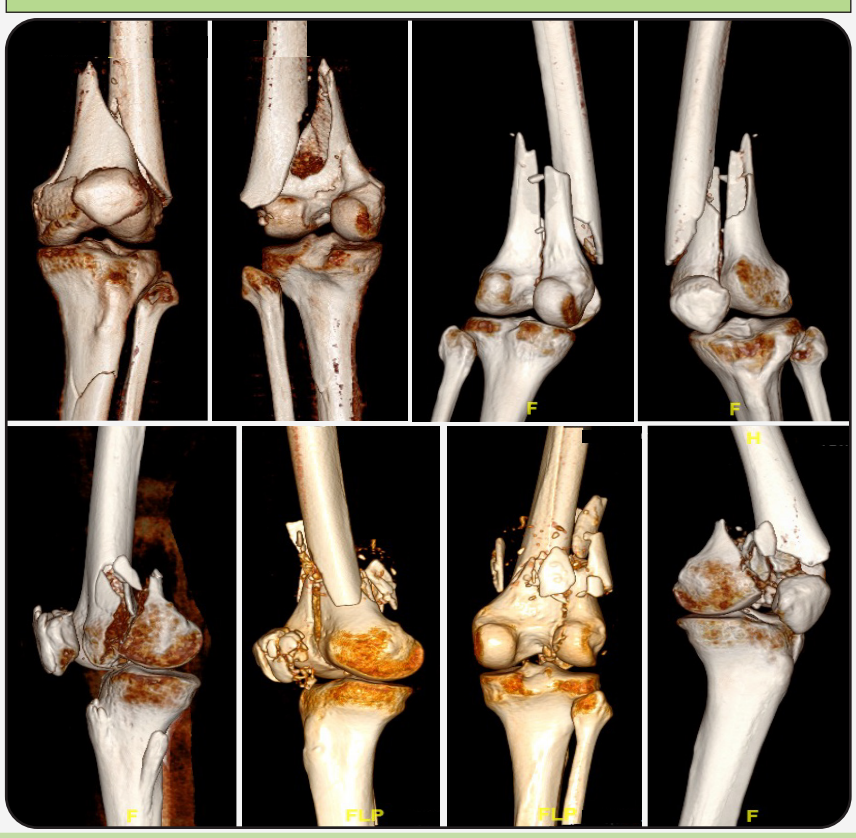
Type C: complete articular fracture

- **C1:** Articular simple, metaphyseal simple
- **C2:** Articular simple, metaphyseal multi-fragmentary
- **C3:** Articular multi-fragmentary

MANAGEMENT

GOALS OF TREATMENT

1. Restore articular congruity in intra-articular fractures
2. Reconstruction of extra-articular component
3. Length, alignment and rotation should be clinically and flouroscopically confirmed before final fixation



Distal femur fracture

At primary centre → ATLS Management
Limb Splintage/Ice packs/elevation
X-Ray if possible

At secondary centre

- Active bleed - sterile dressing and compression bandage
- Suspected compartment syndrome
- Open fracture- sterile dressing

Refer to secondary centre

- Stop the bleed
- Debride for open fracture
- Fasciotomy if warranted for impending compartment syndrome
- External fixator application
- Open reduction internal fixation for simple fractures

At tertiary centre

- If final fixation not possible
- Geriatric patient/Osteoporotic
- Periprosthetic fracture
- Multi-system/Vascular injury

Refer to tertiary centre

- HDU/ICU management for multi-system injury
- Fasciotomy if required
- Vascular repair

Refer to tertiary centre

- Vascular injury
- Geriatric patient/ Osteoporotic
- Periprosthetic fracture
- Multi-system/ Vascular injury

Final fixation once swelling subsides/blisters resolve/patient physiologically fit

Distal femur fracture → X-Ray

Type A

A1 and >7cm from joint → Antegrade nailing

Type A within 4cm from joint → Retrograde nailing/ ORIF with Locking plate, Blade plate and Sliding barrel condylar plate → Anterolateral approach

Geriatric patients/ Osteoporotic bone → Nail Plate or Dual plate constructs needed

Type B

B1 and B2 fractures → ORIF with locked plate/Condylar Buttress Plating → Anterolateral/ Medial approach

Type C

B3 fractures → ORIF with buttress Plate +/- Screws (Anterior to posterior/ Posterior to anterior)

Lateral/medial approach based on condyle involved
OR
Midline parapatellar approach for visualisation and fixation with A to P screws

Assess need for external fixator – Skin condition/swelling/blisters/compartment syndrome

Rigid anatomic fixation of intra-articular fractures

Single approach- anterolateral, medial/ lateral parapatellar, Swashbuckler, Gerdy's tubercle osteotomy approach

Placement of void filler – bone graft substitute

ABBREVIATIONS

AP: Antero-posterior
ATLS: Advanced Trauma Life Support
HDU: High Dependency Unit
ICU: Intensive Care Unit
ORIF: Open Reduction and Internal Fixation
OTA: Orthopaedic Trauma Association
RTA: Road Traffic Accident

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☛ TIMELY INTERVENTION AS PER RESOURCE SETTING

This STW has been prepared by national experts of India with feasibility considerations for various levels of healthcare system in the country. These broad guidelines are advisory, and are based on expert opinions and available scientific evidence. There may be variations in the management of an individual patient based on his/her specific condition, as decided by the treating physician. There will be no indemnity for direct or indirect consequences. Kindly visit the website of ICMR for more information: (**icmr.gov.in**) for more information.

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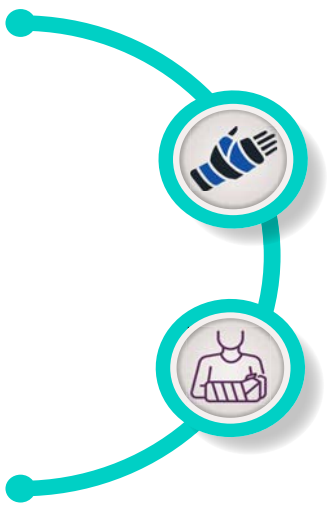
Standard Treatment Workflow (STW)

FRACTURE DISTAL END RADIUS

ICD-10-S62



RISK FACTORS

- Old age
- Osteoporosis
- Female
- Post menopause

PRESENTATION

- Pain over distal radius
- Swelling and ecchymosis
- Deformity - commonly Dinner fork or spade
- Painful restriction of wrist motion

EXAMINATION

- Swelling and ecchymosis
- Deformity
- Tenderness
- Limited active and passive wrist motion

INVESTIGATIONS

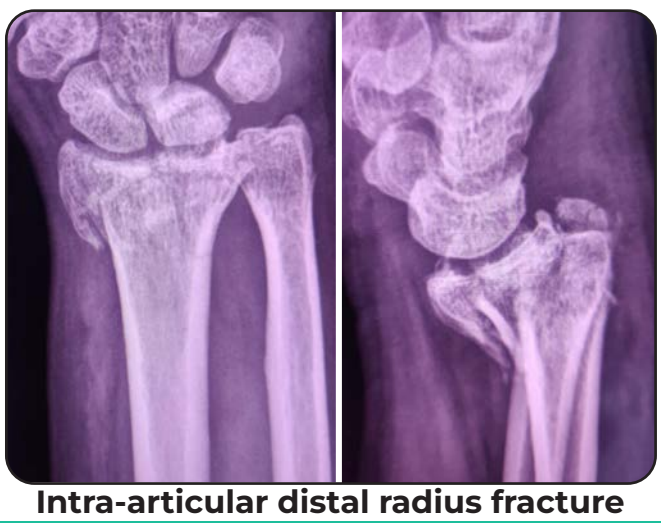
Essential: Radiographs of wrist AP, lateral and oblique views

