ANKLE FRACTURES

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FOOT & ANKLE SURGEON

JAIPUR

FOUNDER JAIPUR FOOT AND ANKLE SOCIETY

EXECUTIVE MEMBER SICOT INTERNATIONAL FOOT AND ANKLE COMMITTEE

EXECUTIVE MEMBER INDIAN FOOT AND ANKLE SOCIETY

INTRODUCTION

- MOST COMMON INTRA-ARTICULAR FRACTURE OF A WEIGHT BEARING JOINT.
- MALUNION LEADS TO ARTHRITIS AND ABNORMAL PRESSURE DISTRIBUTION – RAMSEY, HAMILTON
- GOALS- CONGRUENT JOINT, UNION, PREVENTION OF ARTHRITIS.
- FREQUENT OCCURRENCE – CERTAIN DISREGARD FOR SERIOUSNESS.

ANATOMY

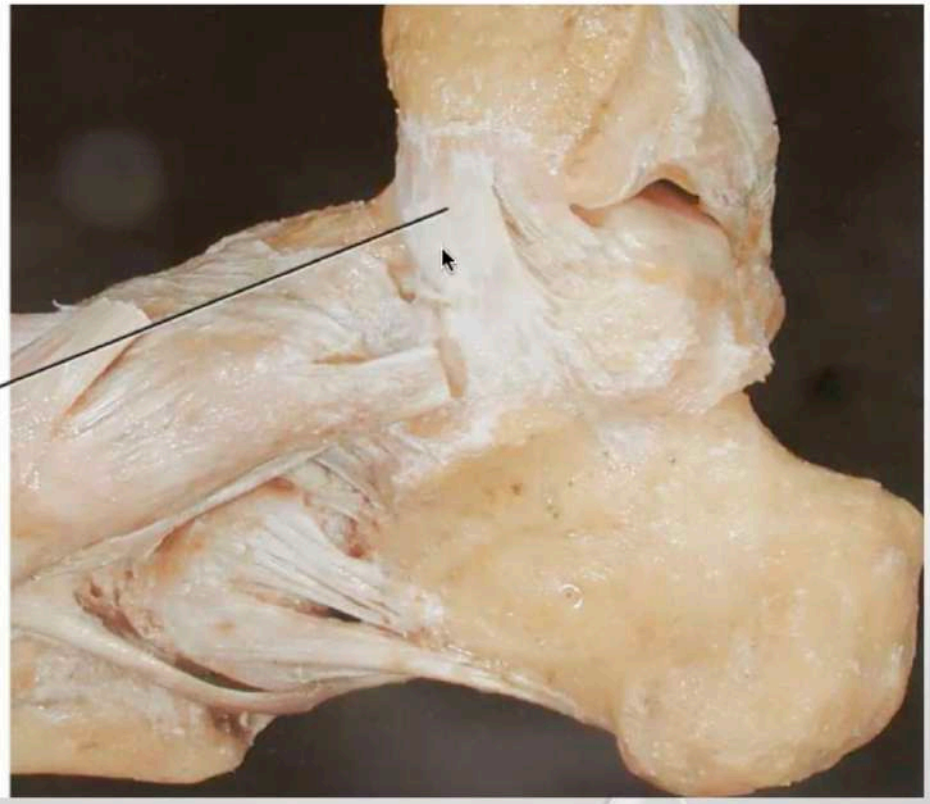
- MODIFIED HINGE JOINT
- 3 BONES- TIBIA, FIBULA, TALUS
- COMPLEX LIGAMENTOUS STRUCTURE
- MOVEMENTS IN MULTIPLE PLANES-

