Physical Therapy After Crus And Foot Injuries

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Musculosceletal Injuries

- Injuries of soft tissues (meaning ligaments, tendons and muscules)
- Injuries of bones- fractures

Sprain

- Is a trauma to a joint that involves stretching or tearing the ligaments
- Three degrees:

GRADE 1 – MILD SPRAIN – there is some stretching or perhaps tearing of the ligamentous fibers with very little or no joint instability. Mild pain, little swelling and joint stiffness may be apparent

Sprain

GRADE 2 – MODERATE SPRAIN – there is some tearing and separation of the ligamentous fibers and moderate instability of the joint. Moderate pain, swelling and joint stiffness.

GRADE 3 – SEVERE SPRAIN – there is complete rupture of ligament with gross instability of the joint, severe swelling, inability to bear weight on the extremity

Muscle Strains

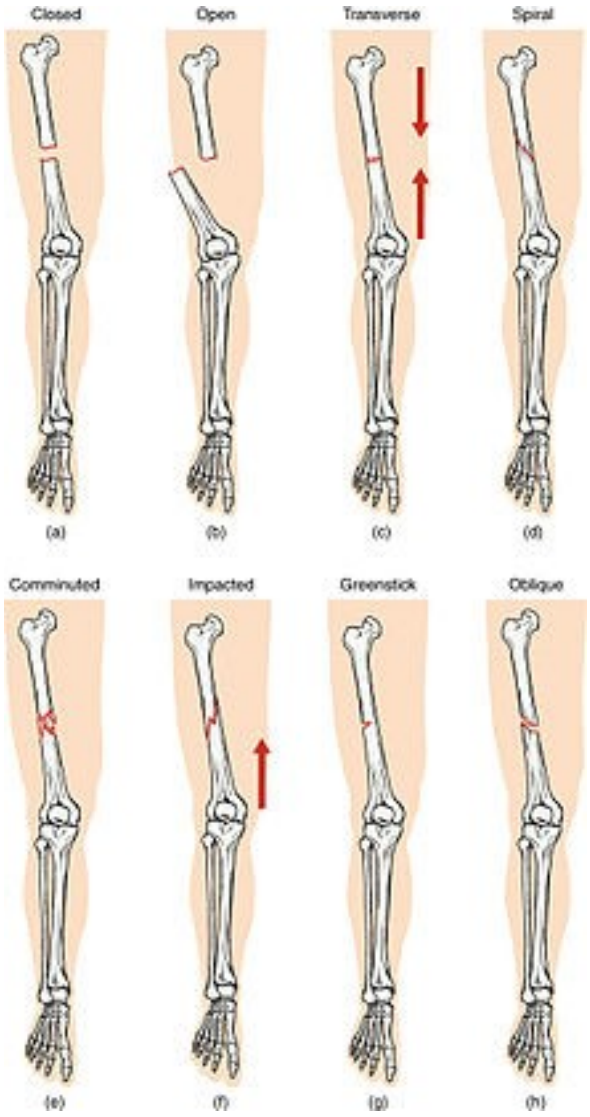
- Is a less serious injury involving overstretching or tearing of muscle fibers
- Muscle strains occur frequently in the hamstrings and quadriceps muscles in the athletes
- **PRICE principle** – Protection, Rest, Ice, Compression, Elevation – can be applied to reduce swelling, relieve pain

Muscle Soreness

- Usually resulting from some strenuous physical activity to which we are unaccustomed
- Muscle soreness may be best prevented by beginning a moderate level of activity and gradually progressing the intensity of the exercise over time
- Treatment of sore muscles usually involves some type of stretching activity and ice application

Fractures, Classifications

- Complete and incomplete fractures
- Traumatic, fatigue (stress) and pathologic fractures
- Closed or open fractures (the bone protrudes through an open wound in the skin)
- Nondisplaced and displaced (translated, angulated, rotated, shortened)
- Simple, multiple and comminuted fractures
- Fracture pattern: linear, transverse, oblique, spiral, compression, impacted, avulsion