Desirable (In patients with trivial trauma):

Distal radial fractures may be the first opportunity to evaluate and treat osteoporosis to reduce the risk of future fragility fractures

- Serum calcium, Serum phosphorous, Serum alkaline phosphates
- Serum vitamin D levels, Serum Parathyroid Hormone (PTH)
- BMD all three sites

Optional: CT scan for comminuted fractures and for planning surgery



Intra-articular distal radius fracture

MANAGEMENT

PRIMARY CARE

Simple fracture

Refer to higher centre after:

1. Adequate analgesia
2. Immobilisation of the limb

Open fracture

1. Refer to open fracture STW

Emergent referral:

Open fractures
Neurovascular Deficit
Concomitant trauma requiring immediate admission

SECONDARY/TERTIARY CENTRE

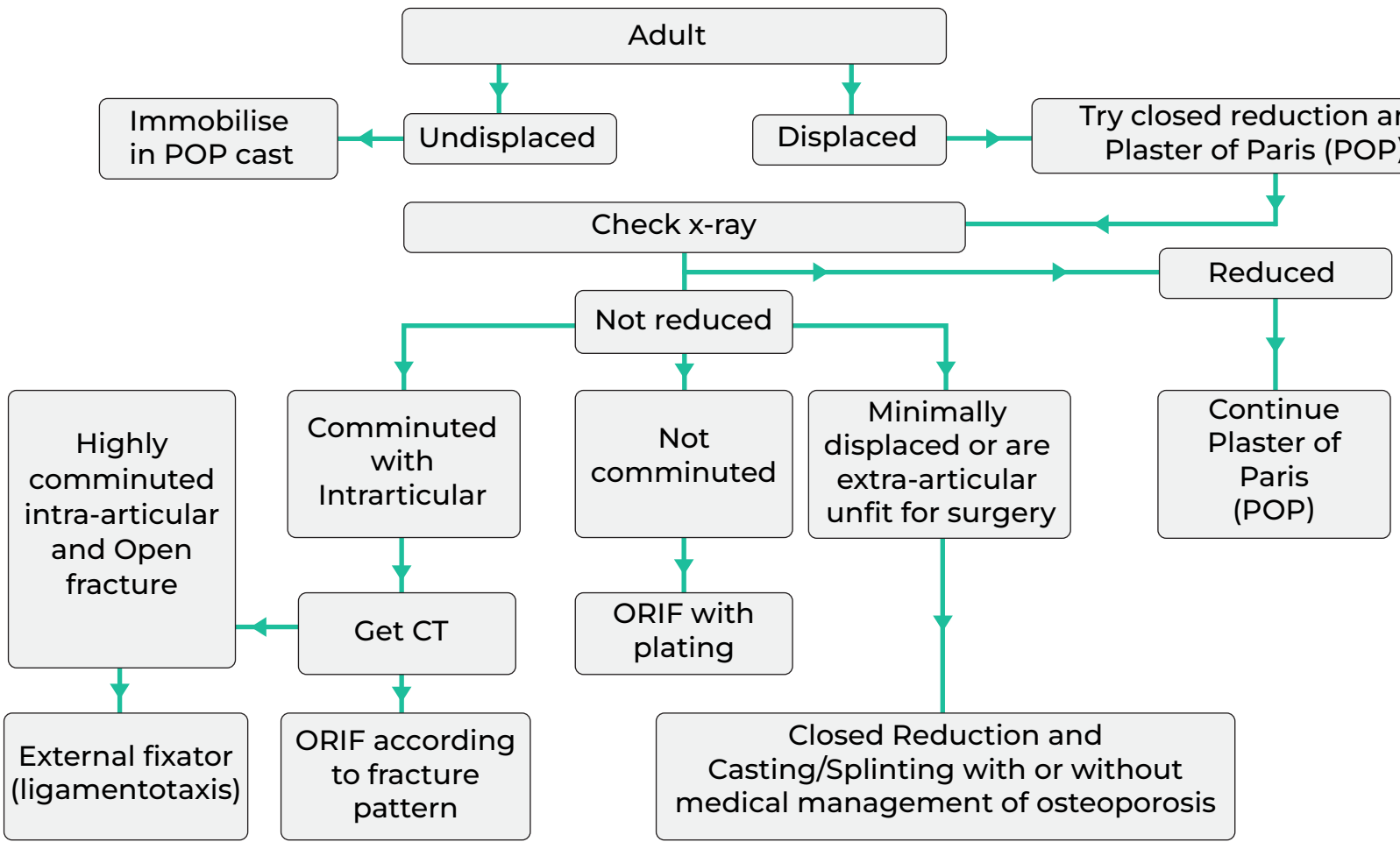
Simple fracture

1. Adequate analgesia
2. Immobilisation of the part

Open fracture

1. Look for Median nerve function, dysfunction/compartment syndrome
2. Distal radial and ulnar pulses
3. Rule out compartment syndrome

TRY INITIAL CLOSED REDUCTION IN ALL DISPLACED RADIUS FRACTURES



Guidelines for operative intervention

- Radial shortening of >3 mm
- Dorsal tilt of >10 [degrees]
- Intra-articular step-off of >2 mm

A majority of pediatric distal radius fractures are inherently stable and can be treated with a short period of immobilization with a cast or splint

Extra-articular distal radius fracture

FOLLOW UP

- Conservatively treated fractures are managed for 4-6 weeks in cast
- To check for fracture displacement, angulation subsidence and fracture healing, serial images are necessary at 1 week and 2 weeks follow up
- If fracture displaces in follow up, may require re-reduction/surgery
- Exercises should be initiated early (Shoulder, elbow and finger ROM during cast application and wrist ROM after removal of plaster)

ABBREVATIONS

AP: Antero-posterior
CT: Computed Tomography
ORIF: Open Reduction and Internal Fixation
ROM: Range of Motion

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KEEP A HIGH THRESHOLD FOR INVASIVE PROCEDURES

July/ 2024

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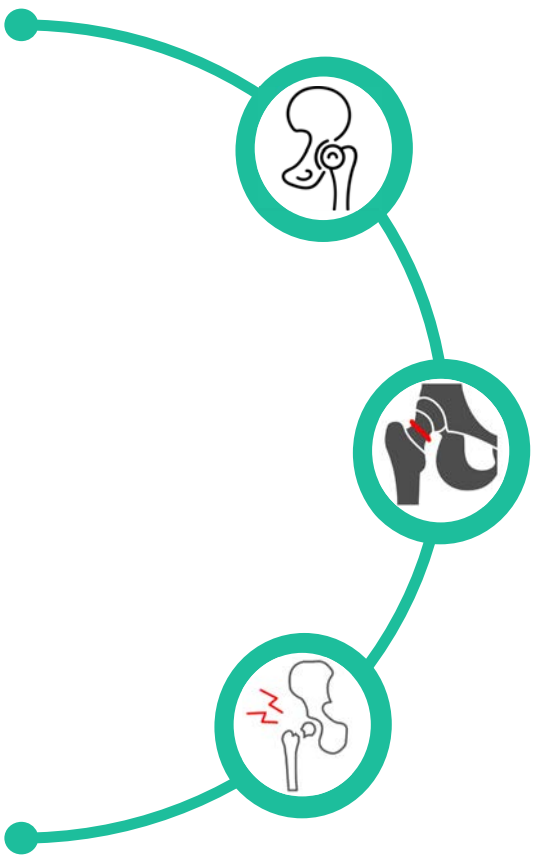
Standard Treatment Workflow (STW)