  SAGITTAL – PLANTAR AND DORSI FLEXION

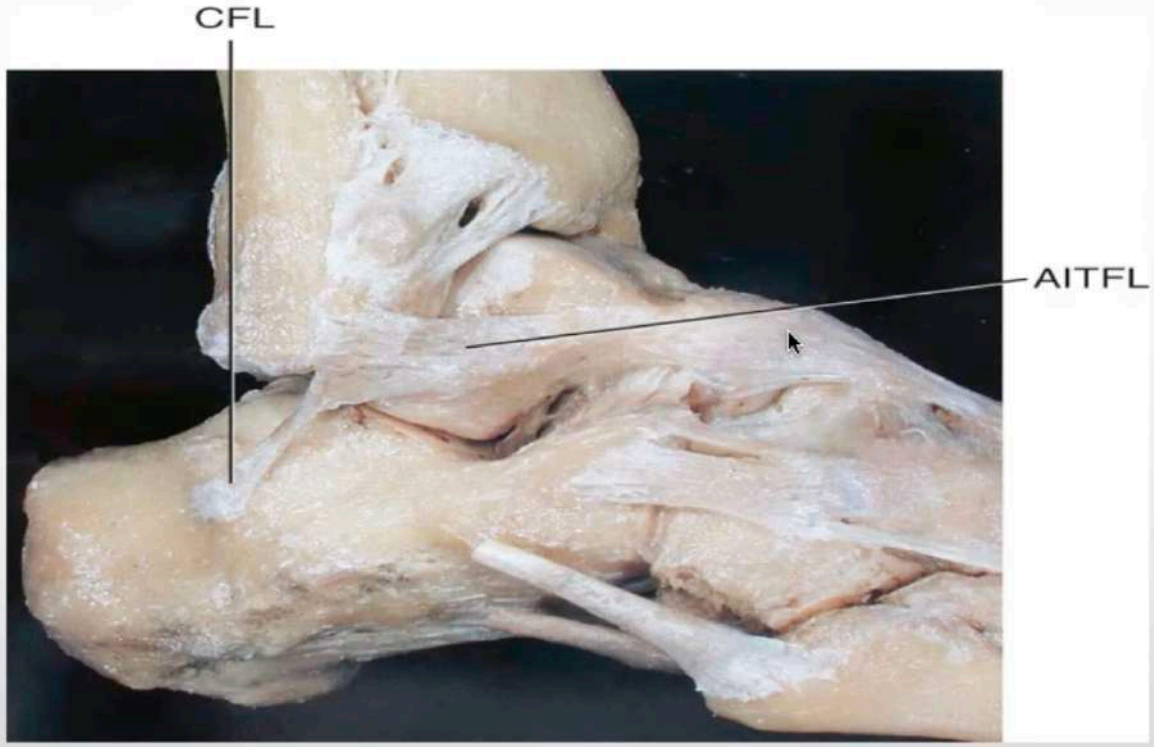
  CORONAL AND AXIAL – COUPLED ROTATIONS

ANTERIOR ANKLE

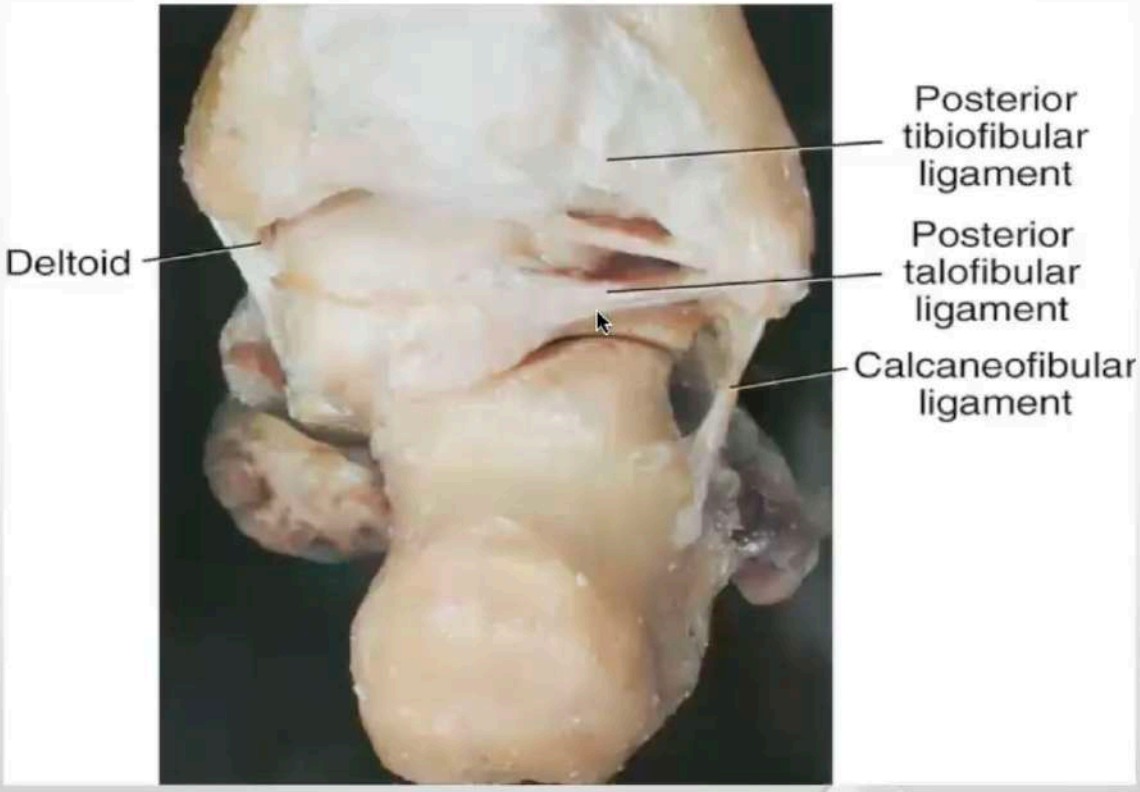
MEDIAL ANKLE



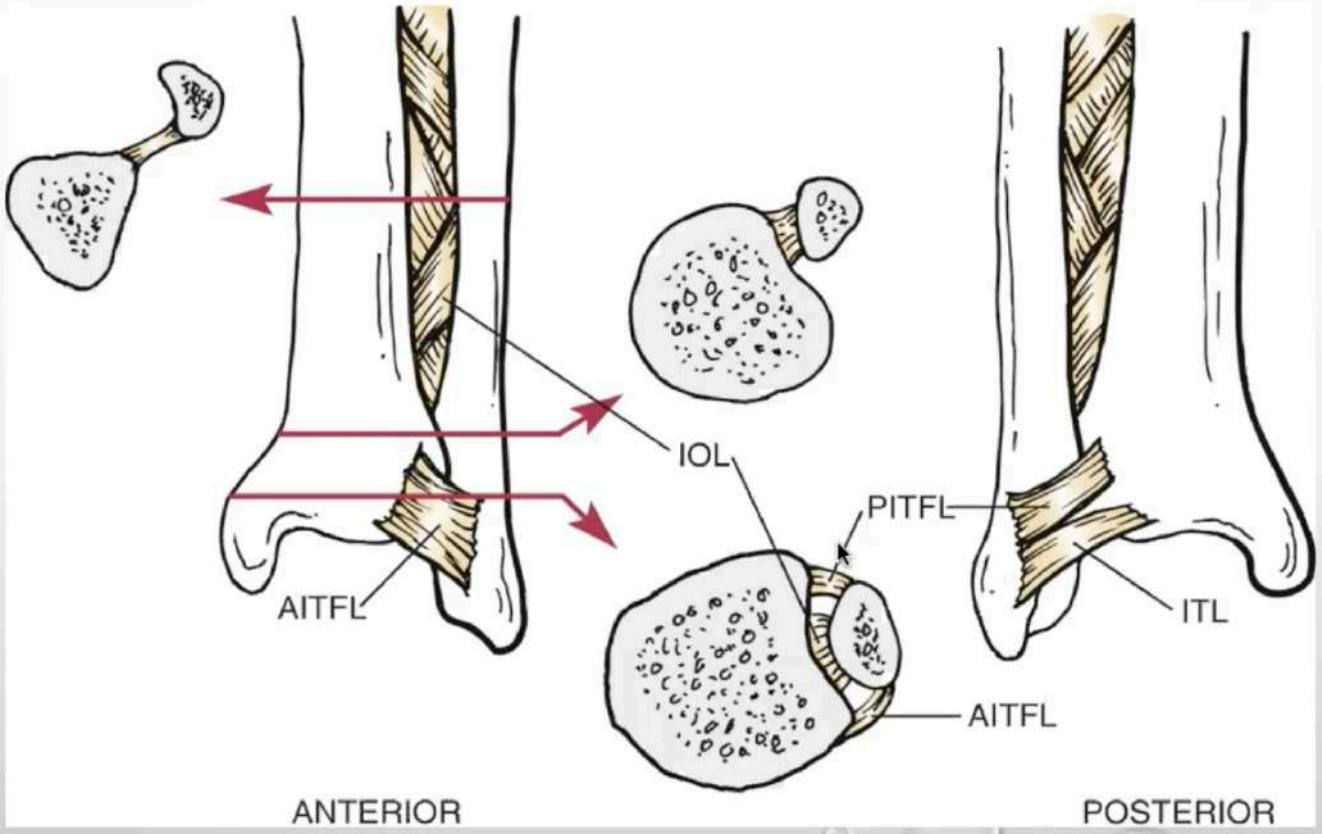
LATERAL ANKLE



POSTERIOR ANKLE

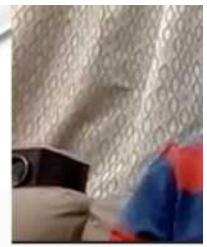


SYNDESMOSIS



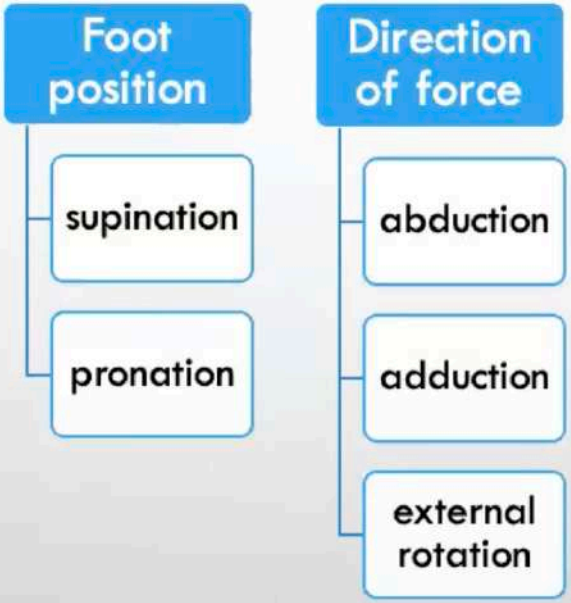
CLASSIFICATION

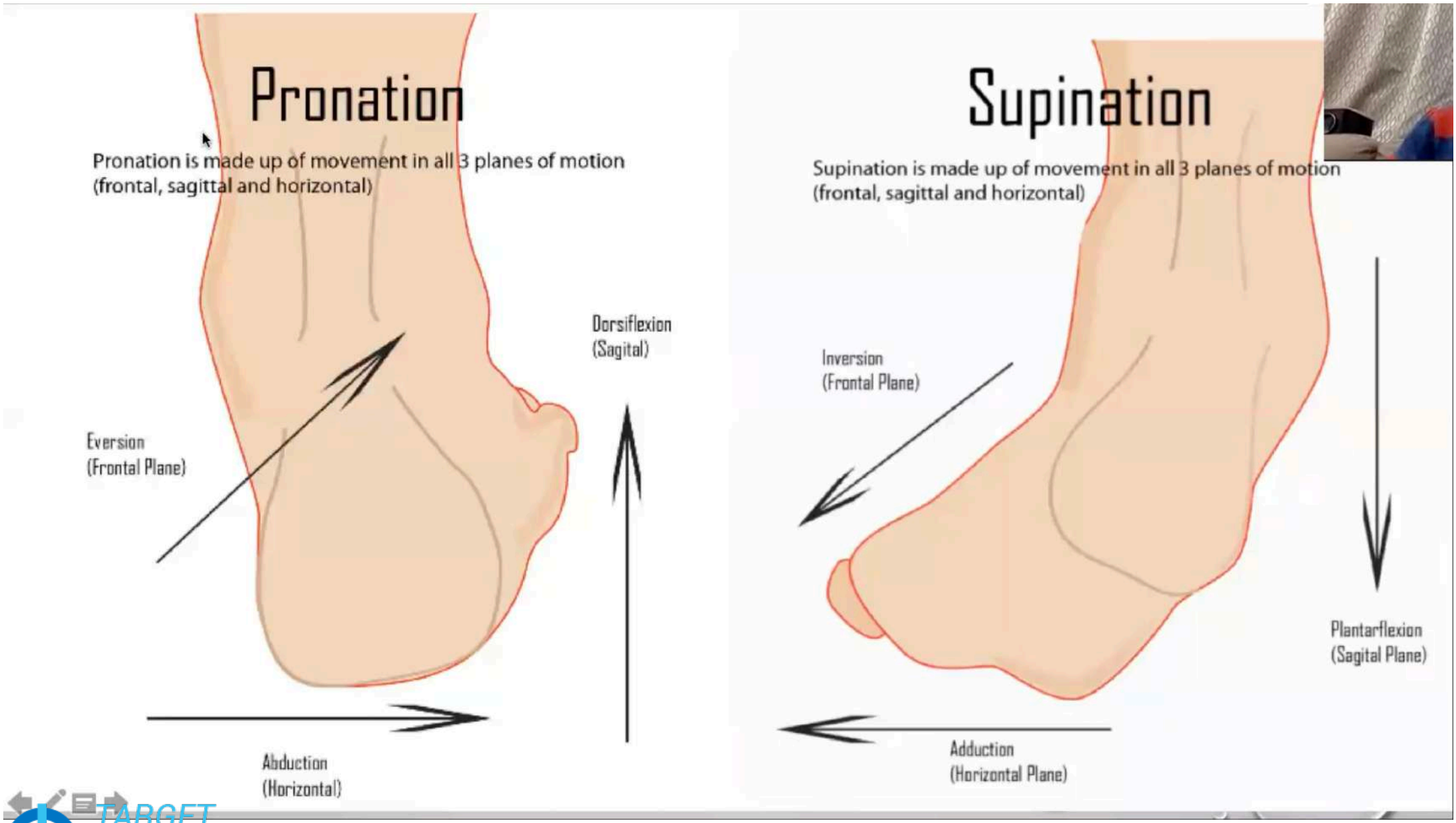
- FRACTURE PATTERN EXPLANATION, TREATMENT OPTIONS, PROGNOSTIC EXPECTATION.
- LAUGE-HANSEN
- DANIS –WEBER
- AO MULLER CLASSIFICATION
- COMBINATION

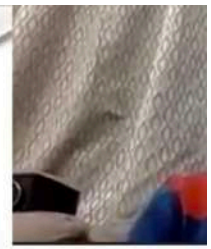


LAUGE-HANSEN CLASSIFICATION

- BASED ON SUSPECTED INJURY MECHANISM





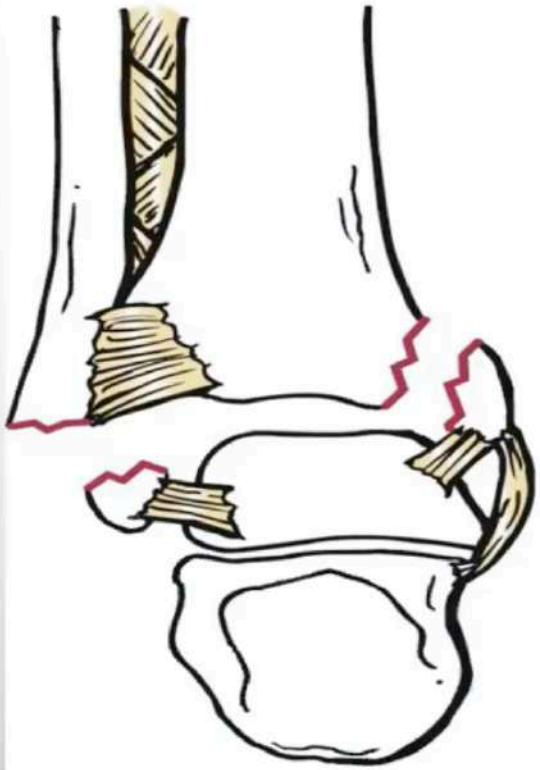


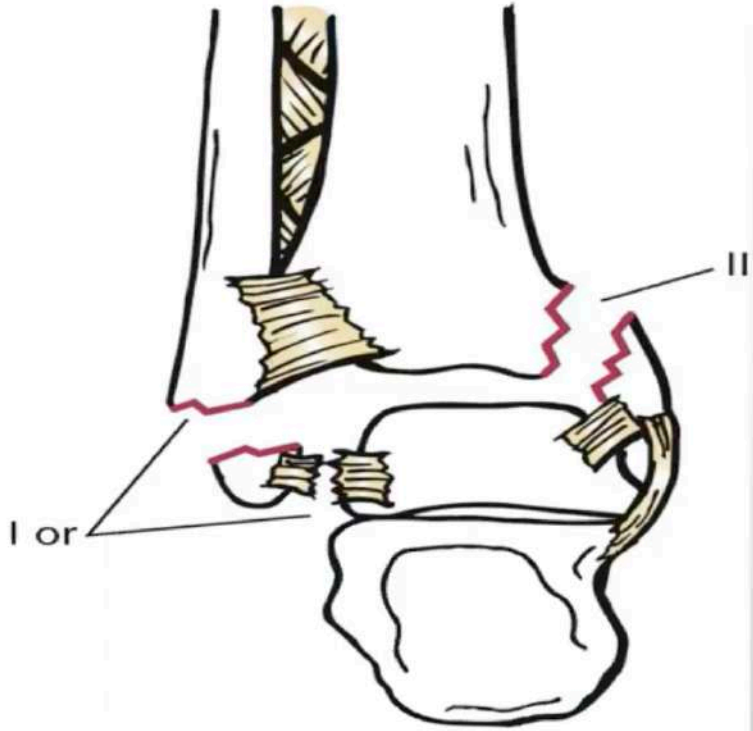
DANIS-WEBER CLASSIFICATION

- BASED ON LEVEL OF FIBULA FRACTURE
- MORE RELEVANT TO DECISION MAKING

AO MULLER – TYPE A (INFRASYNDESMOTIC)