Closed
Open
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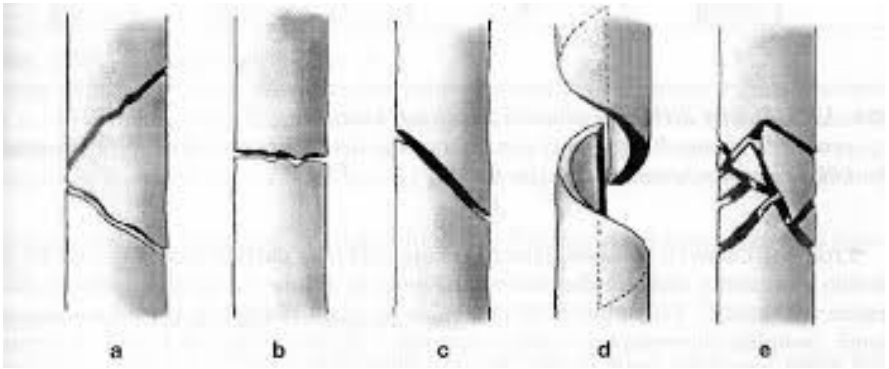
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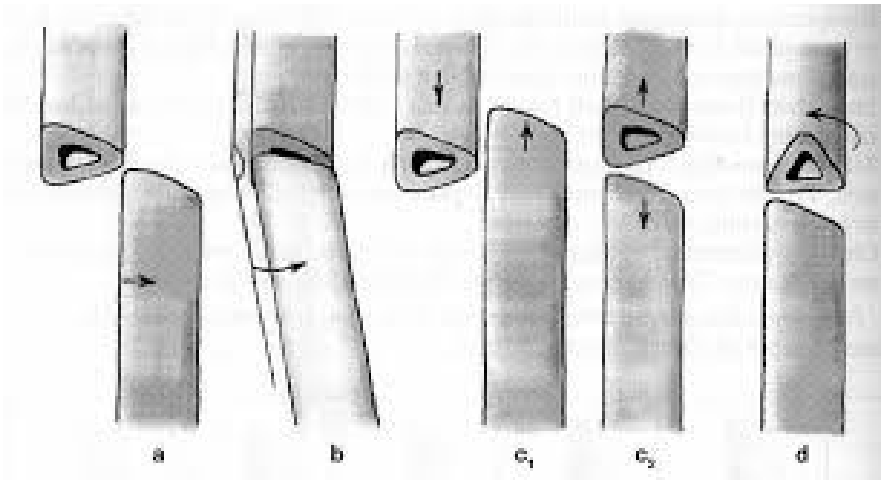
a
b
c1
c2
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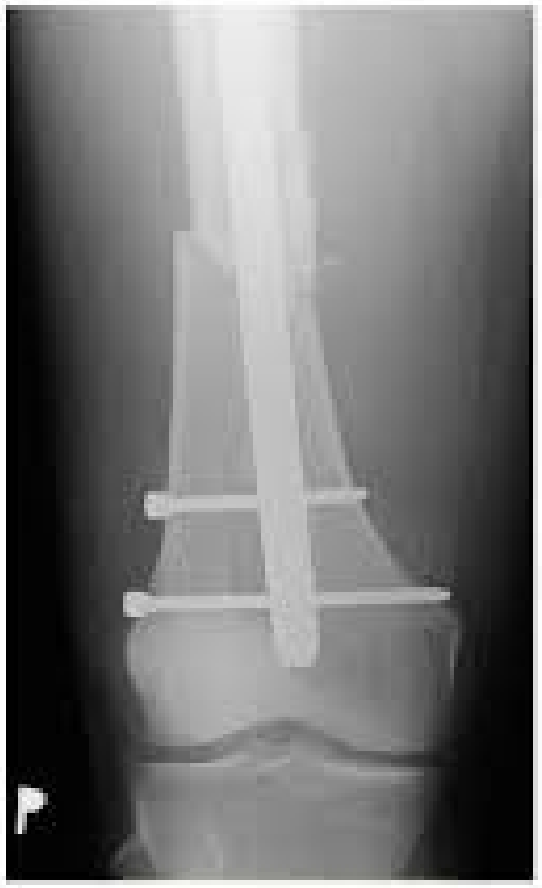
Treatment Of Fractures