FRACTURE NECK OF FEMUR

ICD-10-S72.0



FEMORAL NECK FRACTURES

- Femoral neck fractures are intracapsular fractures

RISK FACTORS

- Osteoporosis
- Advancing age
- Increased number of comorbidities
- Increased dependency with Activities of Daily Living (ADL)

SYMPTOMS

- Severe pain in the hip after fall/ Road Traffic Accident (RTA)
- Limb in a deformed position (usually external rotation) and shortening
- Unable to move and stand on the injured limb
- Bruising and swelling around the hip

SIGNS

- Limb is short and externally rotated
- Patient unable to stand or do active straight leg raising
- Marked tenderness at hip joint

FIRST AID

- Pain relief
- Immobilisation of (Splintage including hip, knee & ankle to minimize movements at fracture site during transport)

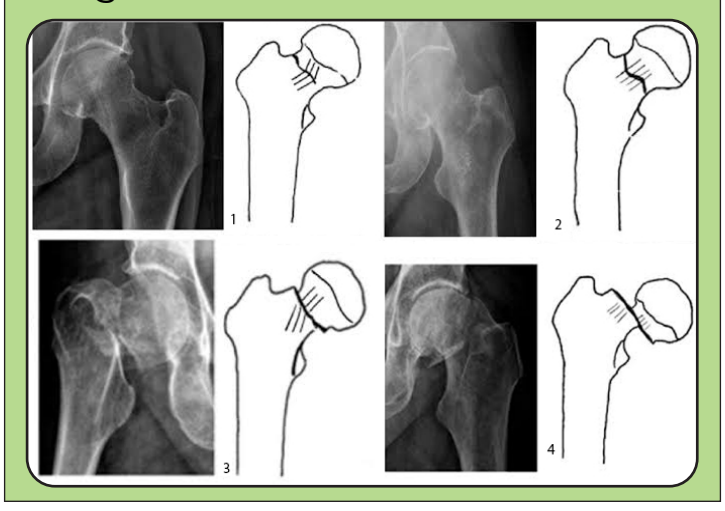
RADIOGRAPHS

- X ray Pelvis with bilateral hips- AP
- Involved hip with thigh – AP (with hips in internal rotation to see the entire neck properly) and lateral view

MANAGEMENT

GARDEN CLASSIFICATION

- **Type I:** Incomplete fracture/Valgus impacted
- **Type II:** Complete fracture without displacement of the fracture fragments
- **Type III:** Complete fracture with partial displacement of the fracture fragments
- **Type IV:** Fracture is complete with total displacement of the fracture fragments

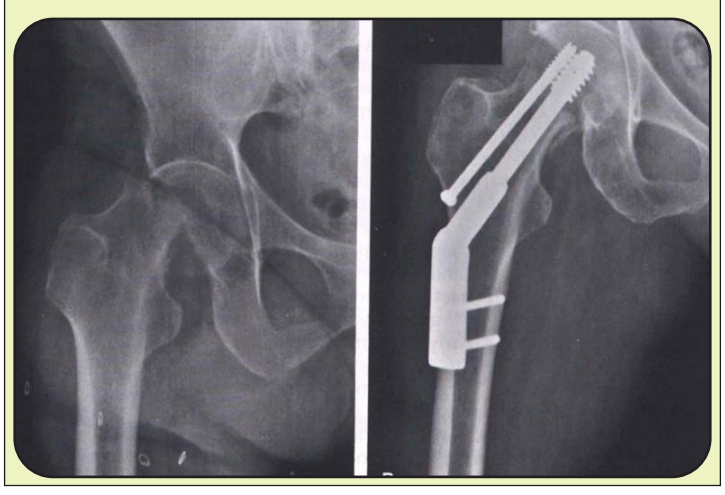


VALGUS/UNDISPLACED (TYPE I & TYPE II)

- In situ internal fixation at the earliest possible
- Three 6.5 cancellous screws (Threads crossing fracture site) should be placed in inverted triangle or triangular configuration

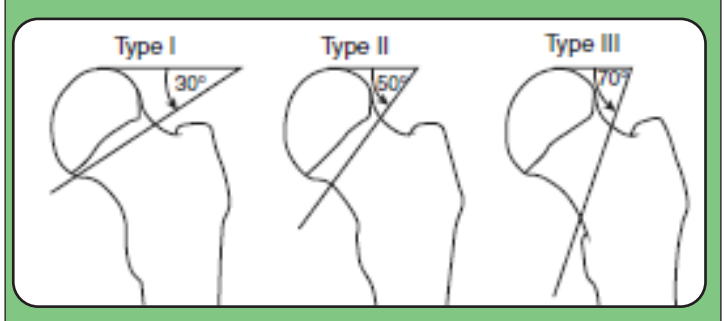
DISPLACED (TYPE III & TYPE IV) UPTO AGE 60 YEARS

- Closed reduction in anatomical position
- If closed reduction is not possible then open reduction should be done
- Fracture fixation is performed by either multiple screw fixation or by Dynamic Hip Screw (DHS) with de-rotation screw



DHS WITH DE-ROTATION SCREW

- Cervicotrochanteric basal neck femur
- Pauwel's type III fracture



MORE THAN 60 YEARS

- Displaced femoral neck fractures require arthroplasty
  - Unipolar (Austin Moore prosthesis)
  - Modular bipolar prosthesis
  - Total Hip Replacement (THR)

INDICATIONS OF THR

- Intracapsular fracture associated with marked arthritis of the hip
- Pathological fractures in patients more than 60 years

ABBREVATIONS

ADL: Activities of Daily Living

AP: Antero-posterior

DHS: Dynamic Hip Screw

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☛ EARLY SURGICAL TREATMENT IS DESIRABLE

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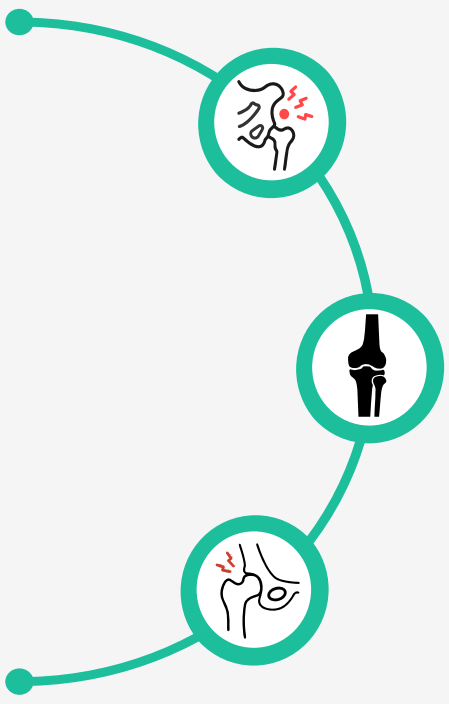
Standard Treatment Workflow (STW)