DANIS-WEBER

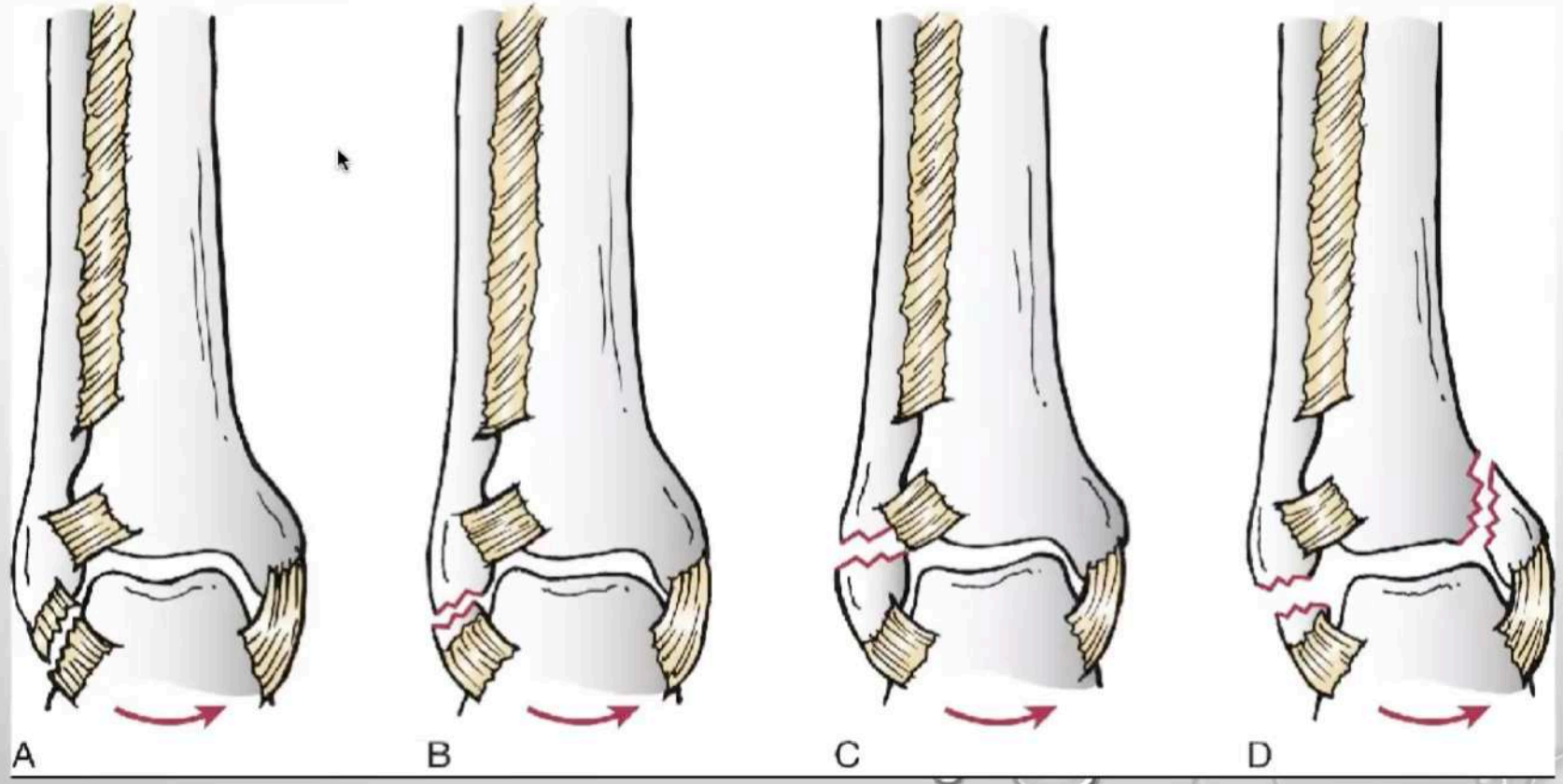




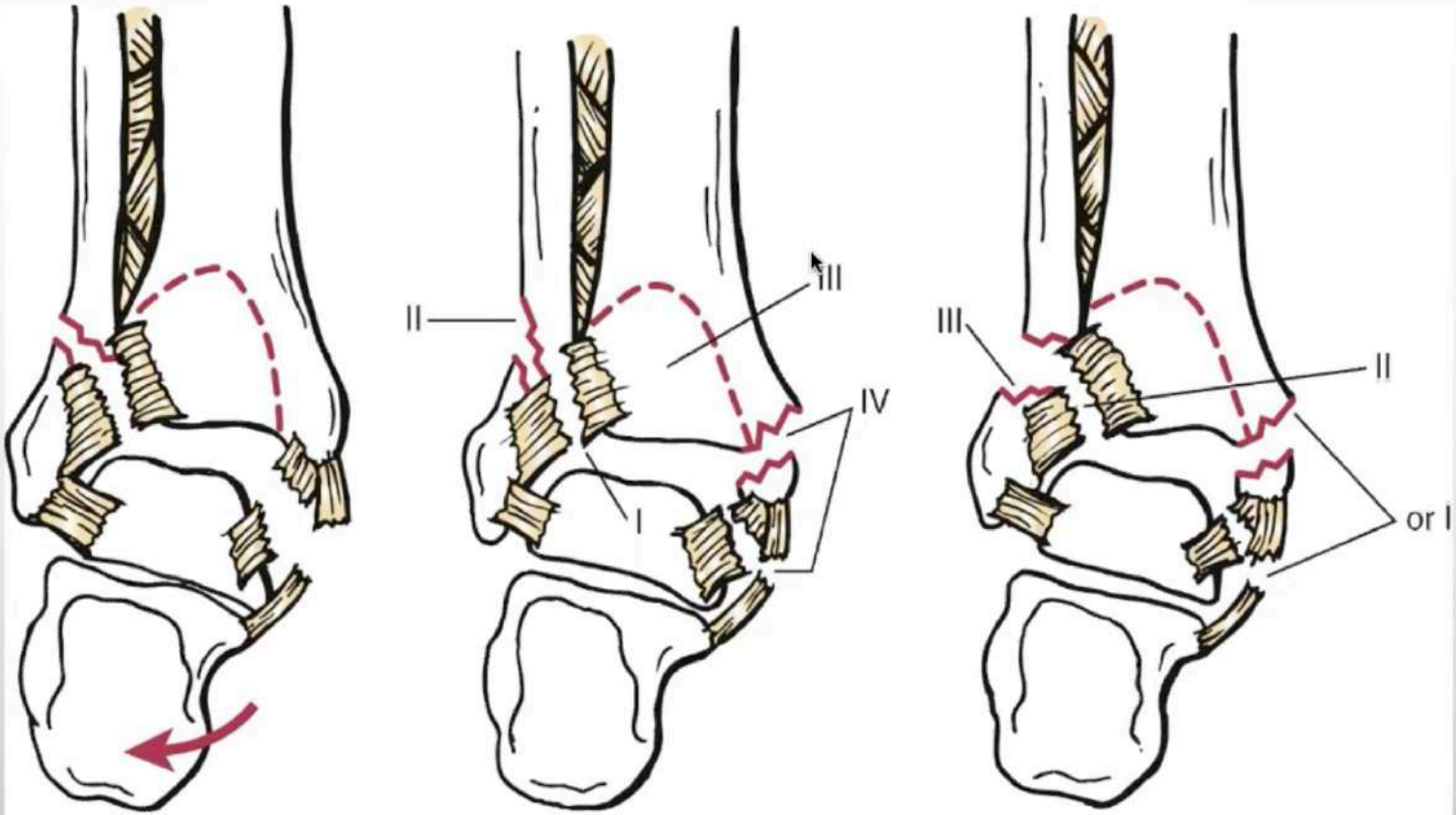
LAUGE-HANSEN

Supination–adduction
stages I and II

SEQUENCE OF MORPHOLOGIC EVENTS



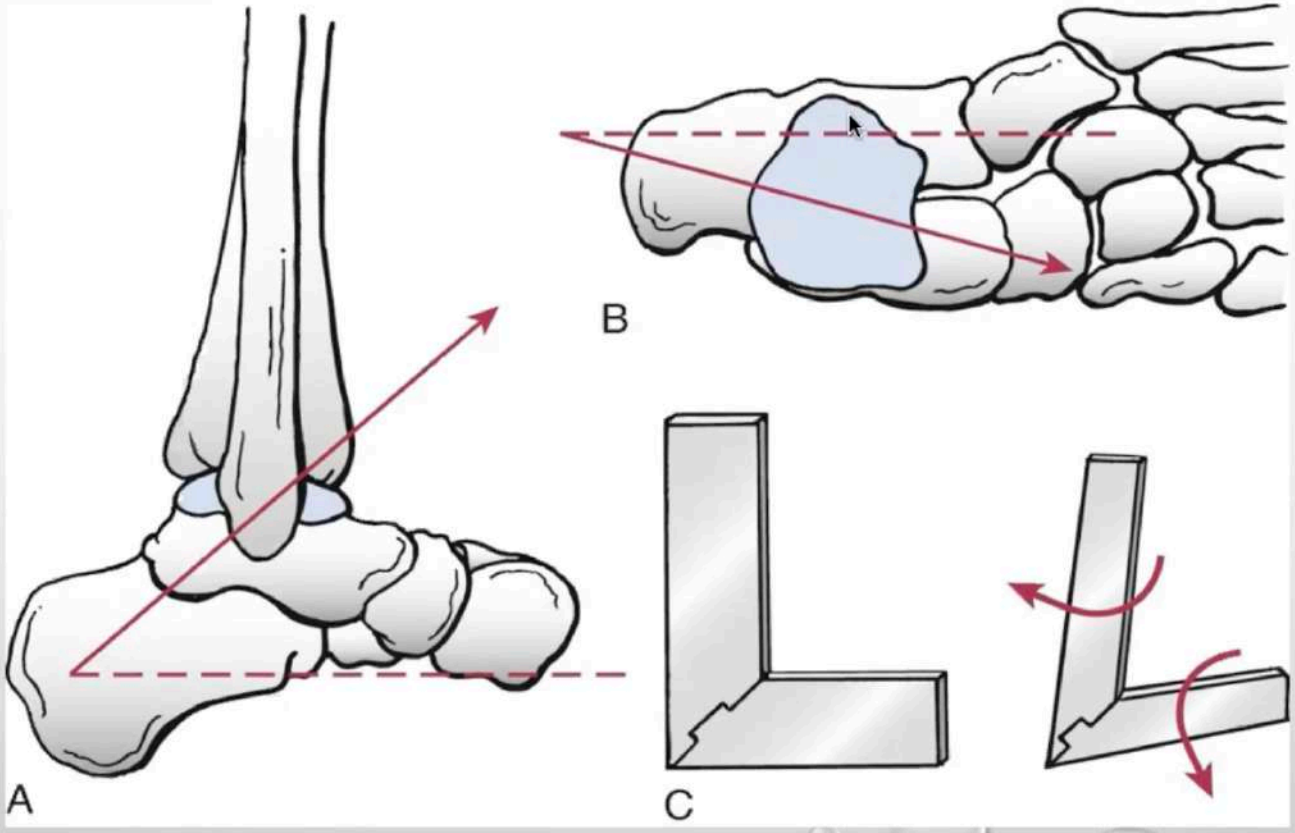
TYPE B- TRANS-SYNDESMOTIC



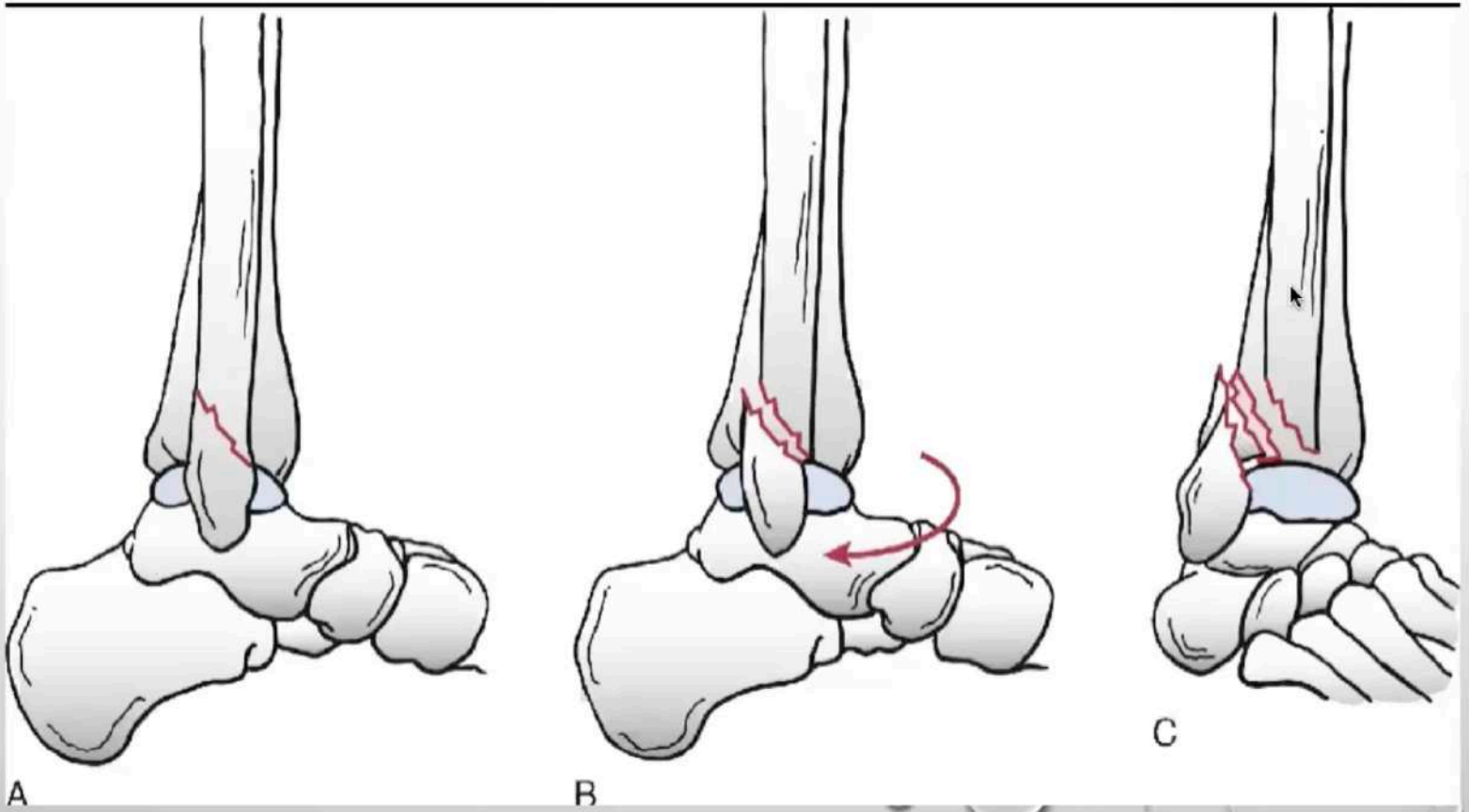
Supination–external rotation stages I - IV