- **CONSERVATIVE – Closed reduction** – is placing the bone back to its normal position without a surgical intervention and application of a cast to immobilize the injured bone. Non-operative treatmenet results in prolonged immobilization

- **SURGICAL – Open reduction** – involves surgery – **ORIF** (open reduction/internal fixation) – intramedullary (insertion of nails, screws) and extramedullary (insertion of plats)

  External fixator

ORIF




Fixateur
Externe
SYNTHES
Original-Instrumente und -Implantate der
Schweizerischen Arbeitsgemeinschaft für
Osteosynthesefragen – AO

Compartment Syndrome

- Complication when vessels and nerves are compressed by oedema or a plaster leading to increase pressure in the compartement
- Symptoms – oedema, pain, sensory disturbances, motion disturbances
- Intrafascial pressure over 60mm H2O – indication to emergency surgical correction – fasciotomy
- If untreated, the lack of blood supply leads to permanent muscle and nerve damage and can result in the loss of function of the limb

Compartment Syndrome

Crus Fasciotomy

Obr. 10. Schéma fasciotomie na bérci při kompartmentovém syndromu.

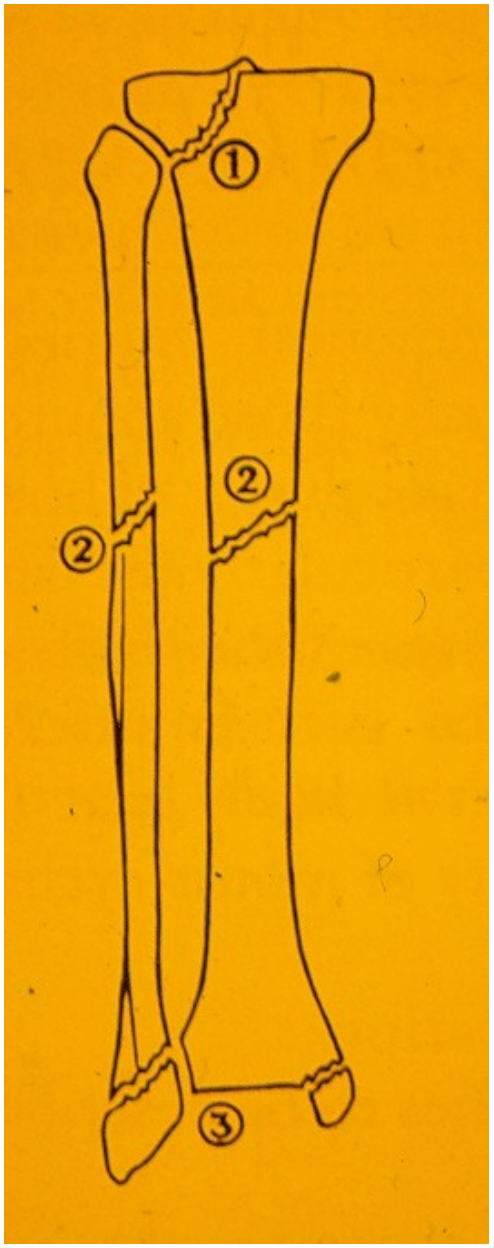
Crus Fractures

- TIBIA fractures (Tibial plateau fracture, Pilon fracture, Fractures of tibial diaphysis)
- FIBULA fractures (Fractures of proximal aspect, of diaphysis and distal aspect)
- Combined tibia and fibula fractures (Malleolar fractures)

1)Proximal aspect

2)Diafysis

3)Distal aspect



Foot Fractures

- Calcaneal fracture
- Thalus fracture
- Metatarsal fractures
- Finger fractures

Physical Therapy

A) CONSERVATIVE TREATMENT

Phase 1 – Acute Phase – during immobilization

Phase 2 – Rehabilitative Phase – after removing plaster

B) SURGICAL TREATMENT

Phase 1 – Acute Phase – during committal

Phase 2 – Rehabilitative Phase – in physiotherapy clinic

A1 Rehabilitation During Immobilization

GOALS

- Prevent oedema and compartment syndrome
- Prevent deep vein trombosis
- Prevent joint stiffness and muscle contractions or weakness of unaffected limbs
- Prevent deconditioning
- Gait training with assistive devices such as underarm or forearm crutches