HIP OSTEOARTHRITIS

ICD-10-M16. 9



SYMPTOMS & SIGNS

Pain

- During or after movement
- Joint stiffness
- Tenderness
- Loss of flexibility & restricted range of hip movement
- Grating sensation
- Deformity

PRIMARY

- Very rare

SECONDARY

- Developmental dysplasia of hip
- Osteonecrosis
- Failed reconstruction
- Post-traumatic
- Tuberculosis
- Coxa plana (Legg-Calvé-Perthes disease)
- Slipped capital femoral epiphysis
- Paget's disease
- Hemophilia

MANAGEMENT

CONSERVATIVE MEASURES

- Weight loss
- Non-opioid analgesics (as per need)
- Reasonable activity modification
- Avoid standing for long hours, climbing stairs, squatting, sitting cross legged
- Hip abductor and extensor muscle strengthening exercises and quadriceps exercises
- Ambulatory aids like walking stick

KELLGREN (1963) DESCRIBED 4 GRADES OF HIP OA

- **Grade 1 (doubtful OA)**, Possible narrowing of the joint space medially and possible osteophytes around femoral head
- **Grade 2 (mild OA),** Definite narrowing of the joint space inferiorly, definite osteophytes and slight sclerosis
- **Grade 3 (moderate OA),** Marked narrowing of the joint space, slight osteophytes, some sclerosis and cyst formation, and deformity of the femoral head and acetabulum
- **Grade 4 (severe OA),** Gross loss of joint space with sclerosis and cysts, marked deformity of the femoral head and acetabulum, and large osteophytes

INDICATIONS OF TOTAL HIP REPLACEMENT (THR)

- Patients with osteoarthritis of hip, Kellgren & Lawrence Grade-IV with following clinical features may require surgery after appropriate conservative treatment has failed
- Deformity & pain that significantly limits the activities of daily living
- Disabling hip pains that continues even at rest
- Daily requirements of analgesic
- Bilateral ankylosis of hip joints

ABBREVIATIONS

OA: Osteoarthritis

THR: Total Hip Replacement

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KEEP A HIGH THRESHOLD FOR INVASIVE PROCEDURES

July/ 2024

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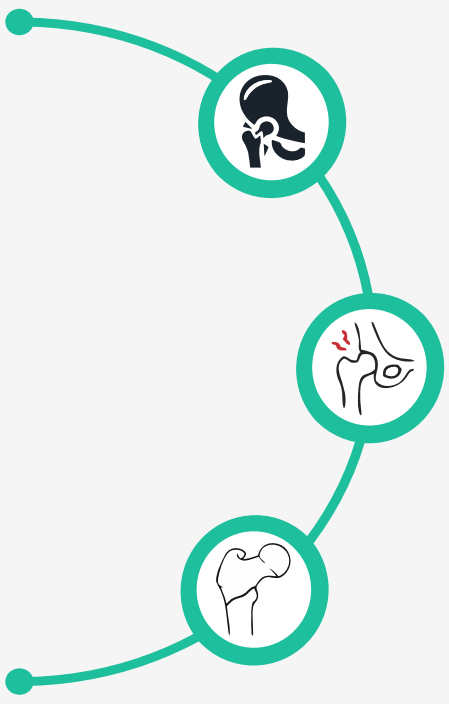
Standard Treatment Workflow (STW)

INTERTROCHANTERIC FEMORAL FRACTURES

ICD-10-S72. 14



DEFINITION

- Extracapsular fractures of the proximal femur that occur between the greater and lesser trochanter

RISK FACTORS

- Osteoporosis
- Advancing age
- Increased number of comorbidities
- Increased dependency with Activities of Daily Living (ADL)

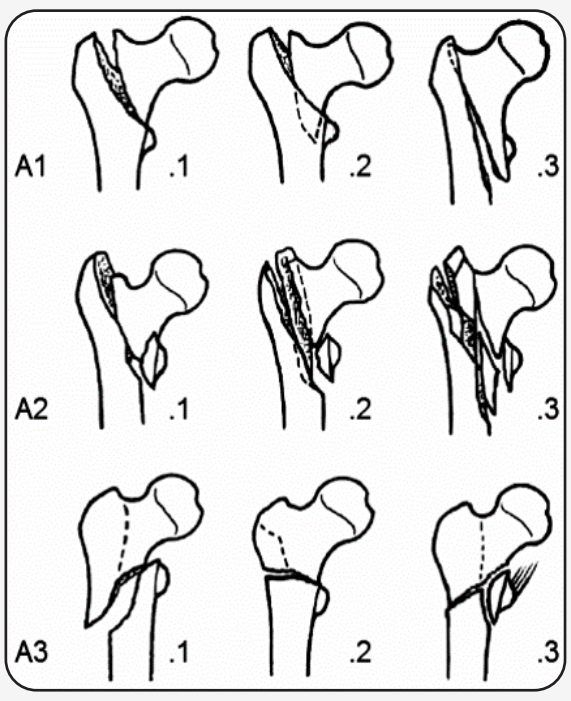
SYMPTOMS AND SIGNS

- Severe pain in the hip after fall/Road Traffic Accident (RTA)
- Limb in a deformed position (usually external rotation)
- Unable to move and stand on the injured limb
- Bruising and swelling around the hip
- Tenderness at trochanteric level

MANAGEMENT

AO CLASSIFICATION

- AO/OTA type-31-A pertrochanteric fractures:
  31-A1 fractures - simple
- 31-A2 fractures - multifragmentary -
  - A2.1: detachment of the lesser trochanter
  - A2.2: several intermediate fragments including the lesser trochanter
  - A2.3: several intermediate fragments extending more than 1 cm distal to the lesser trochanter
- 31-A3: fractures - fracture line through the lateral femoral wall, anatomically defined as the lateral femoral cortex distal to the greater trochanter



AO CLASSIFICATION

FIRST AID

- Pain relief
- Immobilisation of limb (splintage including hip, knee and ankle to minimize movements at fracture site during transport)

RADIOGRAPHS

- X ray pelvis with bilateral hips- AP
- Involved hip with thigh – AP and lateral

OPERATIVE MANAGEMENT

- The mainstay of treatment is fixation with a dynamic hip screw (DHS) or proximal femoral Intramedullary nail
- Stable FRACTURE -intact posteromedial cortex- Association of osteosynthesis (Ao) type A1 and A2.1 -DHS
- Unstable FRACTURE - broken posteromedial cortex- Association of osteosynthesis (Ao) type A3 & A2.2 & A2.3 - Proximal femoral Intramedullary nail

31-A2

Dynamic Hip screw with plating post operative Xray

31-A3

Proximal femoral nail A2 Post operative Xray

ARTHROPLASTY - INDICATIONS (RARE)

- Revision for failed internal fixation
- Associated pre-existing severe hip arthritis
- Severely osteoporotic bone that is unlikely to hold internal fixation

Red flag signs
Excessive Bruising/hematoma or any distal neurovascular deficit

Nonoperative treatment to be considered in patients with severe comorbidities not fit for surgery understanding high risks of pneumonia, urinary tract infection, decubitus ulcers, deep vein thrombosis and mortality

ABBREVIATIONS

ADL: Activities of Daily Living **AP:** Antero - posterior **DHS:** Dynamic Hip Screw **RTA:** Road Traffic Accident