Pronation–abduction stages I - III

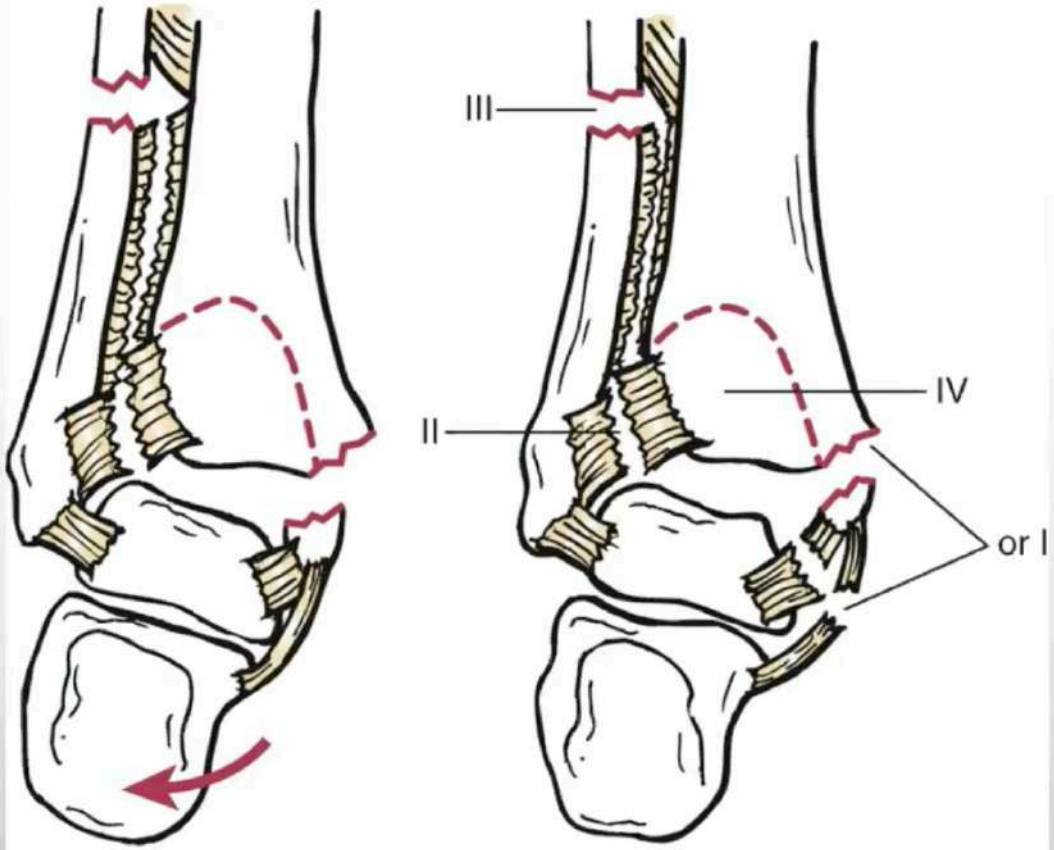
MOVEMENT AROUND SUBTALAR JOINT



MORPHOLOGIC EVENTS OF TYPE B

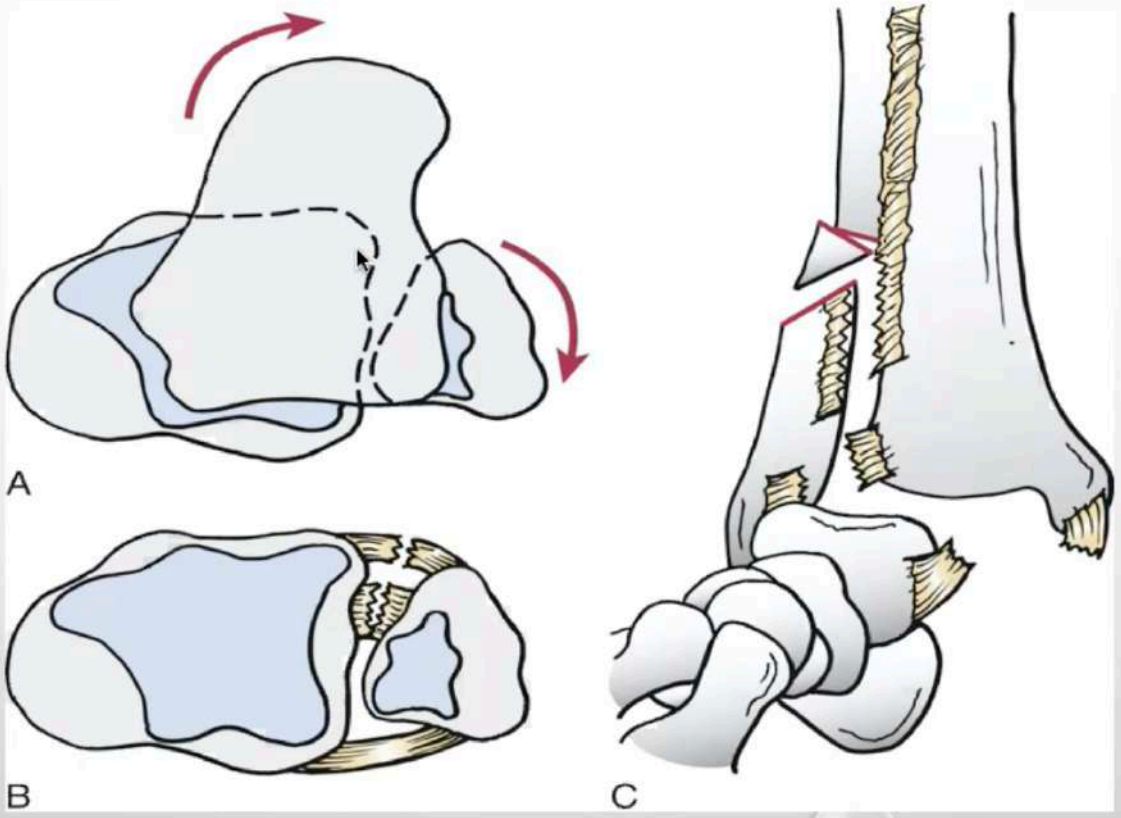


TYPE C- SUPRA-SYNDESMOTIC



Pronation–external rotation stages I - IV

MORPHOLOGIC SEQUENCE TYPE C



RADIOLOGY

- MECHANISM OF INJURY
- SEVERITY OF INJURY
- BEST APPROACH
- ADEQUACY OF TREATMENT- SURGICAL/ CONSERVATIVE

OTTAWA ANKLE RULES

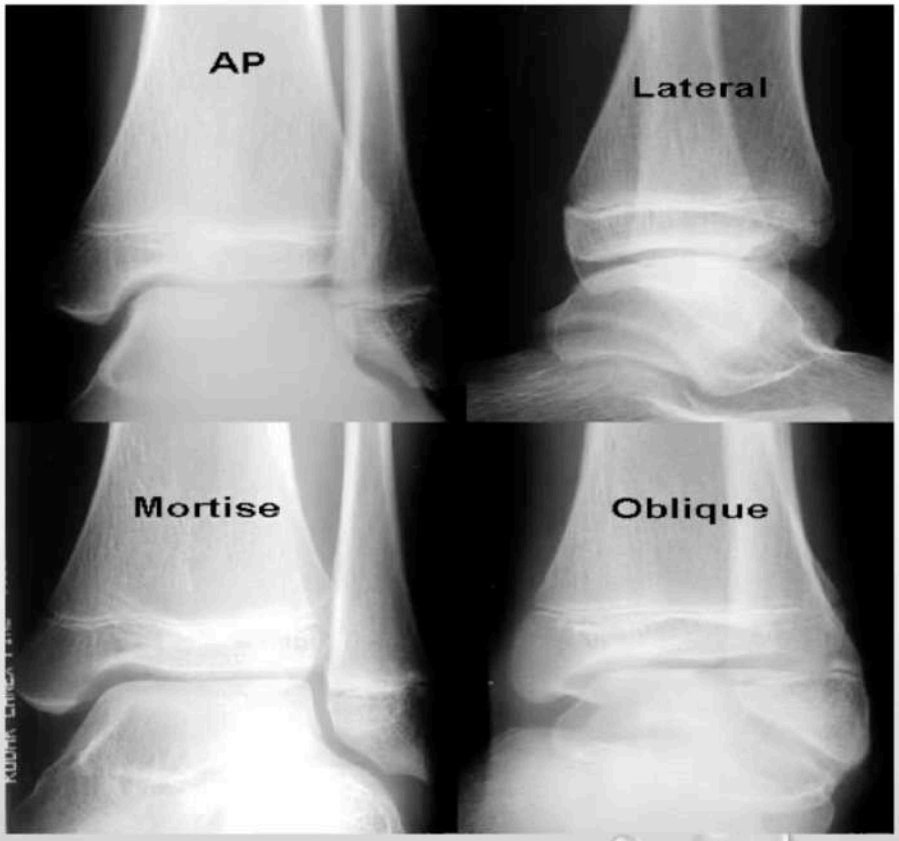
- TELLS WHEN TO PERFORM ANKLE RADIOGRAPH SERIES
- AS PER THE RULE ANKLE SERIES IS NEEDED ONLY IF PATIENT HAS PAIN IN MALLEOLAR REGION

PLUS ANY OF THE FOLLOWING:

1. BONE TENDERNESS AT THE POSTERIOR EDGE OR TIP OF THE LATERAL MALLEOLUS
2. INABILITY TO BEAR WEIGHT BOTH IMMEDIATELY AND IN ER

- WHEN IN DOUBT OBTAIN XRAYS

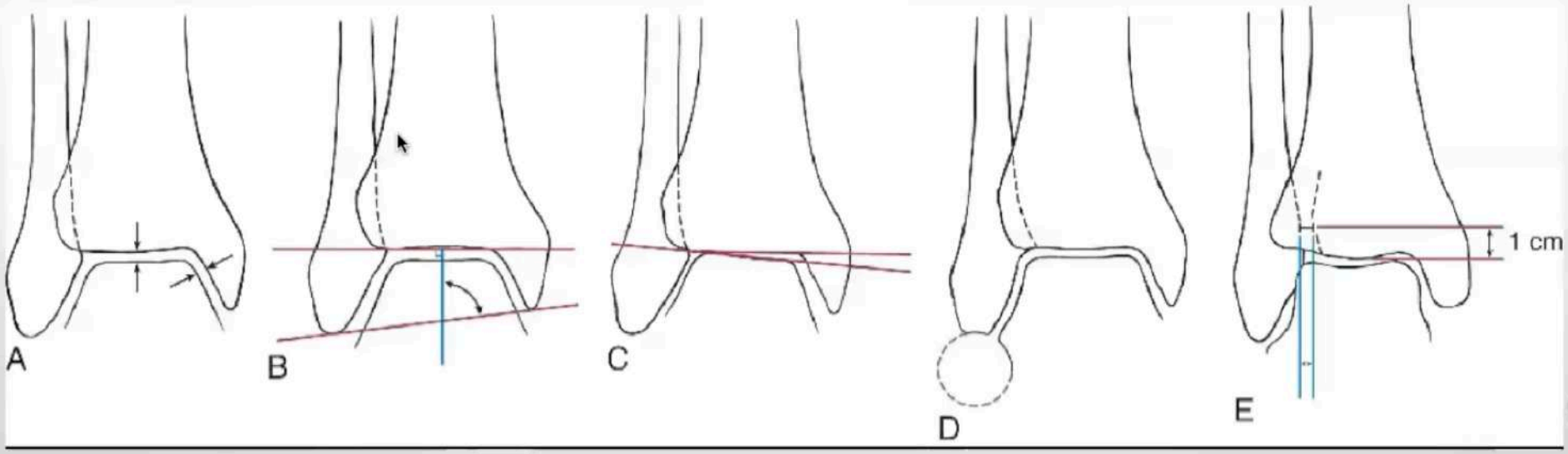
XRAY VIEWS



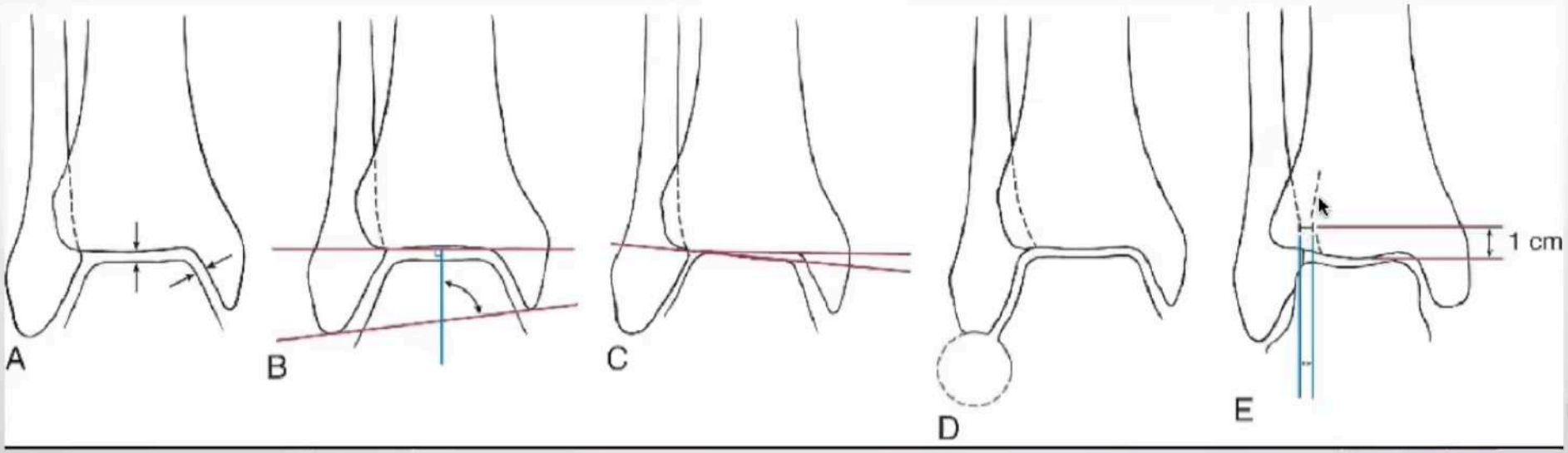
ADDITIONAL VIEWS

- FULL LENGTH VIEW OF TIBIA AND FIBULA – MAISONNEUVE # (PER)
- CT SCAN- COMMINUTED #

IMPORTANT RADIOLOGICAL INDICES

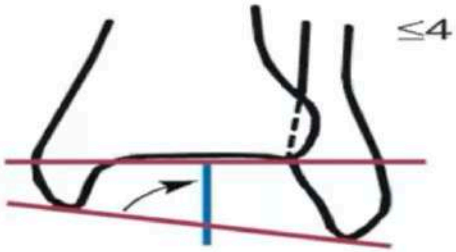


IMPORTANT RADIOLOGICAL INDICES

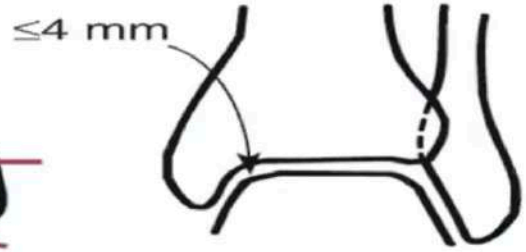


SYNDESMOTIC IMAGING CRITERIA

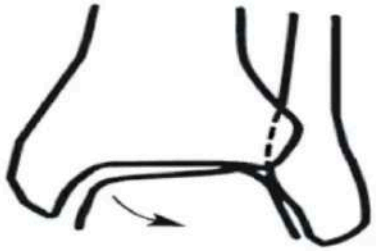
Mortise View



Talocrural angle
(83° ± 4°)

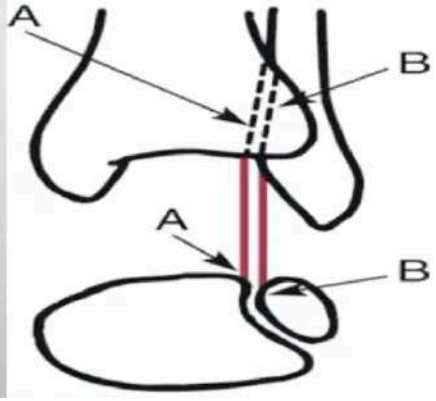


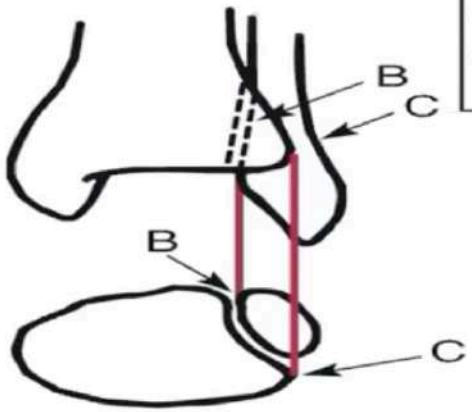
"Medial clear space
(≤4 mm)



Talar tilt
(≤2 mm)