A1

PHYSICAL THERAPY

- Cryotherapy (application of ice reduces swelling), limb elevation
- Circulatory exercises
- Active range of motion and resistance trainning unaffected limbs
- Isometric exercises affected limb
- Exercises non-immobilizated parts of limb
- Gait training – gait pattern (two/three/four point gait) – depands on full weight-bearing or non-weight-bearing (toe-touch weight-bearing, partial weight-bearing, weight-bearing as tolerated) – recommended by physicians

A2 Rehabilitaion To Restore Mobility

- Inpatient rehabilitation or physiotherapy clinic
- After removing plaster there is often oedema, pain, limited movement, joint stiffness, lower muscle strength of affected area
- **GOALS** – decrease oedema, relieve pain, improve ROM, improve muscle strenght
- **GOALS** – improve or maintain physical fittness, improve balance, improve coordination, enable ambulation

A2

PHYSICAL THERAPY

- Modalities – cryotherapy, magnet therapy (promotes fracture healing), hydrotherapy – whirpool (reduces swelling a relieves pain)
- Soft tissues mobilization (PIR, balling) – to release contracted muscles, tendons and fascia
- Joint mobilization – to restore joint play
- PROM – passive range of motion exercises, AAROM – active assisted range of motion, AROM – active range of motion

A2

- Resistance exersice to improve muscle strength
- Sensorimotor training – to improve balance skills and joint stability (includes simple exercises such as toe-standing, standing hip flexion, standing side leg raise following modifications doing exercise with eyes closed; balance training aids such as balance discs, unstable platform)

Balance Training Aids

A2

- Gait training without assistive devices, gait pattern correction
- Posture correction
- Apropriate sports – stacionary bike, cycling, swimming, walking, jogging

B1 Rehabilitation After Surgury During Committal

GOALS

- Prevent oedema and compartment syndrome
- Prevent deep vein trombosis
- Prevent respiratory complications
- Prevent joint stiffness and muscle contractions or weakness of unaffected limbs
- Prevent deconditioning
- Improve bed mobility
- Gait training with assistive devices such as walker, underarm or forearm crutches

B1

PHYSICAL THERAPY

- Cryotherapy (application of ice reduces swelling), limb elevation, balling free parts
- Circulatory exercises
- Respiratory rehabilitation
- Active range of motion exercise and resistance exercise unaffected limbs (upper and lower limbs)
- Isometric exercises affected limb
- PROM or AAROM exercise of operated limb

B1

- Functional mobility training – includes bed mobility and transfer training such as bridging, rolling to the sides, moving up or down the bed –scooting, transitions from lying to sitting in bed or on the edge of bed, from sitting to standing transfers from bed to chair/wheelchair
- Gait training with assistive devices such as walker, underarm or forearm crutches – it depands on patient condition
- Stair climbing

B1

- Full weight-bearing or non-weight-bearing (toe-touch weight-bearing, partial weight-bearing 25/50/75%, weight-bearing as tolerated) – recommended by physicians
- ADL training (washing, dressing)
- Scare care – after stitches extraction
- Instruction patient to follow exercise at home

B2 Rehabilitation In Physiotherapy Clinic

- Full weight bearing stadium approx. after 6-8 weeks

GOALS

- decrease oedema
- relieve pain
- improve ROM
- improve muscle strenght
- improve or maintain physical fittness
- improve balance, improve coordination
- enable ambulation

B2

PHYSICAL THERAPY

- Modalities – cryotherapy, magnet therapy (promotes fracture healing), hydrotherapy – whirpool (reduces swelling a relieves pain)
- Soft tissues mobilization (PIR, balling) – to release contracted muscles, tendons and fascia
- Joint mobilization – to restore joint play
- Scare care