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☛ EARLY SURGERY DECREASE COMPLICATIONS AND MORTALITY

July/ 2024

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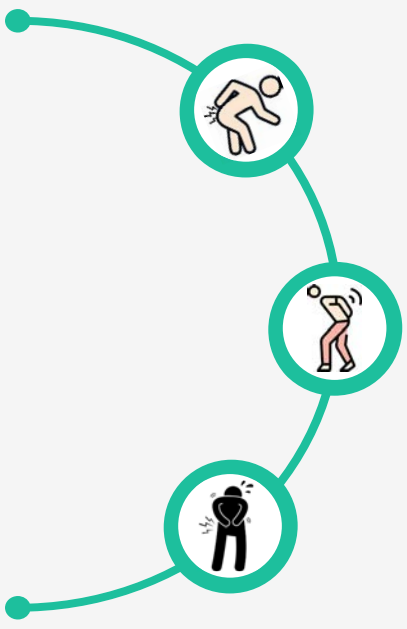
Standard Treatment Workflow (STW)

LOWER BACK PAIN

ICD-10-M54. 2



HISTORY

- Lower back pain-acute or chronic
- Severity of pain
- Site and onset of pain
- Radiation of pain
- Associated features such as fever, trauma, weight lifting, associated tingling or numbness
- History related to Pelvic Inflammatory disease (PID)- if positive-refer to Gynecologist
- Anticonvulsants and steroids intake

RED FLAG SIGNS

- Features of Cauda Equina Syndrome including sudden onset of loss of bladder/ bowel control, saddle anesthesia and weakness of lower limbs
- Severe worsening pain, especially at night or when lying down
- Significant history of trauma
- Weight loss, history of cancer, fever
- Use of prolonged steroids or intravenous drugs
- First episode of severe pain in patient over 50 years of age

Conduct a full assessment including
- History taking
- Physical and neurological examination
- Evaluation of red flags
- Psychosocial risk factors

Red Flag Signs → Yes → Consider referral to higher center for evaluation

No

Acute and Sub acute-duration less than 12 weeks

- **Consider analgesics for short duration**
  - Acetaminophen
  - NSAIDs
  - Short course muscle relaxants
  - Use opioids (short duration) if not responding to above analgesics
- Recommend back strengthening exercises and/ or physical activity (when pain becomes bearable), avoid heavy weight lifting activities
- **Prescribe self-care strategies**
  - Alternating cold and heat therapy
  - Continuation of Activities of Daily Living as tolerated
- **Encourage early return to work**
- **Educate patient that low back pain usually resolves with time**

↓

Re-assess at 2-6 weeks (including Red Flags) if patient is not returning to normal function or symptoms are worsening

↓

Consider lab test and imaging*
Consider Referral
- Physical therapist
- Orthopeadic surgeon (for unresolving radicular symptoms)
- Multidisciplinary pain program (if not returning to work)

Chronic-duration greater than 12 weeks

- **Consider lab test and imaging (X -rays)**
- **Prescribe back strengthening exercises or therapeutic exercise**
- **Analgesic options**
  - Acetaminophen
  - NSAIDs
  - Short term muscle relaxant for flare-ups
- **Pain not responding to above**
  - Opioids for short term in severe pain
  - Low dose antidepressants for short duration
- **Other modalities**
  - Physiotherapy
  - TENS as adjunct to active therapy etc
- If pain still does not subside then consider Referral
- **Modalities at Referral centre**
  - Multidisciplinary chronic pain program/ clinic
  - Epidural steroids (for short-term relief of radicular pain)
  - Surgery in carefully selected patients after expert opinion and based on indications

***Based on provisional diagnosis - Lab and imaging Test**
- Lab tests
  - Hemogram with ESR and CRP
- Imaging
  - X rays LS Spine- Anteroposterior (AP) and lateral
  - MRI LS spine
  - DEXA Scan- suspected osteoporosis

ABBREVIATIONS

CRP: C-reactive Protein
DEXA: Dual-energy X-ray Absorptiometry
LS: Lumbo-Sacral
ESR: Erythrocyte Sedimentation Rate
MRI: Magnetic Resonance Imaging
NSAIDs: Non-Steroidal Anti-inflammatory Drugs
PID: Pelvic Inflammatory Disease
TENS: Transcutaneous Electrical Nerve Stimulation

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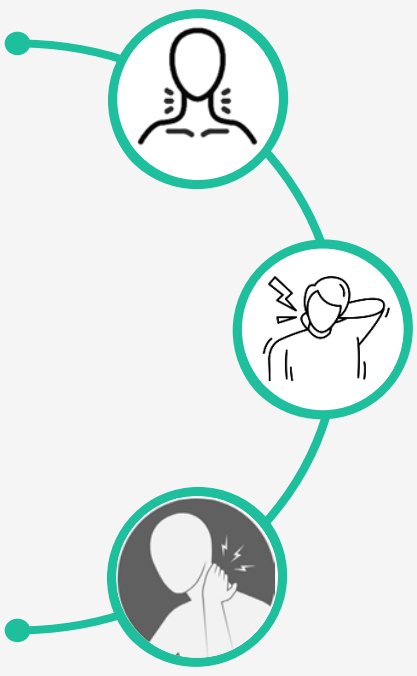
NECK PAIN

ICD-10-M54. 2



HISTORY

- Acute or chronic
- Severity of pain
- Site and onset of pain
- Radiation of pain
- Associated features such as fever, trauma, weight lifting, associated tingling or numbness
- Anticonvulsants and steroids intake

RED FLAG SIGNS

- Features of neurological deficit including sudden onset of loss of bladder/ bowel control, numbness/paresthesias/weakness of upper limbs or lower limbs
- Severe worsening pain, especially at night or when moving the neck
- Significant history of trauma
- Weight loss, fever, history of cancer
- Use of prolonged steroids or intravenous drugs
- First episode of severe pain in patient over 50 years of age

Conduct a full assessment including
- History taking
- Physical and neurological examination
- Evaluation of red flags
- Psychosocial risk factors

Red Flag Signs → Yes → Referral to higher center for evaluation

No

Acute and Sub acute (Duration - less than 12 weeks)

- **Consider analgesics for short duration**
  - Acetaminophen/PCM and NSAIDs
  - Short course muscle relaxants
  - Use opioids (short duration) if not responding to above analgesics
- Immobilize neck in acute stage. Once pain subsides - start neck strengthening exercises and/or physical activity
- Recommend neck strengthening exercises and/or physical activity (when pain becomes bearable)
- Avoid lifting heavy weights
- **Prescribe self-care strategies**
  - Alternating cold and heat therapy
  - Continuation of Activities of Daily Living as tolerated
- **Encourage early return to work**
- **Educate patient that neck pain usually resolves with time**

Re-assess at 2-6 weeks (including Red Flags) if patient is not returning to normal function or symptoms are worsening

*Based on provisional diagnosis - Lab and imaging Test

- Lab tests
  - Hemogram with ESR and CRP
- Imaging
  - X rays Cervical Spine- AP and lateral
  - MRI Cervical spine

Chronic (Duration - greater than 12 weeks)

- **Consider lab test and imaging (X -rays)**
- **Prescribe neck strengthening exercises or therapeutic exercises**
- **Analgesic options**
  - Acetaminophen/Paracetamol (PCM)
  - NSAIDs
  - Short term muscle relaxant for flare-ups
- **Pain not responding to above**
  - Opioids for short term in severe pain
  - Low dose antidepressants for short duration
- **Other modalities**
  - Physiotherapy
  - TENS as adjunct to active therapy etc
- If pain still does not subside then consider Referral

