PTB AFO

Patellar Tendon Bearing Ankle Foot Orthosis

Prepared by :

Ahed Bseiso

Sara Al Theabat

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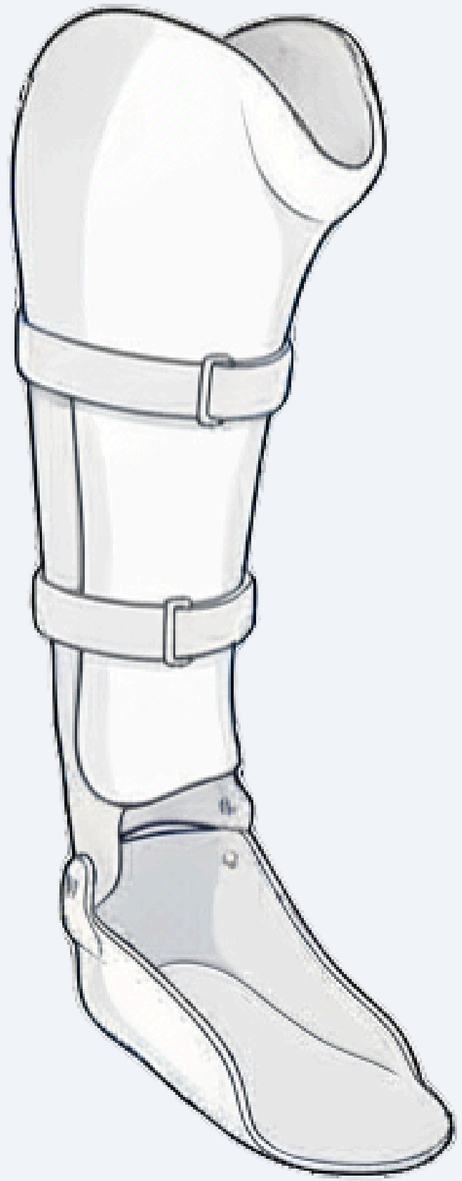


Introduction

Patellar Tendon Bearing Ankle Foot Orthosis *(PTB AFO) is a specialized orthotic device designed to offload the distal lower limb , Transfers body weight from the foot and ankle to the patellar tendon region ,Used when weight bearing on the foot must be minimized or avoided ,Commonly prescribed in trauma, ulcers, fractures, and postoperative rehabilitation .*

Objectives

- ***Weight reduction on the foot*** *: A patient with a foot ulcer The device transfers weight to the knee instead of the foot Reduce pressure on the wound and helps heal*