B2

- PROM – passive range of motion exercises, AAROM – active assisted range of motion, AROM – active range of motion
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- Sensorimotor training – to improve balance skills and joint stability (includes simple exercises such as toe-standing, standing hip flexion, standing side leg raise following modifications doing exercise with eyes closed; balance training aids such as balance discs, unstable platform)

B2

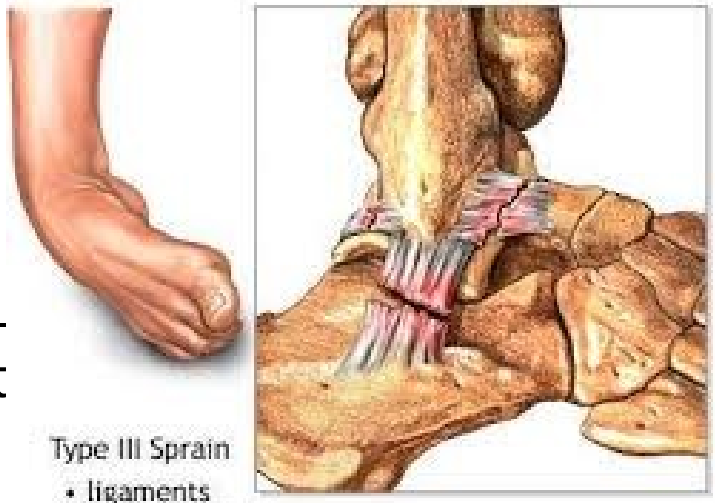
- Gait training without assistive devices, gait pattern correction
- Posture correction
- Aquatic exercises
- Apropriate sports – stacionary bike, cycling, swimming, walking, jogging
- Instruction patient to follow exercise at home