Consider lab test and imaging*

Consider Referral
- Physical therapist
- Orthopaedic surgeon (for unresolving radicular symptoms)
- Multidisciplinary pain program (if not returning to work)

- **Modalities at Referral centre**
  - Multidisciplinary chronic pain program/clinic
  - Surgery in carefully selected patients after expert opinion and based on indications

ABBREVIATIONS

AP: Antero-Posterior
CRP: C-reactive Protein
NSAIDs: Non-Steroidal Anti-Inflammatory Drugs
ESR: Erythrocyte Sedimentation Rate
MRI: Magnetic Resonance Imaging
TENS: Transcutaneous Electrical Nerve Stimulation

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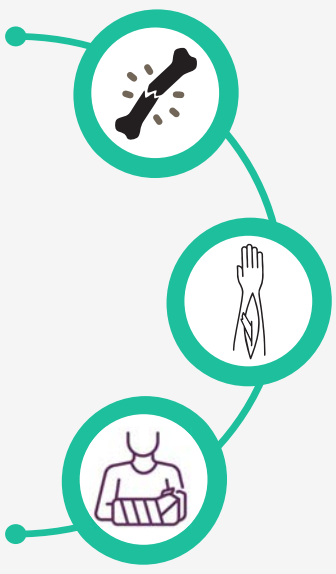
Standard Treatment Workflow (STW)

OPEN FRACTURES

ICD-10-S82.891B



A fracture is considered open when there is communication between the fracture and/or the fracture hematoma and the external environment

CLINICAL EXAMINATION

Management of patient as per ATLS protocols
Systematic inspection of each limb is critical
Expose the entire extremity
- Size of skin wounds
- Muscle crush or loss
- Periosteal stripping or bone loss
- Contamination
- Clinical photography of wound is a must
- Neurovascular status assessment

GOALS OF TREATMENT

First Preserve life
↓
Preserve limb
↓
Preserve function
Prevention of infection
Fracture stabilization
Soft tissue coverage

MANAGEMENT

*ANTIBIOTIC - WHICH, WHEN AND FOR HOW LONG?

Single most important factor in reducing the infection rate - early administration of antibiotics - ideally within 1 hour of injury
- Cephalosporin (cefuroxime 1.5 gm) 3 doses 8 hours apart
- **Type III** - Add aminoglycoside (gentamycin 5mg/kg every 24 hours)
- **Duration** - 3 days after wound closure
- **Potential soil contamination** - Add metronidazole 500 mg IV every 8 hours

- Consider Aspirin in case of prolonged immobilisation
- Look for signs of DVT and embolism

REFERRAL

Ensure Splintage is done, Analgesic IV/IM Diclofenac single dose is given. Patient is kept NPO and IV fluid (RL) is started

At primary centre after initial management is done
- GA Type I to III A → Refer to secondary centre
- GA Type III B → Refer to tertiary centre

SURGICAL WOUND DECONTAMINATION

- Prior to formal debridement the wound should be handled only to remove gross contamination
- 'Mini-washouts' outside the operating theatre environment are not indicated
- Debride all devitalized structures – skin, muscle, bones ('When in doubt, take it out)
- Irrigation: Low to medium pressure; normal saline
- **Rule of 3 (Type 1 – 3L; Type 2 – 6L; Type 3 – 9L)**
- Send cultures
- Fracture stabilization with fresh instruments once debridement is complete
- **Grade I to IIIA** - Early internal fixation – With definitive skin cover
- **Grade IIIA and IIIB** - Provisional stabilization of fracture with wound management when definitive skin cover is not possible

GA TYPE III B/III C

Managed at tertiary centre
Multidisciplinary approach - **'Orthoplastic'**
III C injuries may require CT angiogram/doppler study

WOUND CLOSURE

- Recommendation is primary closure of Type I, Type II and a few selected Type IIIA fracture – but avoid tension at closure site
- Coverage of III A and III B - after proper debridement and cleaning. May require one or two or more formal debridements
- Definitive soft tissue closure or coverage should be aimed within 72 hours of injury if it cannot be performed at the time of debridement

INITIAL EMERGENCY TREATMENT

OBVIOUS BLEED → Apply local pressure
- Controlled → No obvious bleed
- Does not stop → Pack the wound

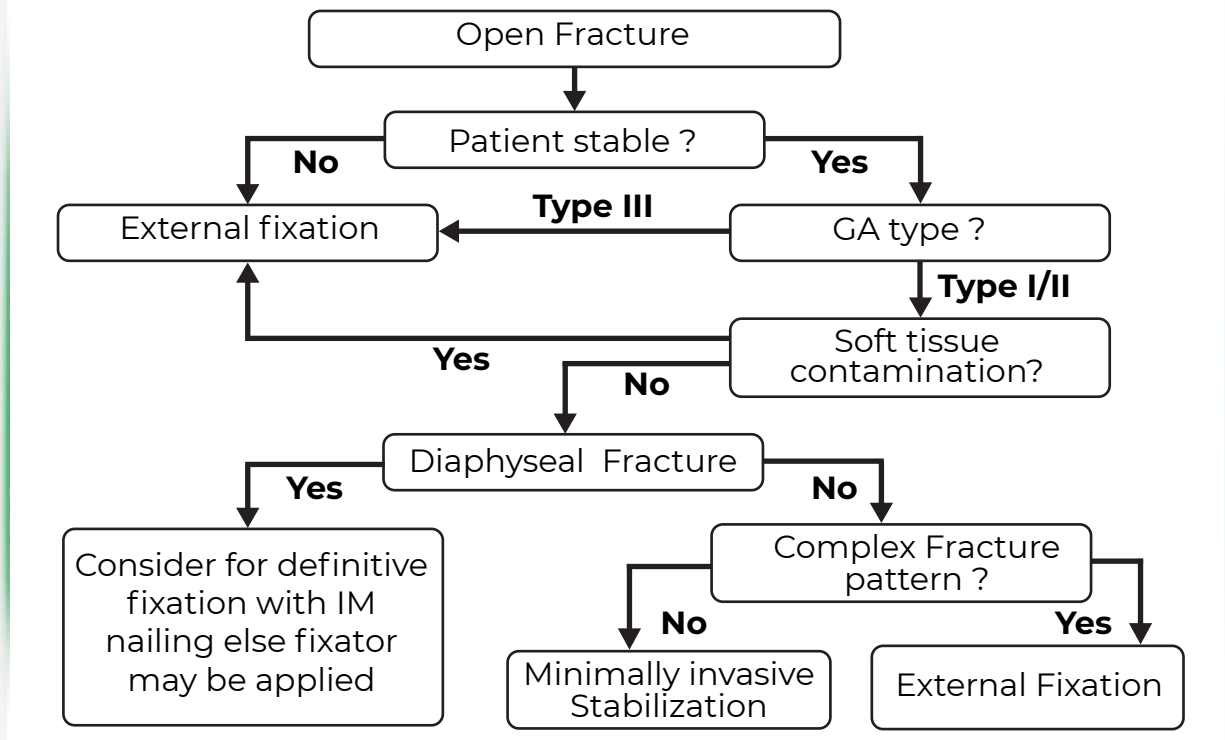
→ Antibiotics* and Tetanus prophylaxis
→ Remove gross contamination with gentle saline wash
→ Cover with saline gauze
→ Do not debride/suture in ED
→ Assess Neurovascular status
→ Reduction, realignment, splintage
→ Reassess Neurovascular status