Anterior Posterior View

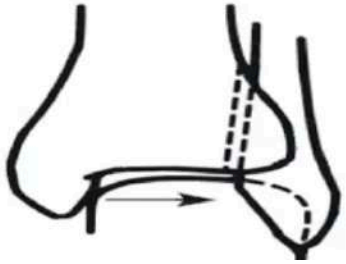


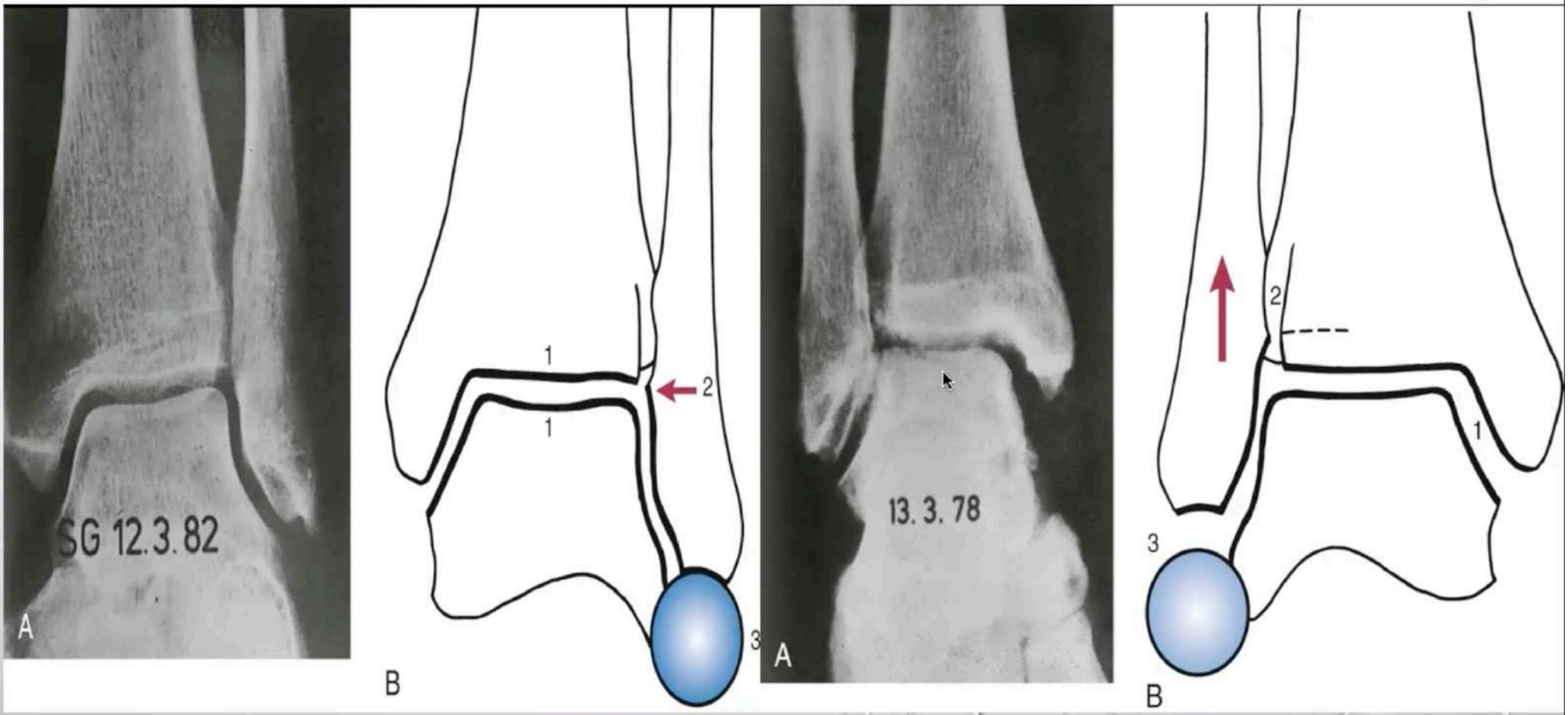


A = Lateral border of posterior tibial malleolus

B = Medial border of fibula

C = Lateral border of anterior tibial tubercle





TRIVIA : IDENTIFY INJURY PATTERN

a. TYPE A
b. TYPE B
c. TYPE C
d. NORMAL X-RAY

TRIVIA : CLASSIFY INJURY

a. SAD TYPE 1
b. SAD TYPE 2
c. SER TYPE 3
d. PER TYPE 2

TRIVIA: CLASSIFY INJURY

a. SAD TYPE 2
b. PAB TYPE 2
c. PER TYPE 3
d. SER TYPE 4

TRIVIA: CLASSIFY INJURY

a. SER TYPE 4
b. SER TYPE 2
c. PER TYPE 4
d. SAD TYPE 2

TRIVIA : CLASSIFY INJURY

a. **PER TYPE 3**
b. **SER TYPE 3**
c. **PAB TYPE 3**
d. **SAD TYPE 1**

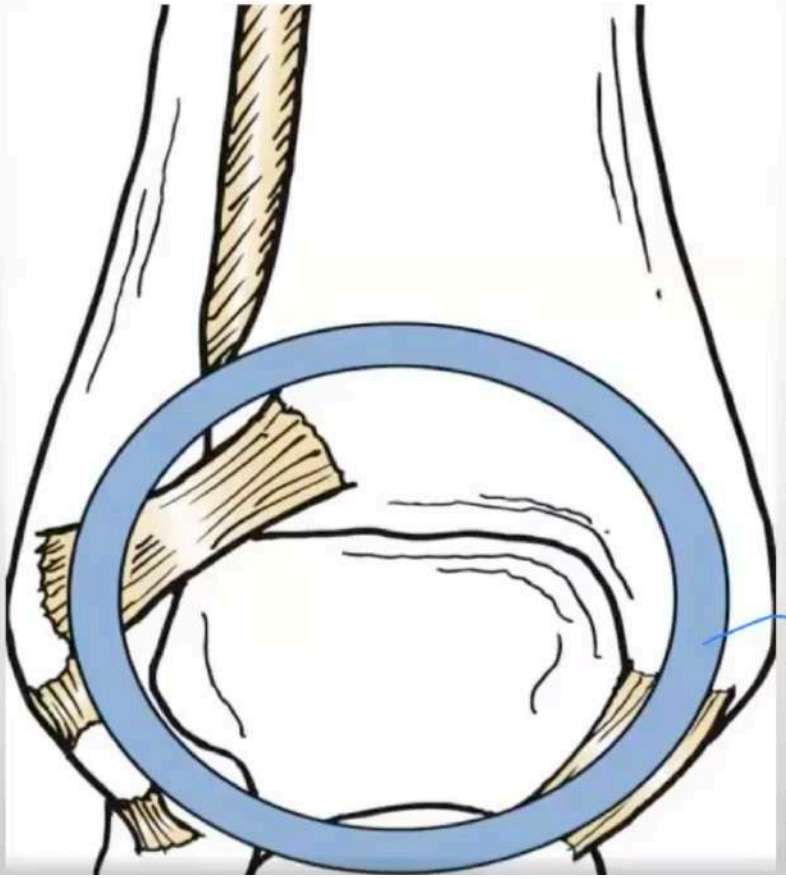
TREATMENT CONCEPTS

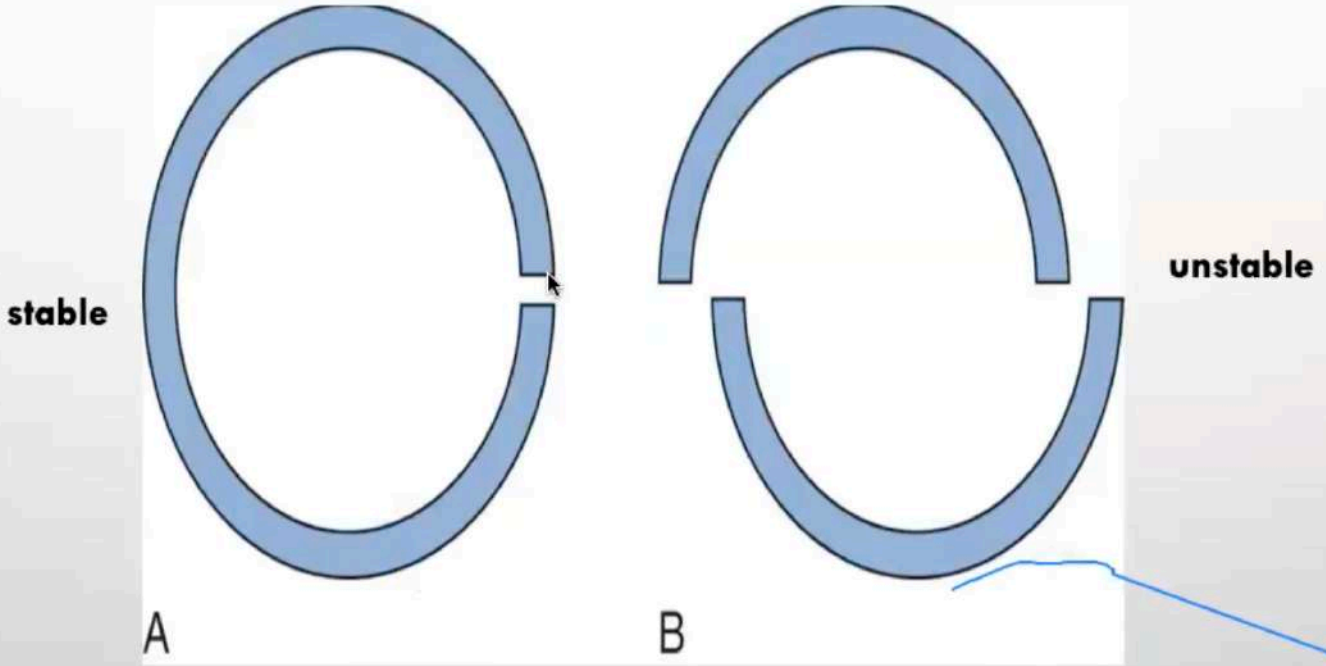
- ANATOMICAL REDUCTION
- EARLY MOBILIZATION
- SOFT TISSUE CONSIDERATION- SWELLING, HEMATOMA, SKIN NECROSIS, OPEN INJURY
- EARLY REDUCTION OF DISLOCATION
- PROLONGED IMMOBILIZATION: MUSCLE ATROPHY, MYOSTATIC CONTRACTURE , DECREASED JOINT MOTION , CAPSULAR AND SYNOVIAL ADHESIONS, CARTILAGE DEGENERATION, BONE ATROPHY.

OPERATIVE VS NON-OPERATIVE

- AIM TO GET BEST ANATOMICAL RECONSTRUCTION.
- OBTAIN BEST STRUCTURAL STABILITY.
- RADIOGRAPHIC AND CT ASSESSMENT.
- EARLIEST MOBILIZATION

RING CONCEPT

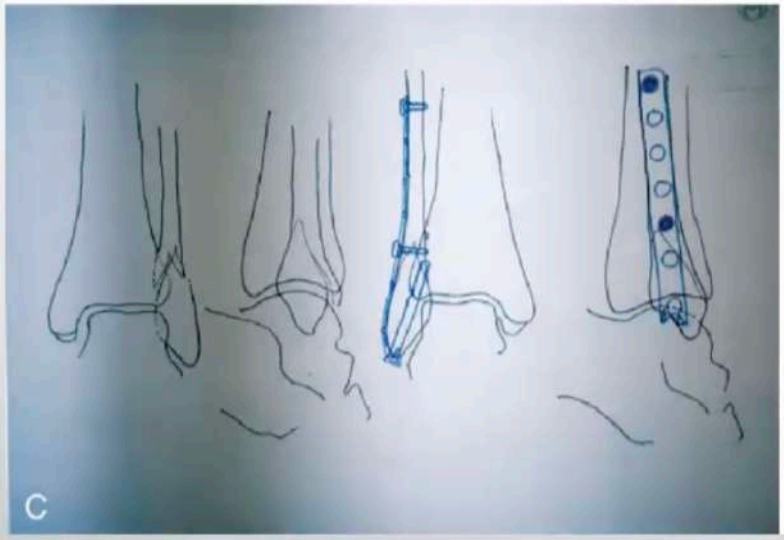


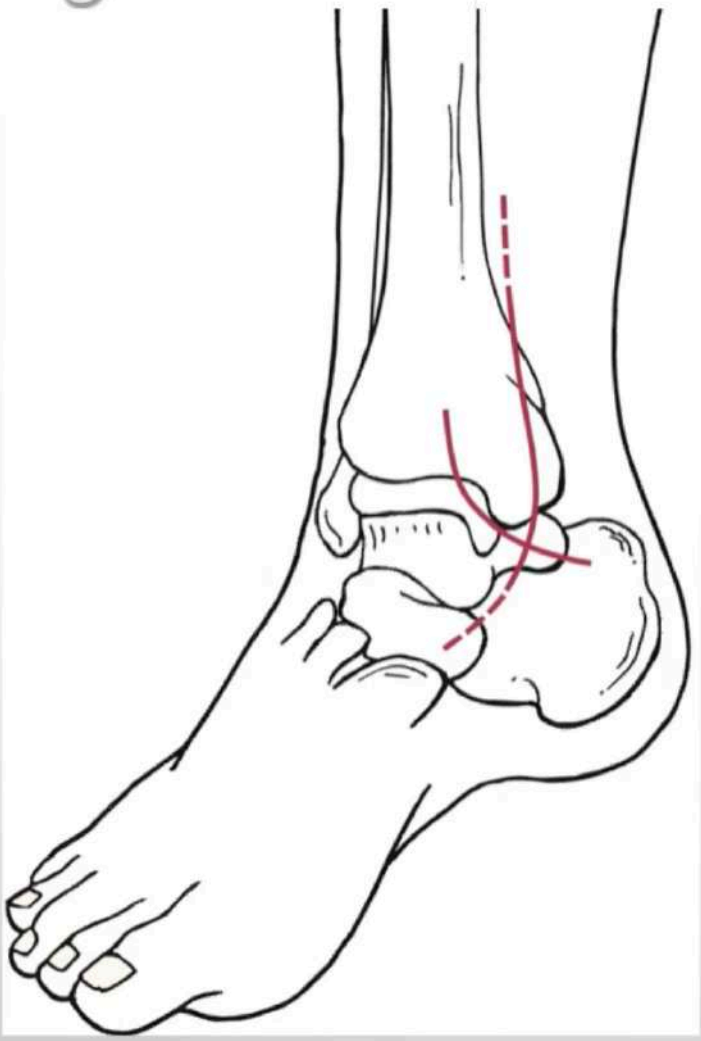


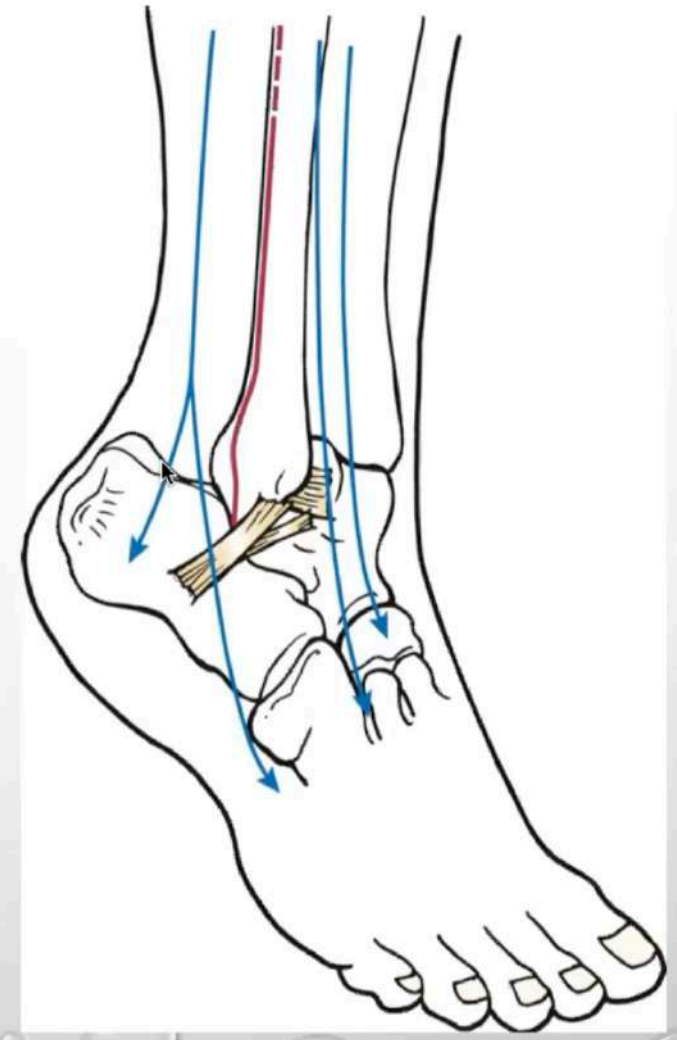
TIMING OF SURGERY

- DISLOCATIONS NEED URGENT REDUCTION
- GOOD RESULTS DEPEND ON RECOGNITION AND MANAGEMENT OF ASSOCIATED SOFT TISSUE INJURY.
- CLEAN AND DRESS THE ABRASIONS TO PREVENT BACTERIAL COLONIZATION
- DEEP DIRTY WOUNDS AFTER 12-24 HOURS- CONTRAINDICATION FOR SURGERY
- IDEAL TIME- BEFORE TISSUE SWELLING EDEMA DEVELOPS.
- IF BLISTERS ARE PRESENT IN LINE OF SURGICAL INCISION- DELAY SURGERY, SPLINT

- DO ADEQUATE PREOP PLANNING BY RADIOGRAPHS
- CT IF NEEDED
- TEMPLATING FOR DIFFICULT FRACTURES
- PATIENT POSITIONING.
- PLAN OF INCISIONS