Malleolar Injuries

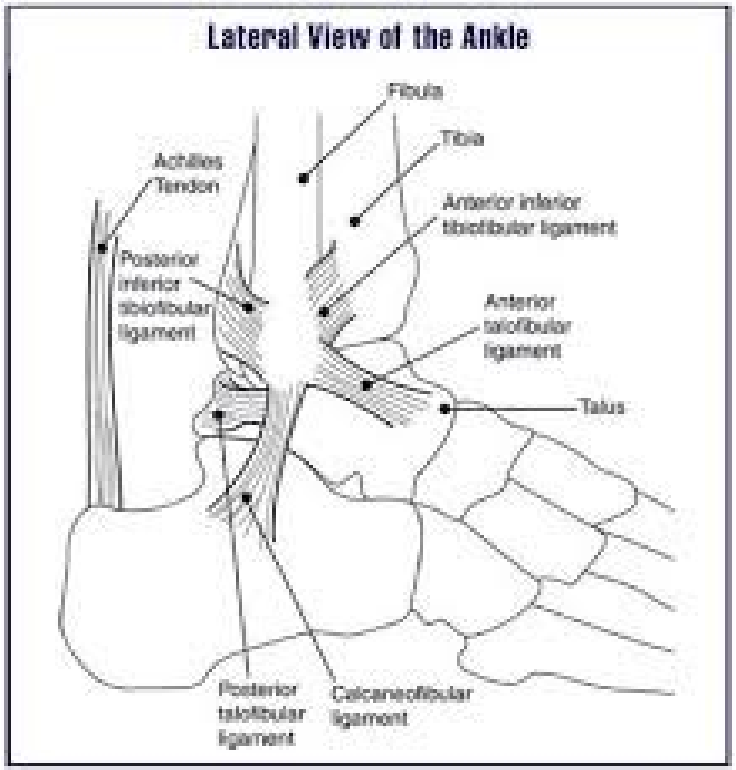
- Ankle sprains
- Ankle fractures

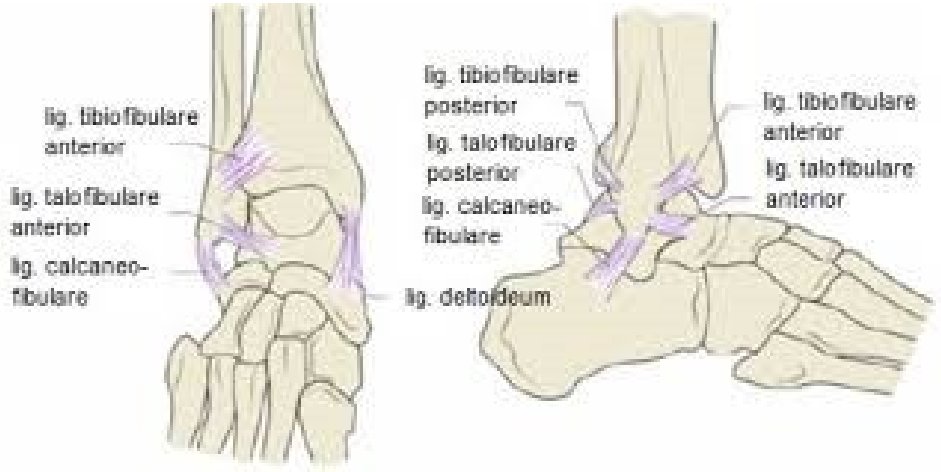
Ankle Sprains

- **Grade 1 – mild ankle sprain** – a stretch of the ligament with no macroscopic tear, little swelling or tenderness, minimal or no functional impairment, and no joint instability
- **Grade 2 – moderate ankle sprain** – involves a partial tear of the ligament with moderate swelling and tenderness, some loss of joint function, mild joint instability
- **Grade 3 – severe ankle sprain** – a complete tear of the ligaments (ATFL, CFL) with severe swelling and tenderness, inabilty to bear weight on the extremity and mechanical joint instability



Ankle Sprain





Rehabilitation Protocol After Ankle Sprains (Lateral Collateral Ligaments)

Phase 1: Acute Phase

- **Timing**
- Grade 1 sprain: 1–3 days
- Grade 2 sprain: 2–4 days
- Grade 3 sprain: 3– 7 days
- **Goals**
- Decrease swelling
- Decrease pain
- Protect from reinjury
- Maintain appropriate weight-bearing status
- **Protection Options**
- Taping
- Functional bracing
- Removable cast boot (some grade 2 and most grade 3sprains)
- Rest (crutches to promote ambulation without gait deviation)

- **Ice**
- Cryocuff ice machine
- Ice bags
- **Light Compression**
- Elastic wrap
- **Elevation**
- Above the heart (combined with ankle pumps)

Phase 2: Subacute Phase

- **Timing**
- Grade 1 sprain: 2–4 days
- Grade 2 sprain: 3–5 days
- Grade 3 sprain: 4–8 days
- **Goals**
- Decrease swelling
- Decrease pain
- Increase pain-free ROM
- Begin strengthening
- Begin non-weight-bearing proprioceptive training
- Provide protective support as needed

- **Modalities to Decrease Pain and Swelling**
- Ice or contrast baths
- Electrical stimulation (high-voltage galvanic or interferential)
- Ultrasound
- **Weight-bearing**
- Progress weight-bearing as symptoms permit
- Partial weight-bearing to full weight-bearing if no signs of antalgic gait are present

- **Therapeutic Exercises**
- Active ROM exercises – Dorsiflexion, Inversion, Foot circles, Plantar flexion, Eversion
- Strength exercises – Isometric in pain-free range, Toe curls with towel, Pick up objects with toes (tissue, marbles)
- Proprioceptive training
- Stretching – Passive ROM-only dorsiflexion and plantar flexion in pain free range, not eversion or inversion, Achilles tendon stretch, Joint mobilizations

Phase 3 – Rehabilitative Phase

- **Timing**
- Grade 1 sprain: 1 wk
- Grade 2 sprain: 2 wk
- Grade 3 sprain: 3 wk
- **Goals**
- Increase pain-free ROM
- Progress strenghtening
- Progress proprioceptive training
- Increase pain-free activities of daily living
- Pain-free full weight-bearing and uncompensated gait