Look for Compartment syndrome
Pain on passive stretching
Pallor
Paraesthesia
Paralysis
Pulselessness
→ If suspected urgent referral to higher centre for immediate fasciotomy

GET X-RAY TO ASSESS UNDERLYING FRACTURE (IF POSSIBLE)

GUSTILO-ANDERSON CLASSIFICATION

	I	II	III-A	III-B	III-C
Energy of mechanism	Low	Moderate	High	High	High
Wound size	<1 cm	1 to 10 cm	>10 cm	>10 cm	>10 cm
Soft tissue injury	Low	Moderate	Extensive	Extensive	Extensive
Contamination	No	Low	Severe	Variable	Variable
Fracture pattern/ comminution	Simple /no	Simple/ Some	Complex /Severe	Complex /Severe	Complex /Severe
Soft tissue coverage	Yes	Yes	Yes	No	Variable
Vascular injury	No	No	No	No	Yes



ABBREVIATIONS

ATLS: Advanced Trauma Life Support
CT: Computed Tomography
ED: Emergency Department
GA: Gustilo Anderson
IM Nail: Intramedullary Nail
IV/IM: Intravenous/Intramuscular
NPO: Nil Per Oral
RL: Ringer's Lactate

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☛ EARLY ADMINISTRATION OF ANTIBIOTICS AND REFERRAL AS PER RESOURCE SETTING

July/ 2024

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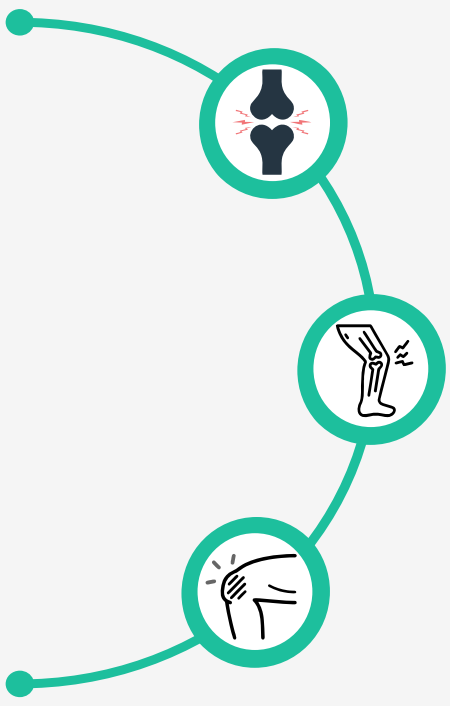
Standard Treatment Workflow (STW)

OSTEOARTHRITIS OF KNEE JOINT

ICD-10-M19. 9



SYMPTOMS

- Pain that increases with activity & relieves with rest
- Joint stiffness especially in the morning or after a period of rest for short duration
- Decrease in Range of Motion (ROM) of the knee, making it difficult to stand from sitting position, get in and out of chair or car, stair climbing, or walk
- Creaking, crackling sounds on movement of knee
- Swelling and feeling of warmth in the joint may be present

SIGNS

- Joint line tenderness
- Patello-femoral crepitus
- Decreased ROM
- Deformity (commonly flexion and varus)
- Joint effusion and synovial thickening may be present

INVESTIGATION

- X-rays
- Bilateral Knee - AP (standing) and lateral views

MANAGEMENT

KELLGREN AND LAWRENCE (RADIOLOGICAL) CLASSIFICATION OSTEOARTHRITIS OF KNEE

Classification

- **Grade 0:** No radiographic features of OA are present
- **Grade 1:** Doubtful Joint Space Narrowing (JSN) and possible osteophytic lipping
- **Grade 2:** Definite osteophytes and possible JSN on anteroposterior weight-bearing radiograph
- **Grade 3:** Multiple osteophytes, definite JSN, sclerosis, possible bony deformity
- **Grade 4:** Large osteophytes, marked JSN, severe sclerosis and definite bony deformity

- High tibial osteotomy may be considered in younger patients with significant varus deformity

Indications of surgery for total knee replacement

Patients with osteoarthritis Kellgren and Lawrence grade 4 with following features may require surgery after appropriate conservative treatment has failed

- Severe knee pain or stiffness that limits activities of daily living including walking, climbing stairs, and getting in and out of chairs
- Patient unable to walk short distances (due to significant knee pain) and requires use of a cane/walker
- Regular analgesic requirement over a long period
- Moderate or severe knee pain while on rest either day or night
- Severe deformity

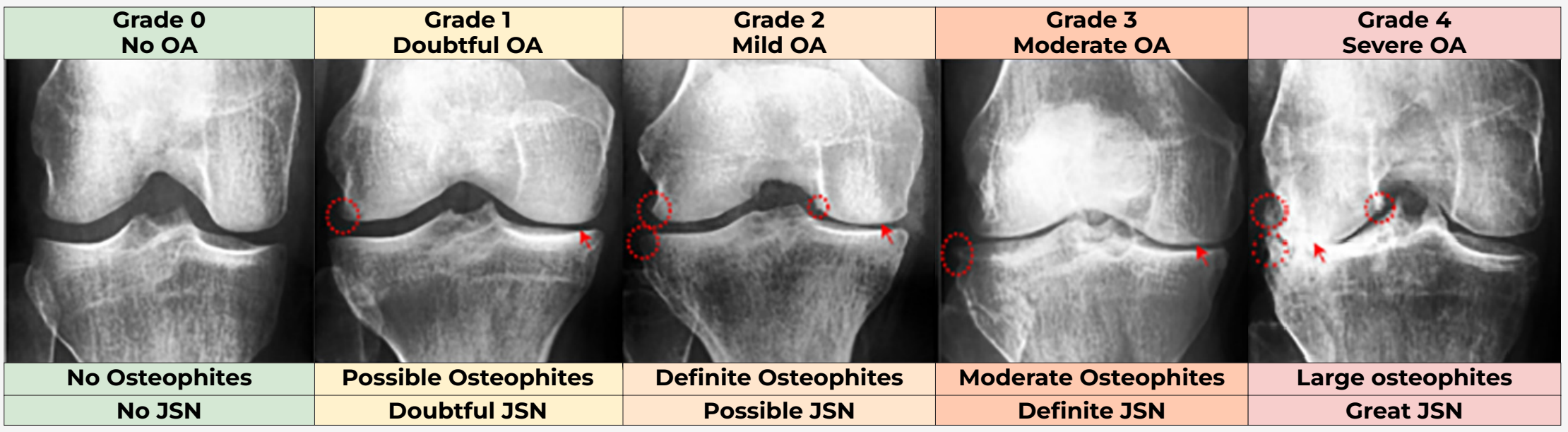
CONSERVATIVE TREATMENT

- Topical NSAIDs
- Oral Acetaminophen
- Oral NSAIDs (If not contraindicated) as and when required

- Quadriceps strengthening and Hamstring stretching exercises
- Lifestyle modifications such as avoid cross legged sitting and squatting and stair climbing wherever possible
- Weight loss

CONTRAINDICATIONS FOR KNEE REPLACEMENT

- Recent or current knee sepsis
- Remote source of ongoing infection
- Extensor mechanism discontinuity or severe dysfunction
- Recurvatum deformity secondary to neuromuscular weakness
- Presence of a painless, well-functioning knee arthrodesis



ABBREVIATIONS

AP: Antero-posterior

NSAIDs: Non-steroidal Anti-inflammatory Drugs

OA: Osteoarthritis

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Standard Treatment Workflow (STW)