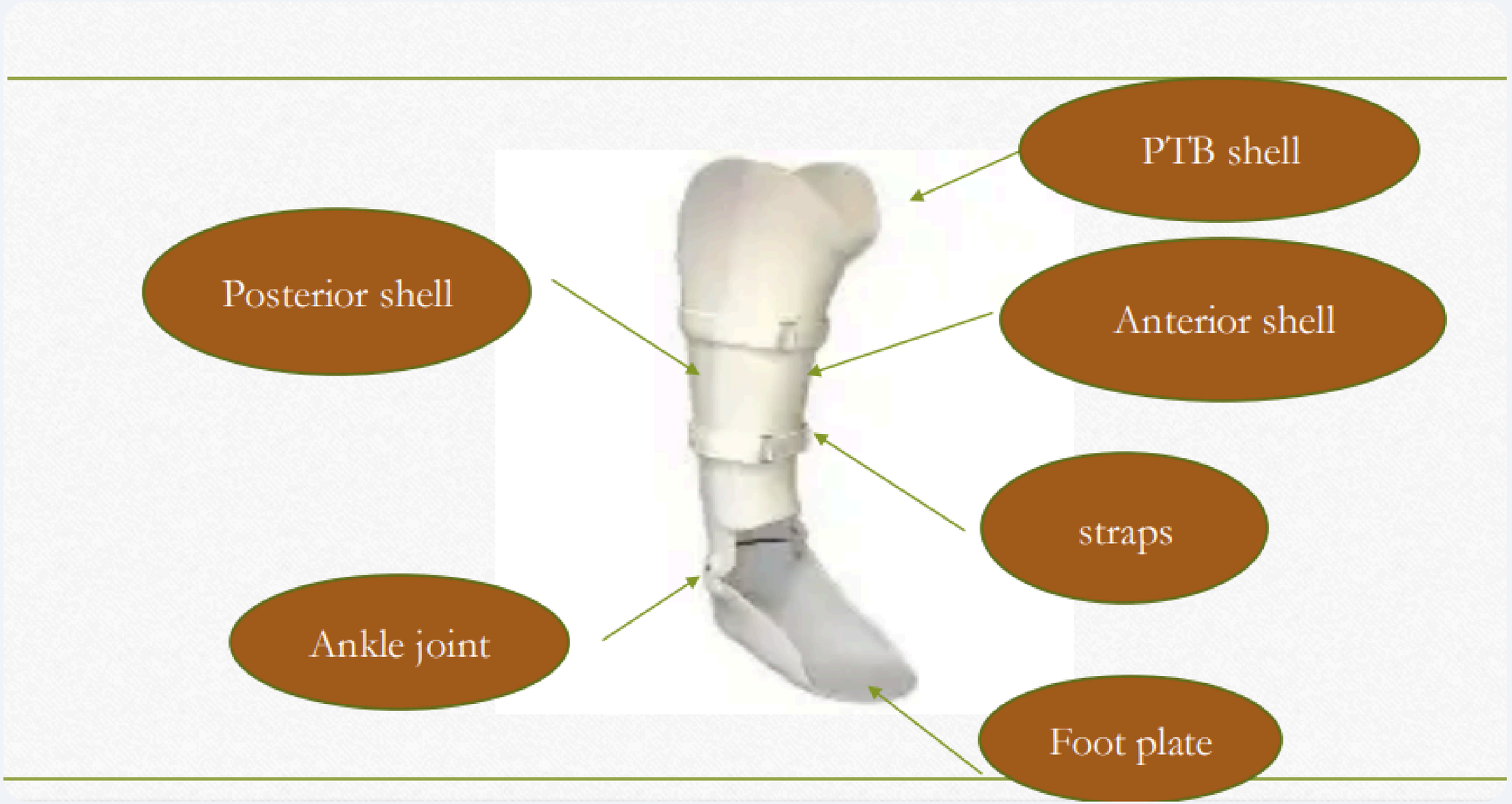
- ***Reduce pain :*** *A patient with ankle fracture Reduce movement and pressure Pain decreases while walking*

- ***Improve balance*** *: A patient with muscle weakness The device gives support to the leg Reduced risk of falling*

- ***Ankle fixation*** *: A patient with instability The device determines the movement Prevents spraining*

- ***Improving walking*** *: Patient after injury The device helps him walk in a better way Due to normal activity*

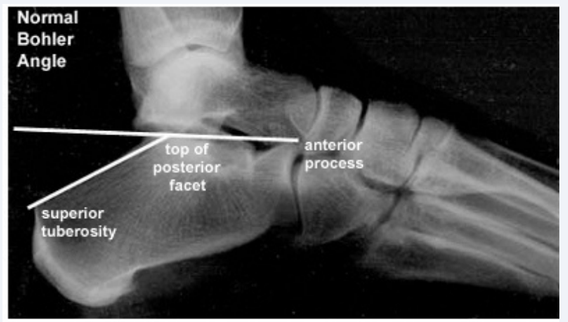
Components of PTB AFO

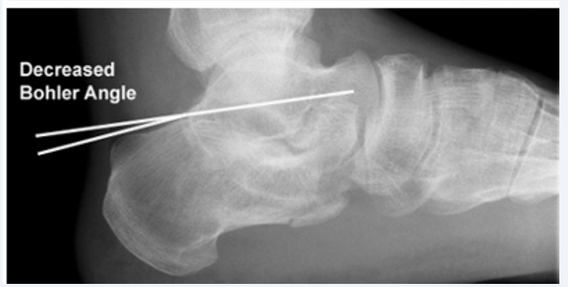


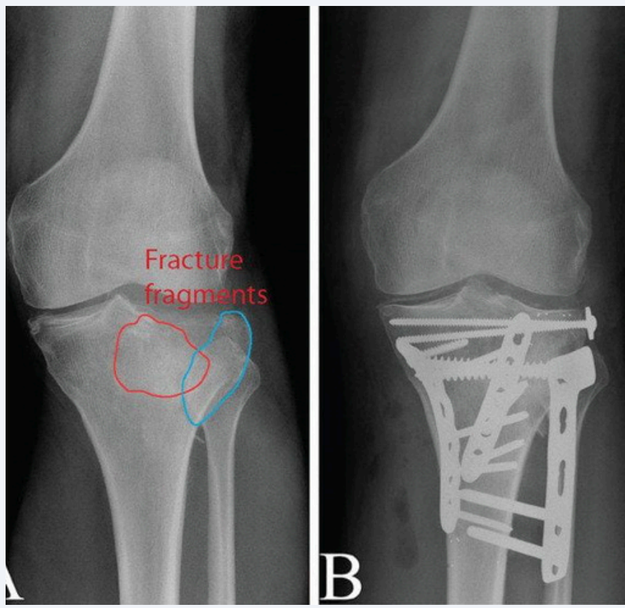
Indications

PTB AFO is used to reduce weight bearing on the tibia OR ankle in conditions such as :