- **Therapeutic exercise**
- Stretching – Gastrocnemius and Soleus with increased intensity, Joint mobilization
- Strengthening – Weight-bearing exercises (heel raises, toe raises, stair steps, quarter squats), Eccentric/concetric and isotonics (with Theraband inversion, eversion, plantar flexion, dorsiflexion)
- Proprioceptive training – single-leg balance activities stable to unstable surfaces (balance disc, trampoline)
- Continue modalities as needed
- Supportive taping, bracing or orthotics used as needed

- **Phase 4 – Return to Activity or Functional Phase**
- **Timing**
- Grade 1: 1–2 wk
- Grade 2: 2–3 wk
- Grade 3: 3–6 wk
- **Goals**
- Regain full strength
- Normal biomechanics
- Return to participation
- Protection and strengthening of any mild residual joint instability

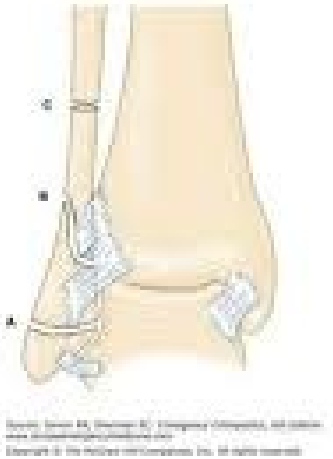
- **Therapeutic exercise**
- Continue progression of ROM and strengthening exercises
- Appropriate sports/activities: jogging, running, cycling, swimming

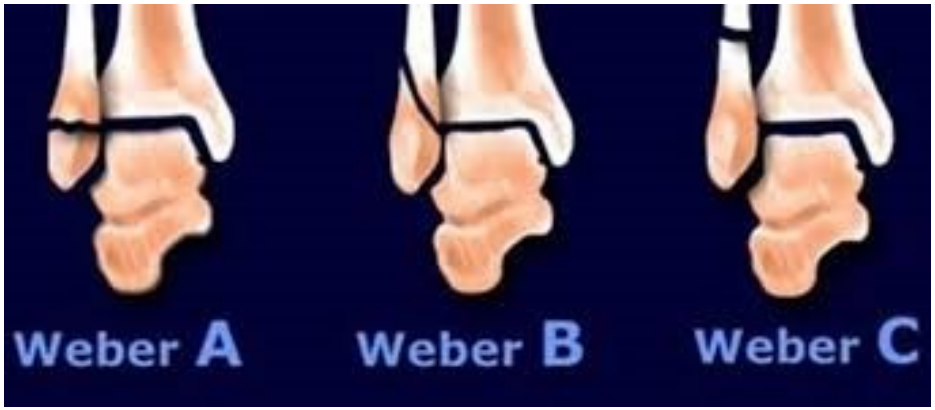
- **Phase 5: Prophylactic Phase**
- **Goal**
- Prevent injury
- **Therapeutic Exercises**
- Functional drills
- Multidirectional balance board activities
- Prophylactic strengthening (emphasis on peroneal eversion)
- Prophylactic protective support as needed

Ankle Fractures

Weber classification

- Level of fibular fracture relative to the syndesmosis
- A = below syndesmosis
- B = level of syndesmosis
- C = above level of syndesmosis





Ankle Fractures – Treatment

- **CONSERVATIVE** – only simple undisplaced fractures, immobilization for 6wk, first 3 wk without weight-bearing, then partial weight-bearing recommended by physician, removing plaster and inititation of physical therapy after 6 wk

PHYSICAL THERAPY

- Modalities – cryotherapy, magnet therapy (promotes fracture healing), hydrotherapy – whirpool (reduces swelling and relieves pain)
- Soft tissues mobilization (PIR, balling) – to release contracted muscles, tendons and fascia
- Joint mobilization – to restore joint play
- PROM – passive range of motion exercises, AAROM – active assisted range of motion, AROM – active range of motion

- Resistance exersice to improve muscle strength
- Sensorimotor training – to improve balance skills and joint stability (includes simple exercises such as toe-standing, standing hip flexion, standing side leg raise following modifications doing exercise with eyes closed; balance training aids such as balance discs, unstable platform)
- Gait training without assistive devices, gait pattern correction
- Posture correction
- Apropriate sports – stacionary bike, cycling, swimming, walking, jogging