TIBIAL PLATEAU FRACTURES

ICD-10-S82.109A

DEFINITION

A fracture involving the proximal end of the tibia which may or may not extend to the articular surface and/or diaphyseal region

MECHANISM OF INJURY

- High-energy trauma in young patients (RTA)
- Low-energy falls in elderly

Management of patient as per ATLS protocols

Presentation:

- Pain, swelling, deformity at or below the knee

PHYSICAL EXAM

- Look circumferentially to rule-out an open injury
- Tenderness below the knee
- Rule out compartment syndrome (blisters, ecchymosis, swelling, pain out of proportion)
- Look for distal neurovascular deficit

A. Airway and cervical spine
B. Breathing and ventilation
C. Circulation and haemorrhage control
D. Disability and neurological status
E. Exposure and environment control

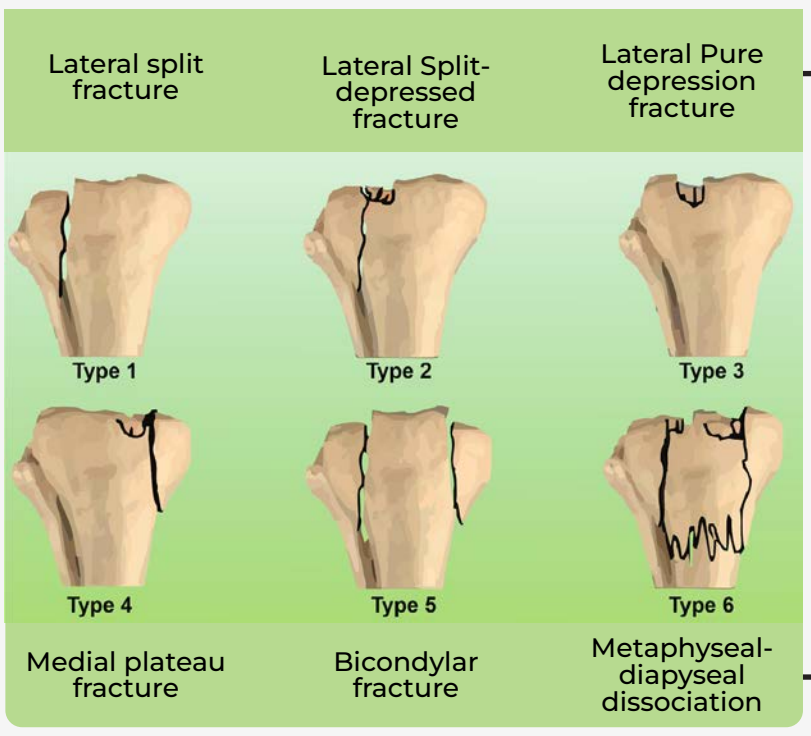
Open Fractures - STW

Urgent referral to higher centre for consideration for Fasciotomy and External Fixator application

INVESTIGATIONS

RADIOGRAPHS

- AP View – Schatzker classification
- Lateral View – Posterior fracture component



CT SCANS REQUIRED FOR

- Detailed assessment of fracture pathoanatomy & Preoperative planning
- Column classification – Luo

LOW ENERGY INJURY

Preferable to get a CT scan

HIGH ENERGY INJURY

Medial fracture dislocations

Open fracture (IIIA/B)

Compartment syndrome

Severe displacement/ Axial shortening

May consider for knee spanning External fixator prior to CT scan

Span → Scan → Plan

THREE COLUMN CLASSIFICATION (LUO)

- One column fracture is defined as an independent articular depression with a break in the column
- Zero-column fracture = purely articular

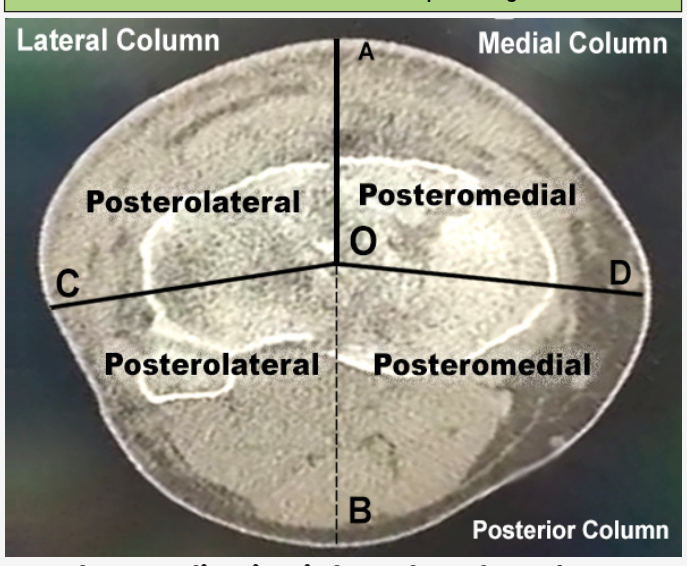


Plate application is based on the column concept.
Attempt to reduce and fix each column individually

MANAGEMENT

GOALS OF TREATMENT

Restoration of joint stability

- Anatomical reduction of the articular surface
- Restoration of the mechanical axis of the lower limb

IMPLANT OPTIONS

Screws alone

- Simple split
- Depressed fracture elevated percutaneously

Hybrid External fixator/Ilizarov: Poor skin condition, post fasciotomy

Anatomical locking plates

- Buttressing against shear forces or Neutralizing rotational forces

- **Additionally** – Rim plates/fragment specific small plates/bone graft substitutes may be used on case to case basis

Tibial Plateau Fracture

ATLS Management
X-Ray if possible
Limb elevation/ice packs/splintage
Analgesics

At secondary centre

- Active bleed
- Suspected compartment syndrome
- Open fracture
- Simple fracture

Refer to secondary centre

- Stop the bleed
- Refer- STW for open fracture
- Fasciotomy if warranted for impending compartment syndrome
- External fixator application

Open reduction internal fixation for simple fractures

- If final fixation not possible
- Complex fracture dislocation
- Vascular repair warranted
- Multi-system injury

At tertiary centre

- High Dependency Unit/Intensive Care Unit management for multi-system injury
- External Fixator
- Fasciotomy if required
- Vascular repair

Refer to tertiary centre

- Vascular injury
- Complex Fracture dislocation
- Multi-system injury

Final fixation once swelling subsides/ blisters resolve/patient physiologically fit

Tibial Plateau Fracture

X-Ray

Assess need for external fixator-Skin condition/ swelling/blisters/compartment syndrome

Open reduction internal fixation should be performed only after appearance of "wrinkle sign"

Schatzker 1 to 3	Schatzker 4	Schatzker 5 & 6
Anterolateral approach	Medial or posteromedial approach based on column involved	Based on the column concept- approach to each column must be made and all columns to be fixed
Articular surface reconstruction by elevating depression using bone punch via lateral fracture split/medial window (Type 2 and 3 fractures)	Fracture reduction	First fix one fragment anatomically (usually posteromedial)
Placement of raft screws and/or plate	Fixation with Antiglide plate	Elevate the articular depression if present
		Fix each fragment with anatomical locking plates

ABBREVIATIONS

ATLS: Advancd Trauma Life Support
CT: Computed Tomography
RTA: Road Traffic Accident

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☛ LOOK FOR RED FLAGS AND ACT TIMELY