- ***Calcaneal fractures***
- ***Severe diabetic foot ulcers***
- ***Tibial fractures requiring offloading***
- ***Severe foot and ankle trauma***
- ***Charcot disease***
- ***Avascular necrosis of talus***
- ***Delayed fracture healing***
- ***Severe Electrical Burn***







Case Study: Severe Electrical Burn

- **Patient Profile :**

  A 25-year-old man with severe electrical burn injuries.

- **Clinical Presentation :**

  PTB orthosis combined with therapeutic rehabilitation.

- **Intervention :**

  Resulted in an unstable ankle, decreased skin integrity, limited ankle ROM, and upper extremity peripheral nerve involvement.

Case Study: Severe Electrical Burn

- **Outcome :**

  Patient was able to walk at a supervision level without additional assistive devices.

- **Usage Details:**

  Worn approximately 8 hours each day (any time out of bed).
  Majority of time spent in a chair.
  Pain levels reported at 3-8/10 on the VAS scale.

Casting Procedure & Modifications

Negative Cast Taking :

- *PVC wrap applied as a protective barrier between the patient’s skin and pop*
- *marking Bony prominences*
- *pipe inserted during casting to protect the patient’s skin while cutting the cast with the cast cutter*
- *Negative cast taken using POP (Plaster of Paris)*
- *Knee positioned in slight flexion (5–10° flexion)*
- *Ankle maintained in neutral position (90°)*
- *Subtalar joint maintained neutral*

Casting Procedure & Modifications

Positive Cast Modification :

The proximal section is modified to create effective patellar tendon weight-bearing while relieving pressure sensitive areas.

- **Relief over:**
  - Patella
  - Fibular head
  - Tibial crest
  - Hamstring tendons

- **Weight-bearing areas:**
- Patellar tendon area
- Medial tibial flare
- Gastrocnemius muscle belly

The distal section is modified to stabilize the foot and ankle while maintaining proper alignment .

- ***Distal Modifications Include***
- Relief around medial and lateral malleoli
- Proper heel contouring
- Neutral ankle alignment maintained
- Longitudinal arch support added
- Hindfoot stabilization
- Forefoot alignment correction if needed
- Foot plate trimmed according to patient needs
- Toe extension may be added for stability
- Pressure areas smoothed carefully

Casting Procedure & Modifications

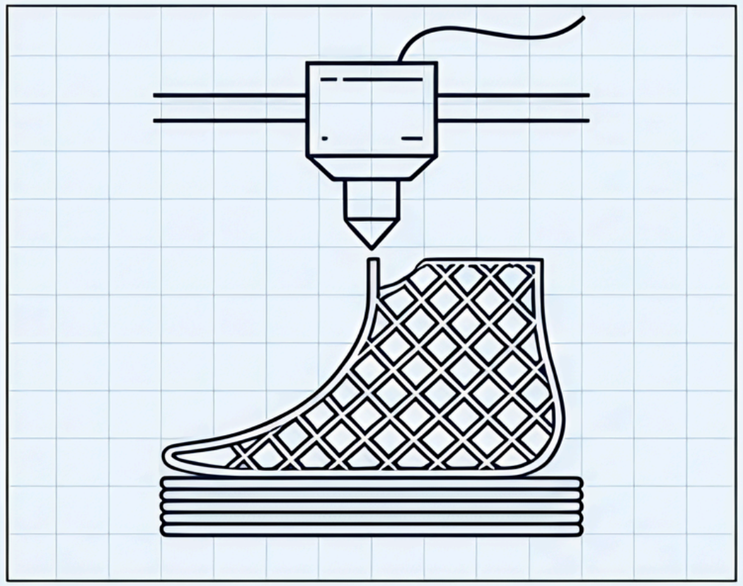
Plastic Fabrication :

- *fabricated using polypropylene thermoplastic*
- *Vacuum forming over positive mold*
- *Thickness commonly 4–5 mm depending on patient weight*
- *Trimlines adjusted for stability and flexibility*
- *Patellar tendon brim carefully molded*

Technological advancements in PTB AFO

Carbon Fiber AFO (CFAFO)

- High stiffness, high tensile strength, light weight, energy storage capacity.
- Thin shell with an open heel; improves plantarflexor muscle power and walking ability.
- Used for foot drop, Charcot-Marie-Tooth disease, poliomyelitis (where no spasticity is evident). High cost limits use.