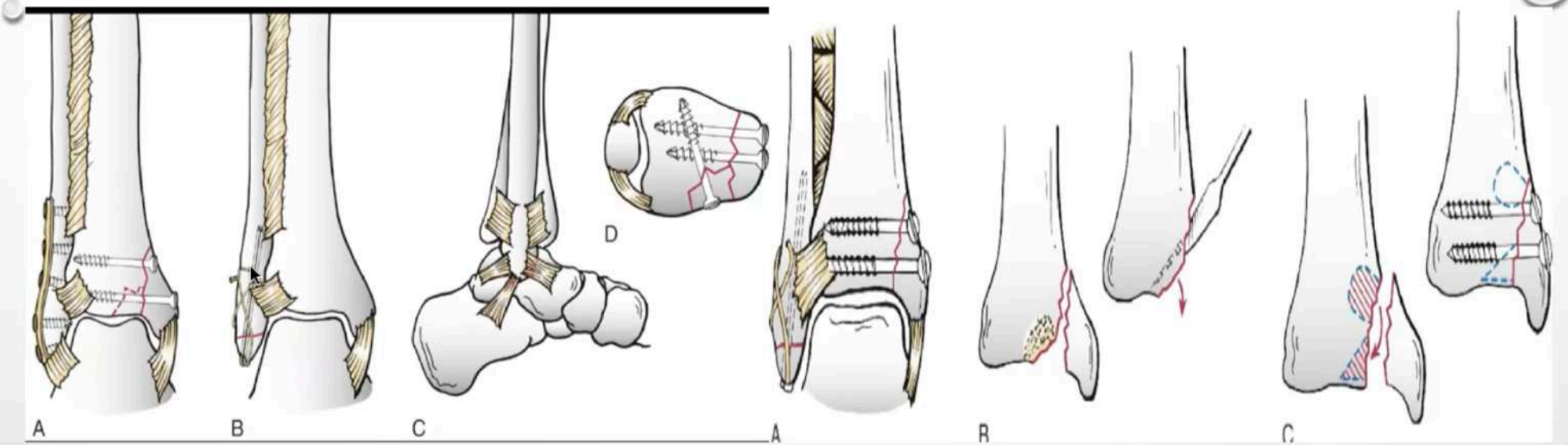


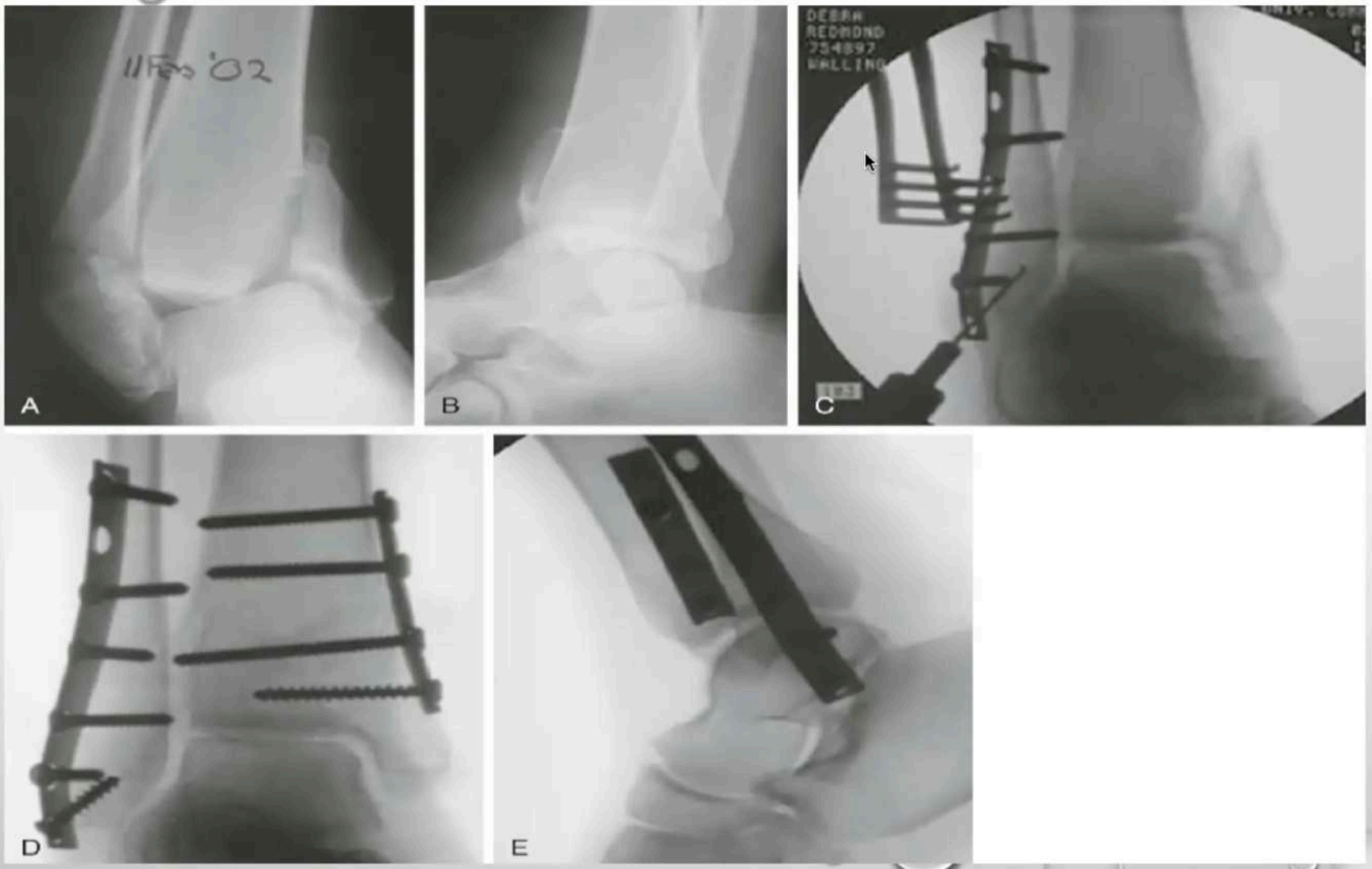
SEQUENCE OF FIXATION

- FIRST STEP IS REDUCTION OF FIBULA – PROVISIONAL / DEFINITIVE
- MEDIAL EXPOSURE IN CASE OF DIFFICULTY- DELTOID LIGAMENT, OSTEOCHONDRAL FRAGMENT
- DEFINITIVE FIXATION

TYPE A (INFRASYNDESMOTIC) FRACTURES

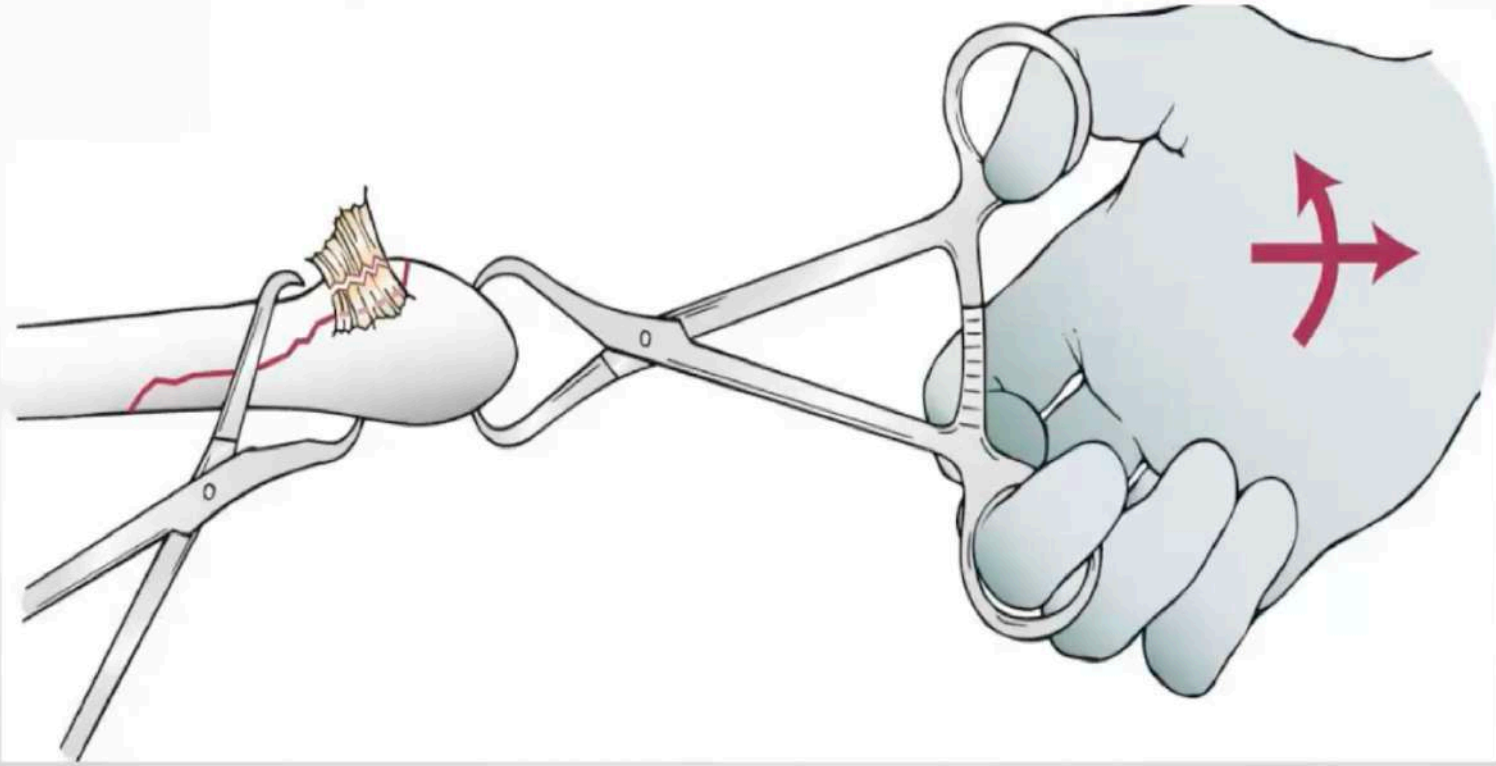
- **ISOLATED LATERAL MALLEOLUS WITH MINIMAL DISPLACEMENT**- STABLE FRACTURE AND TREATED BY **CAST AND NON WEIGHT BEARING CAST.**
- **UNSTABLE FRACTURES- ORIF WITH PLATE OR TBW WITH REPAIR OF LIGAMENTS**
- **MEDIAL MALLEOLUS-COMPRESSION SREW OR GLIDING PLATES**





TYPE B (TRANSSYNDESMOTIC) FRACTURES

- OBLIQUE FIBULAR FRACTURE- DISTAL ANTERIOR TO PROXIMAL POSTERIOR
- FIBULA IS PROXIMALLY SHIFTED, DISPLACED POSTERIORLY AND ROTATED EXTERNALLY
- **GENTLE TRACTION, INTERNAL ROTATION OF FOOT**- REDUCTION.