Ankle Fracture – Treatment

- **SURGICAL** – displaced fractures, post-operative cast immobilization for 3-4wk without weight-bearing

PHYSICAL THERAPY – Acute Phase

- Cryotherapy (application of ice reduces swelling), limb elevation, balling free parts
- Circulatory exercises
- Respiratory rehabilitation
- Active range of motion exercise and resistance exercise unaffected limbs (upper and lower limbs)
- Isometric exercises affected limb
- PROM or AAROM exercise of operated limb

- Functional mobility trainig – includes bed mobility and transfer trainig such as bridging, rolling to the sides, moving up or down the bed –scooting, transitions from lying to sitting in bed or on the edge of bed, from sitting to standing, transfers from bed to chair/wheelchair
- Gait training with assistive devices such as walker, underarm or forearm crutches – it depands on patient condition
- Stair climbing
- Weight-bearing (toe-touch weight-bearing, partial weight-bearing 25/50/75%, weight-bearing as tolerated) – recommended by physicians
- ADL trainig (washing, dressing)
- Scare care – after stitches extraction
- Instruction patient to follow exercise at home

Ankle Fractures – Treatment

PHYSICAL THERAPY – Rehabilitative Phase

- Modalities – cryotherapy, magnet therapy (promotes fracture healing), hydrotherapy – whirpool (reduces swelling a relieves pain)
- Soft tissues mobilization (PIR, balling) – to release contracted muscles, tendons and fascia
- Joint mobilization – to restore joint play
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- Sensorimotor training – to improve balance skills and joint stability (includes simple exercises such as toe-standing, standing hip flexion, standing side leg raise following modifications doing exercise with eyes closed; balance training aids such as balance discs, unstable platform)
- Gait training without assistive devices, correction of gait pattern
- Posture correction
- Aquatic exercises
- Apropriate sports – stacionary bike, cycling, swimming, walking, jogging
- Instruction patient to follow exercise at home

Acute Achilles Tendon Rupture

- Occurs most often in a degeneratively altered tendon, approximately 2-5 from its insertion (there is minimal vascular supply)
- Most common in middle age men
- Occurs during athletic activity involving a sudden acceleration, sudden change in direction of movement
- Typical sports include tennis, squash, volleyball, basketball
- Clinical presentation: loud pop is heard, sharp pain, able to bear weight, but unable to stand on toes on affected limb
- Objective findings: edema, hematoma, a defect can be palpated, +Thompson's test (https://www.youtube.com/watch?v=wCdOoTSm3Vg)

Rehabilitation Protocol After Surgical Repair of Acute Achilles Tendon Rupture in Athletes

- Well-padded 20-degrees of plantar flexion splint with plaster *postoperative*
- Non-weight-bearing with crutches for 4 wk.
- Progress to partial weight-bearing with crutch-assisted ambulation in a short-leg fiberglass cast
- **For High-level Compliant Athletes**
- Initially use cam boot with 15-20 degrees of equinus (plantar flexion) dialed in, using a heel lift and ankle angle boot setting of 20 degrees of plantar flexion
- Active non-weight-bearing ROM exercises can be started as early as 7 days after surgery. Incision must be well healed before inititation of exercises
- Initial exercise consists of very gentle passive plantar flexion and active dorsiflexion limited to 20 degrees, two sets of five, three times a day
- Use walking boot for 6-8 wk, then make the transition to normal shoes when using the smaller heel lifts
- Stationary bicycling (no resistance) and swimming initiated at 6 wk

Rehabilitation Protocol After Surgical Repair of Acute Achilles Tendon

- **For lower-demand Athletes**
- Use a short-leg non-weight-bearing gravity equinus cast for 6-8 wk followed by l-cm heel lift in a removable boot for 1 mo.
- Progressive non-weight-bearing resistance exercises are started at 8- 10 wk.
- Stationary bicycling and swimming at approximately 8 wk.
- Return to some athletic activity (light running) at 5-6 mo if strength is 70% of uninvolved leg
- Generally, return to full level takes 1 yr, can take up to 18 mo.