3D Printed AFO

- Additive manufacturing using nylon-based polymer or thermoplastic polyurethane.
- Allows fine adjustments to bone protrusions, customized thickness, perforations, rapid production, and water resistance.

Kenaf Composites & Dynamic AFOs

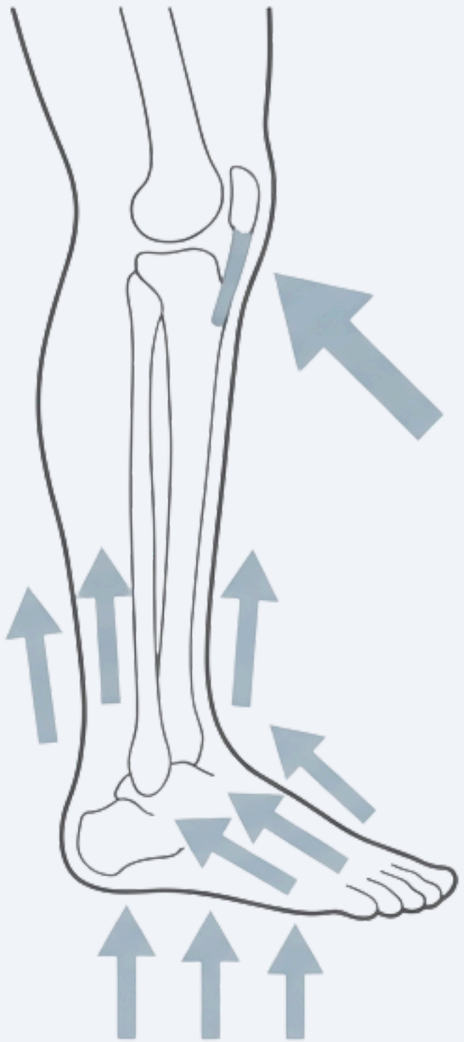
- Newer composite materials are being tested.
- Passive dynamic AFOs (TurboMed-like) have shown 21% to 53% increases in independent walking/running in severe trauma patients, with pain-free reporting rising from 13% to 31% over 34 months.

How PTB AFO Improves Comfort & Mobility

1. Load redistribution

PTB AFO **transfers** part of body weight **away** from the **foot and ankle** to the **patellar tendon region**. This significantly decreases plantar pressure and protects injured tissues from excessive loading.

The orthosis specifically reduces weight load on the heel, ankle, and sole.



especially beneficial in:

- Diabetic ulcers
- Fractures
- Soft tissue injuries
- Postoperative conditions

How PTB AFO Improves Comfort & Mobility

2. Pain Reduction

Reduction in **mechanical stress** leads to **pain reduction** during walking and standing.

Patients often demonstrate:

- Improved standing tolerance
- Increased walking distance
- Better gait confidence
- Reduced fatigue

The burn rehabilitation case demonstrated major improvement in pain and walking function after PTB orthosis fitting.