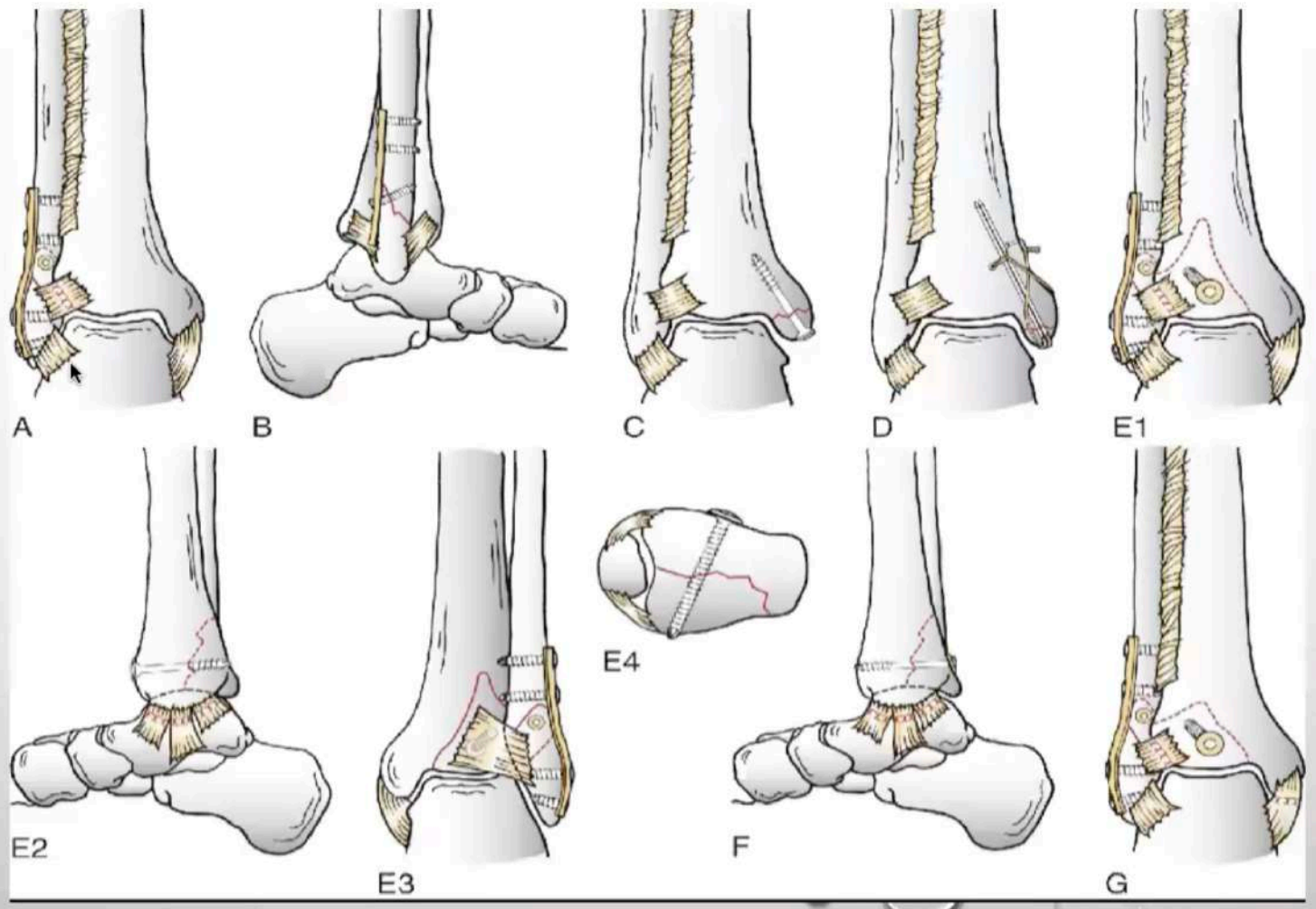
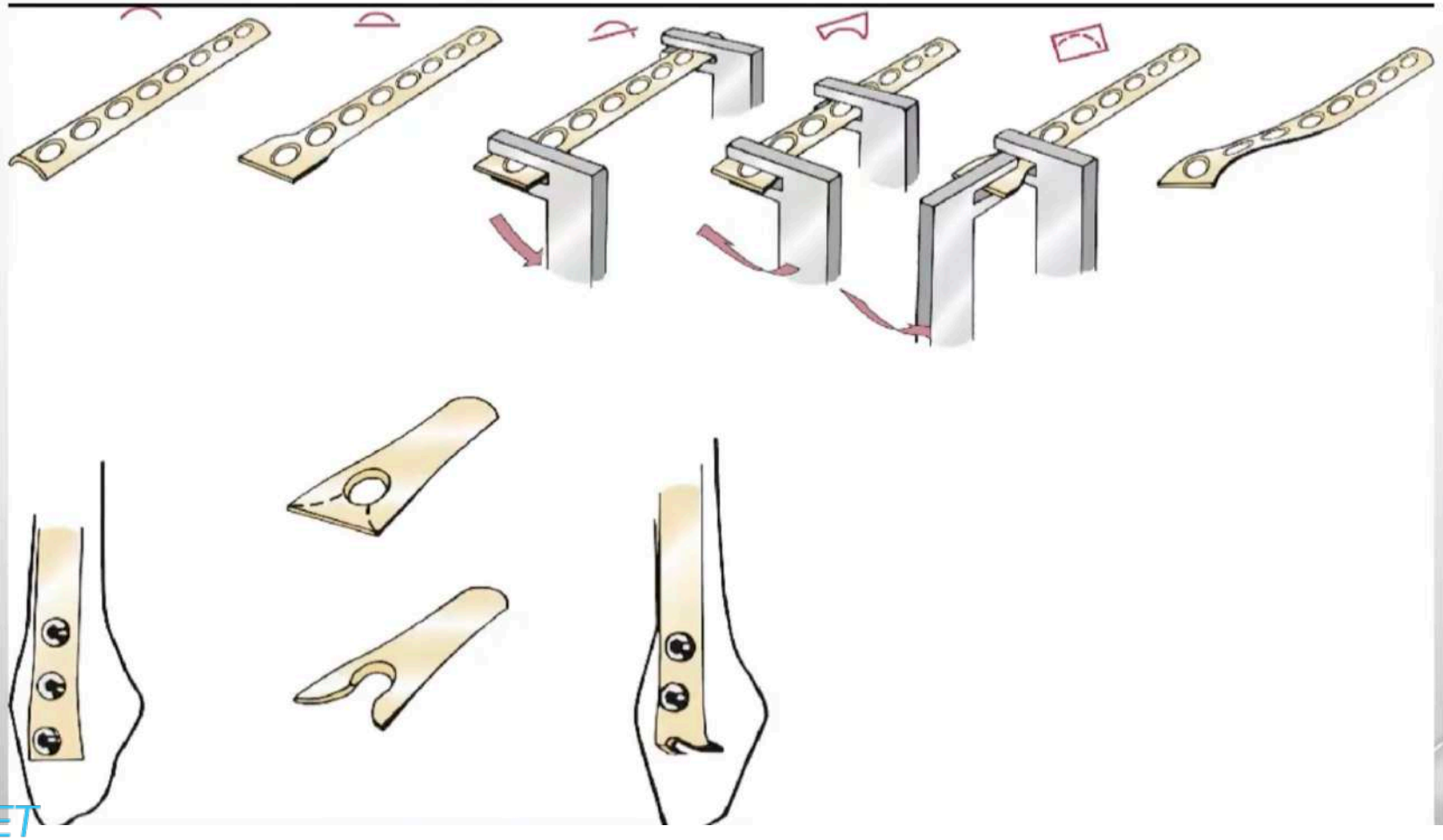
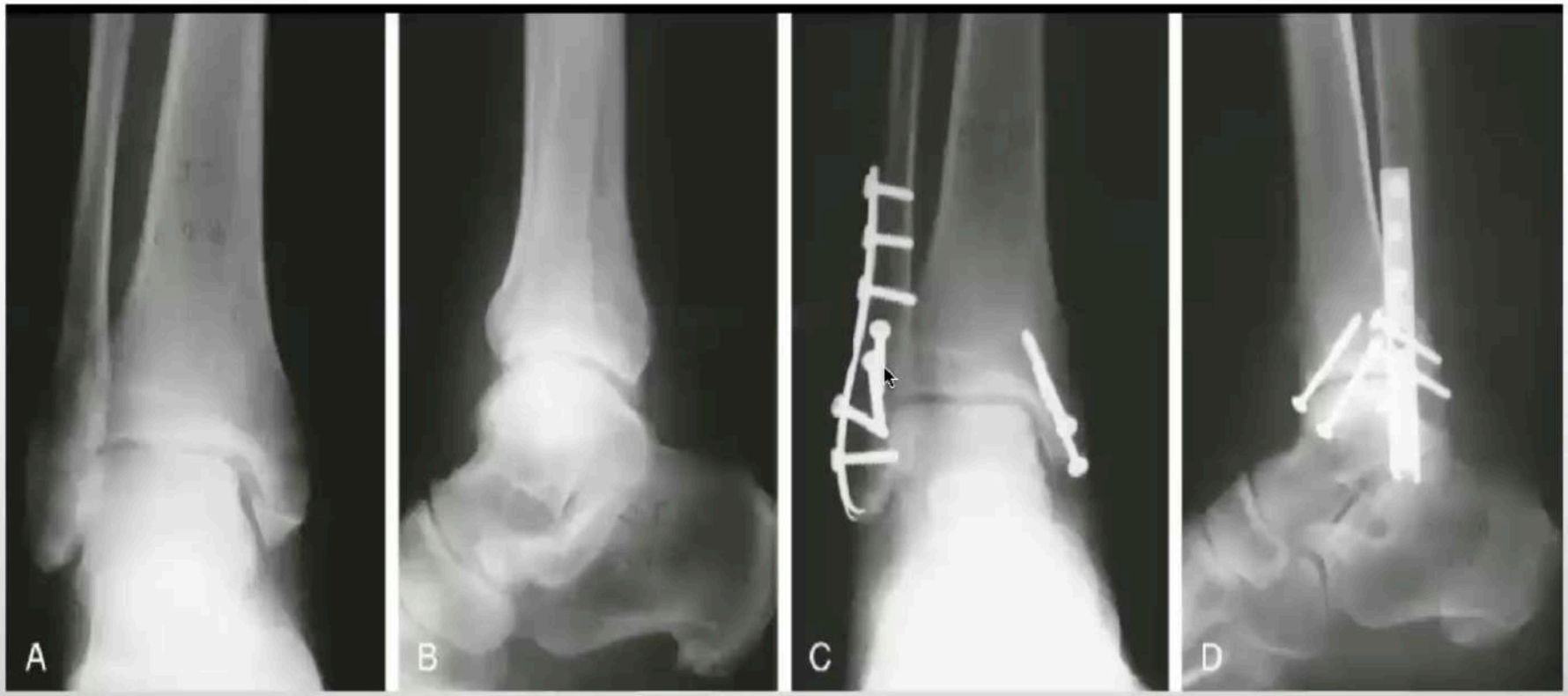


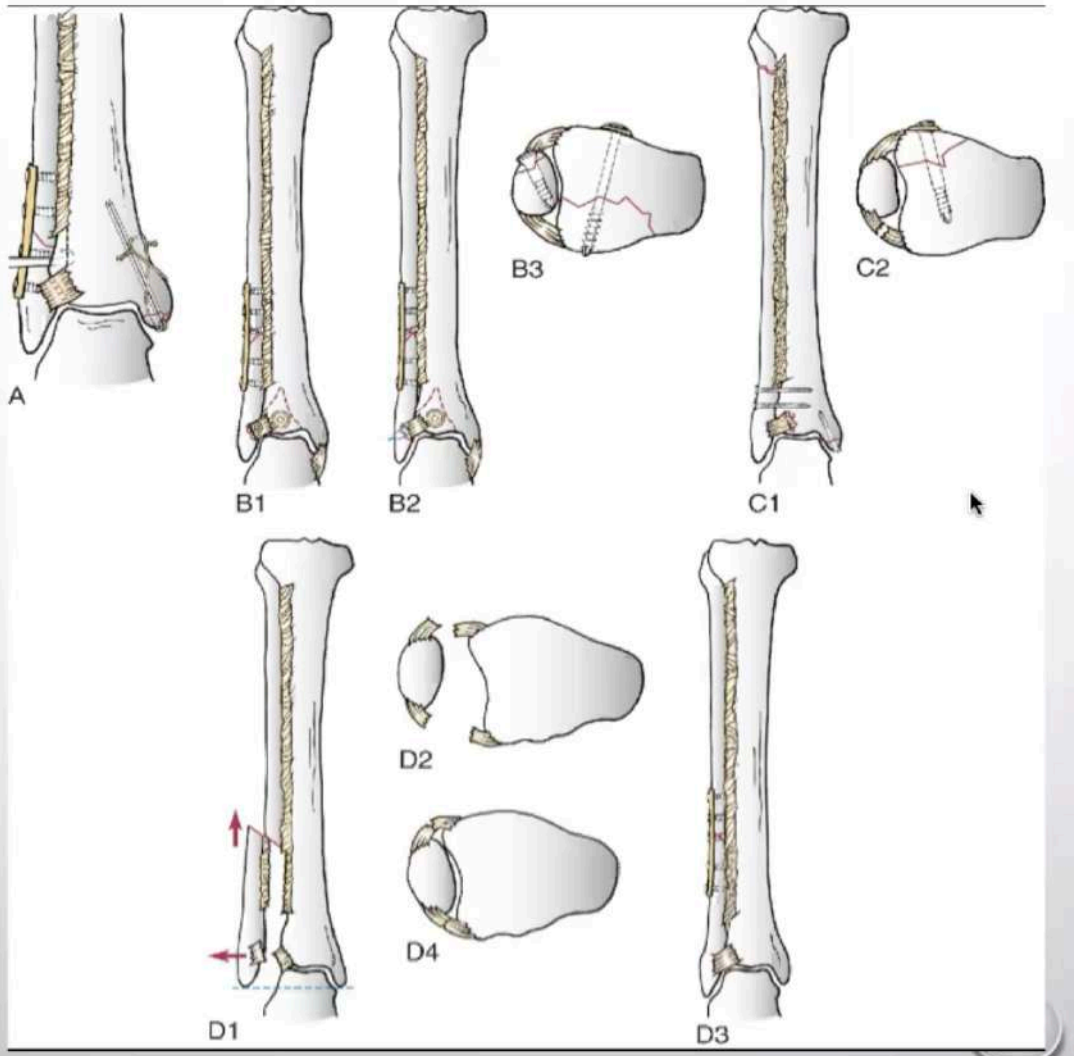
PLATE MOULDING

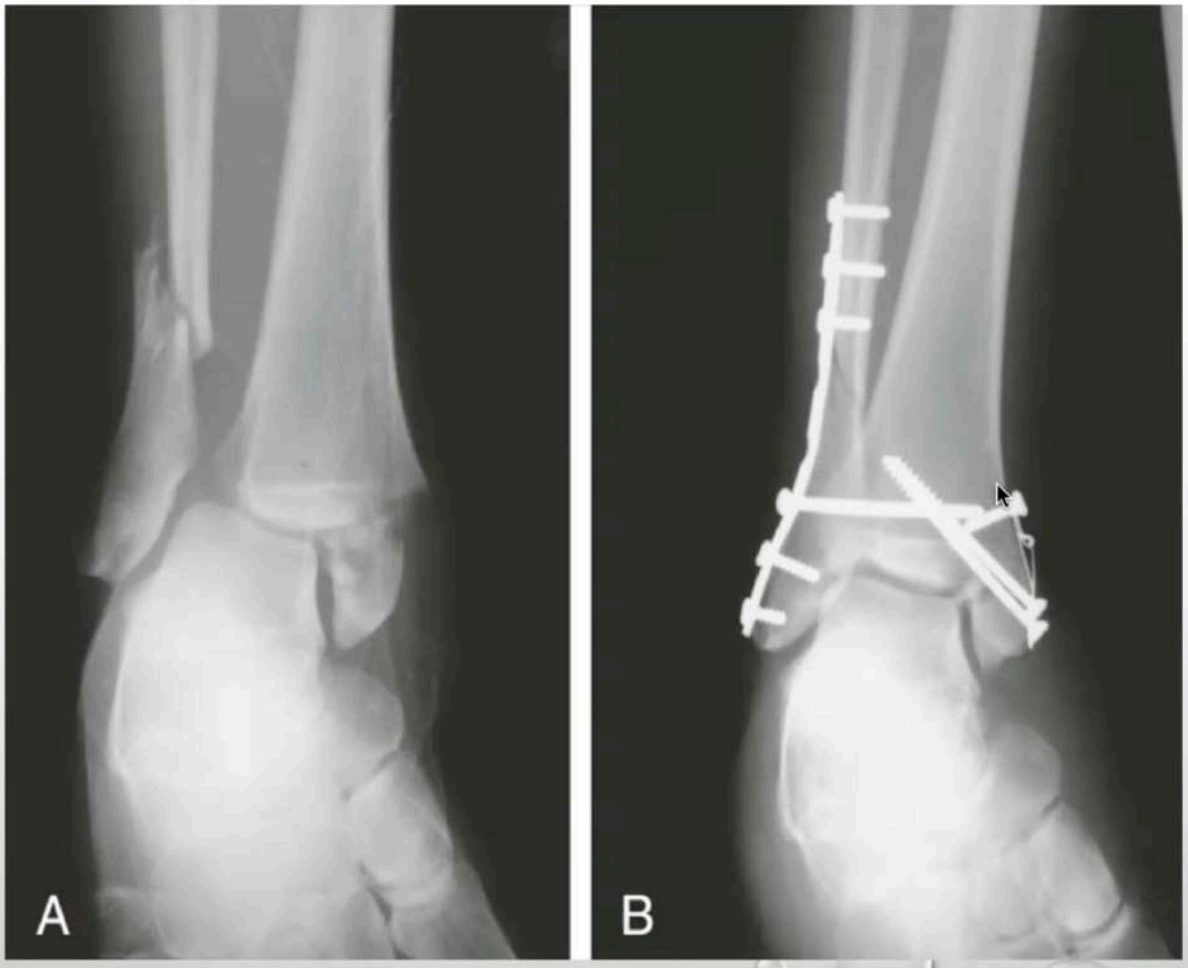




TYPE C (SUPRASYNDESMOTIC) FRACTURES

- FIRST STEP – APPROACH FIBULA
- ACHIEVE ROTATION AND RESTORES LENGTH

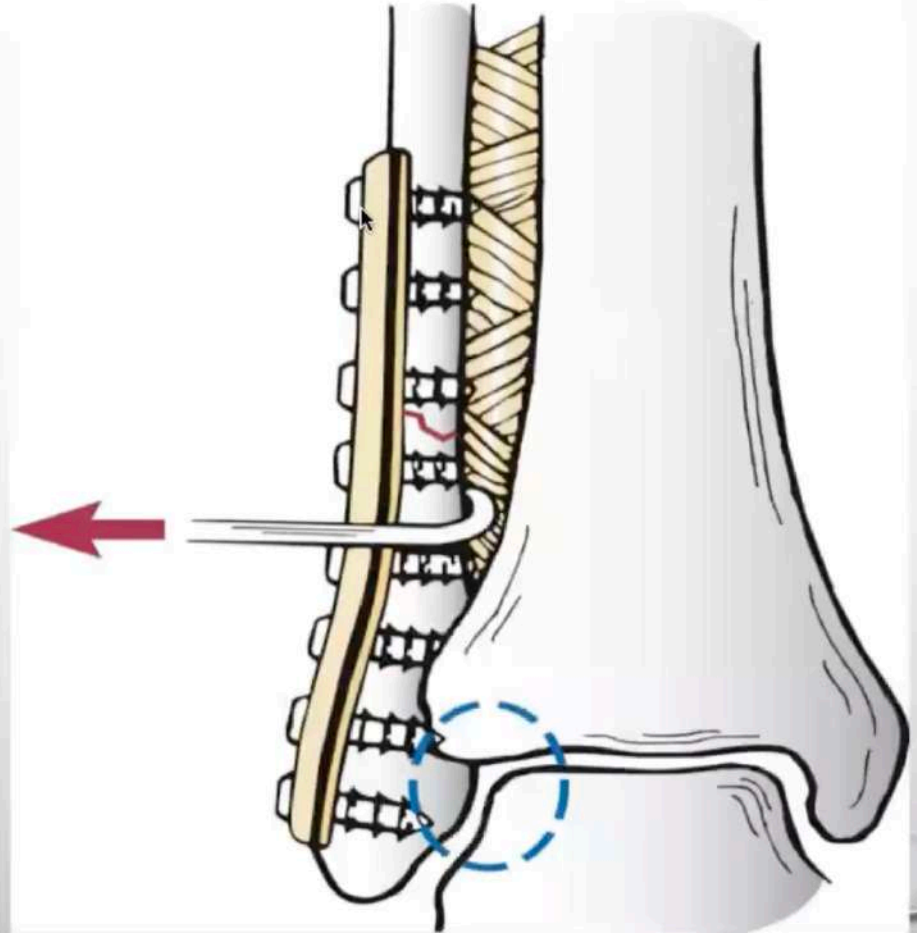




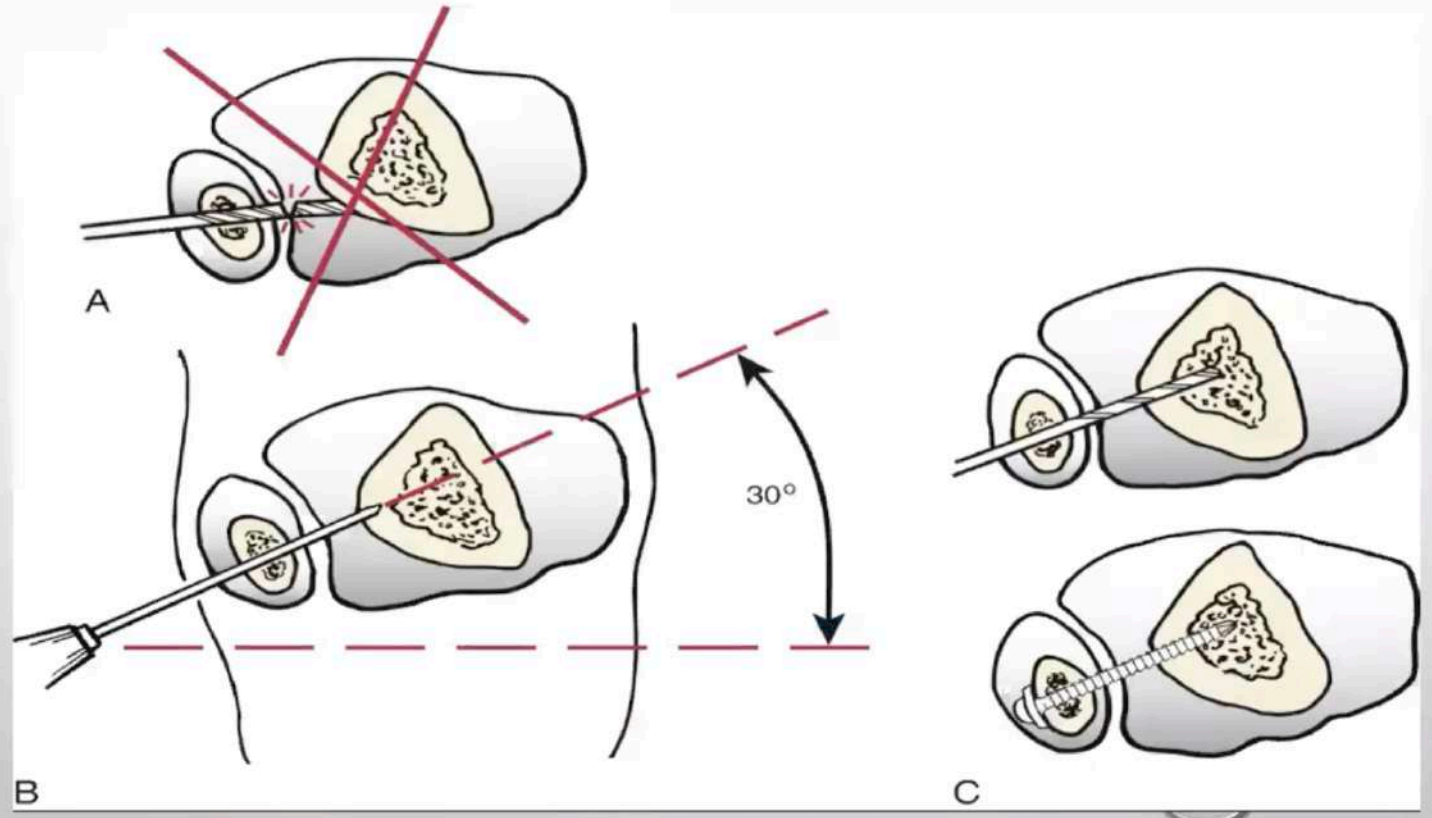
SYNDESMOTIC INJURIES

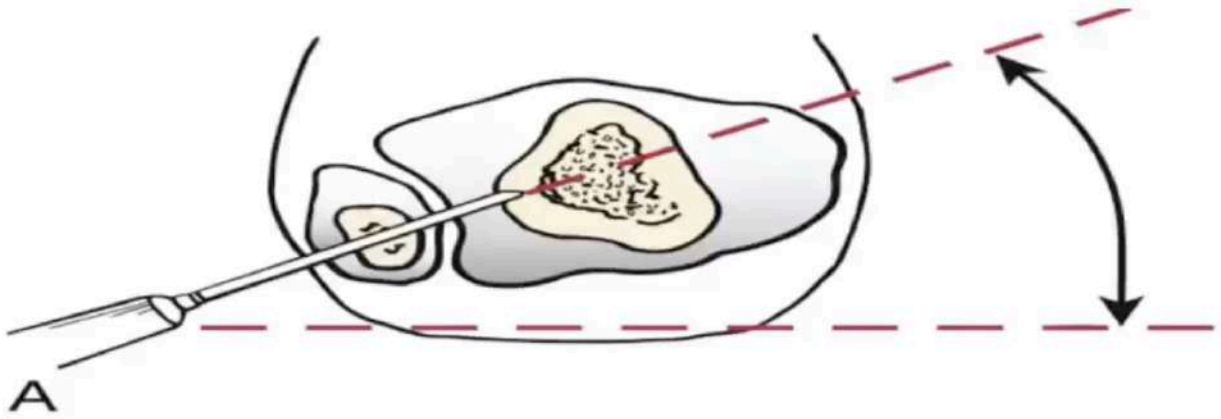
- OBVIOUS DIASTASIS WITH SUPRASYNDESMOTIC FRACTURE (TYPE C) NEEDS FIXATION.
- BIMALLEOLAR FRACTURE WITH IN 3.5 TO 4.5 CM OF ANKLE JOINT IF ANATOMICALLY FIXED DOES NOT NEED SYNDESMOTIC FIXATION.
- ONCE THE FIBULAR LENGTH IS RESTORED, FIBULA FIXED, MEDIAL SIDE RECONSTRUCTED- ASSESS STABILITY INTRA OP (**COTTON'S TEST) – WIDENING OF MEDIAL JOINT SPACE BY >2MM SUGGESTS INSTABILITY**

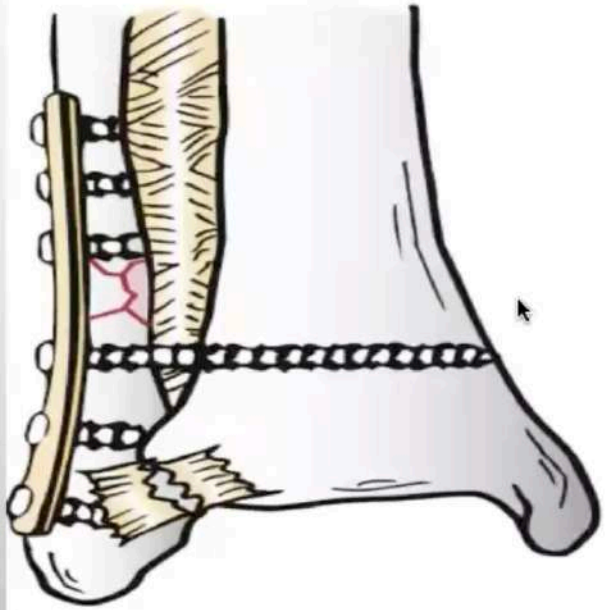
ASSESSMENT POST FIBULA FIXATION- COTTONS TEST

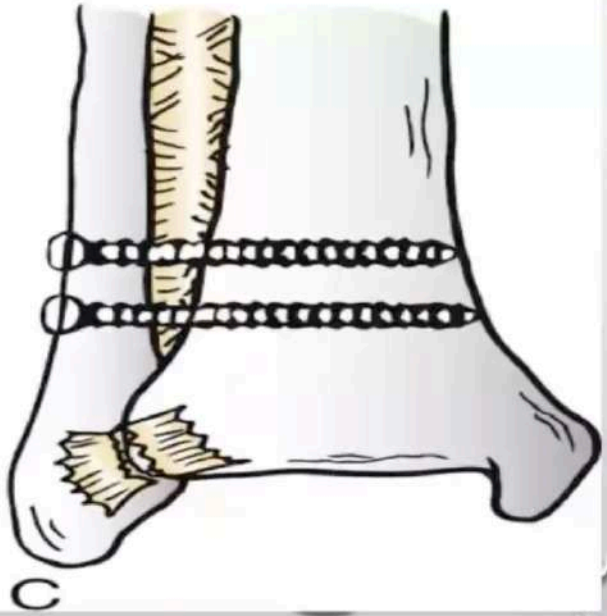


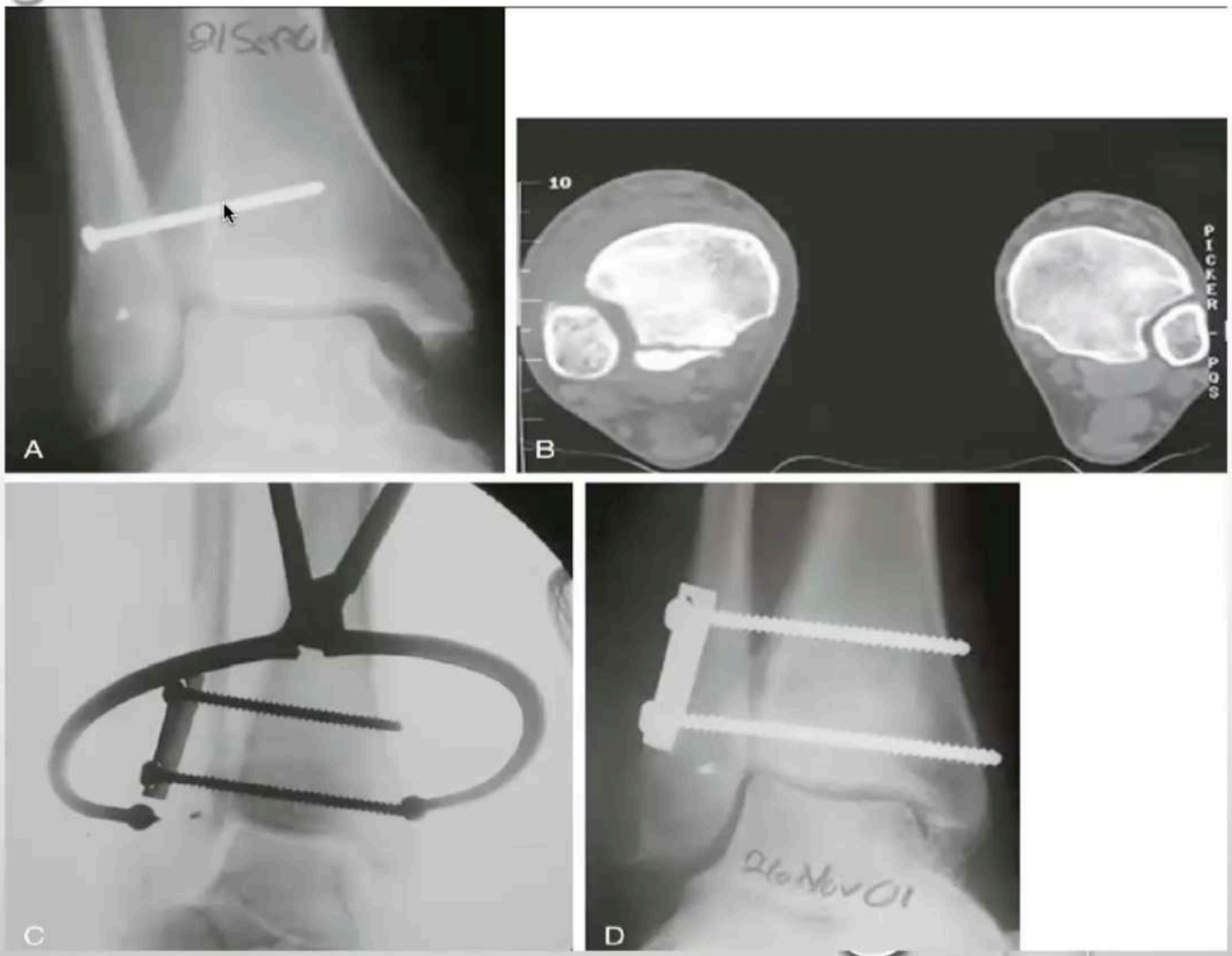
SCREW PLACEMENT











TAKE HOME !!!!

- IDENTIFY FRACTURE PATTERN
- TAKE ALL NECESSARY RADIOGRAPHS AND CT
- DECIDE THE PLAN OF ACTION.
- CONGRUENT JOINT, FULL ROM AND EARLY MOBILIZATION IS VITAL FOR BEST OUTCOME.