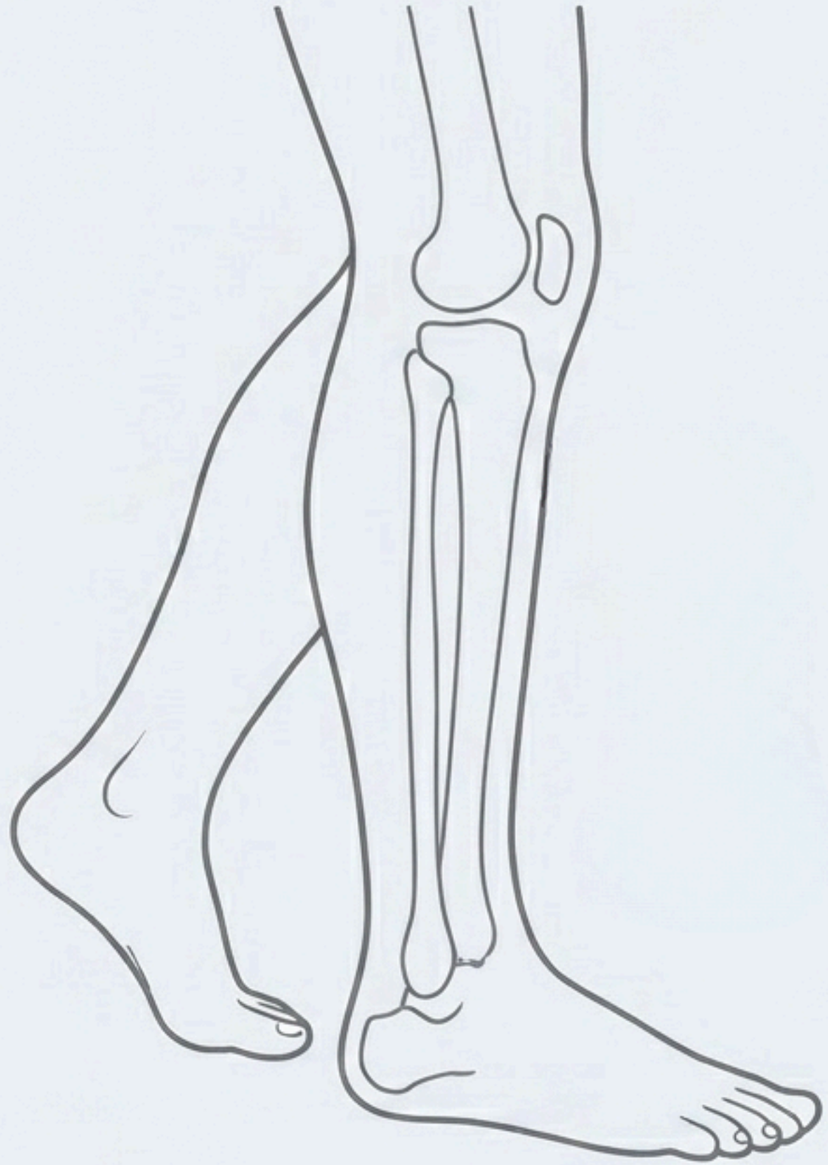
How PTB AFO Improves Comfort & Mobility

3. Improved Gait stability

The orthosis stabilizes the **ankle** and l**ower limb** during the **gait cycle.**

- **Benefits include:**
- Prevention of abnormal ankle motion
- Better balance during stance phase
- Improved foot clearance Safer
- Reduced compensatory gait patterns

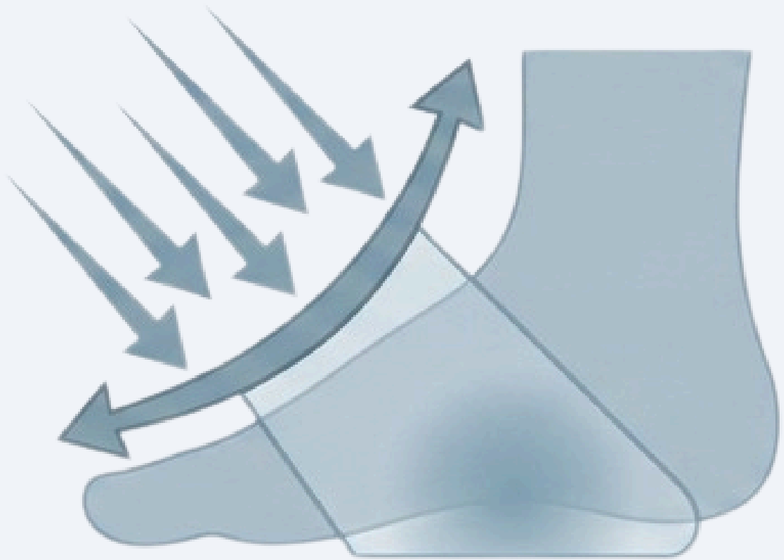
AFOs generally improve posture and gait mechanics during walking.



How PTB AFO Improves Comfort & Mobility

4. Tissue healing

By reducing **repetitive stress** and **pressure** , PTB AFO creates a better environment for **tissue healing**.



- **Benefits include:**
- Promotion of ulcer healing
- Protection of fractures
- Reduction of wound progression
- Possible avoidance of surgery
- Decreased risk of infection

PTB orthosis has been used successfully in **diabetic foot management** and **severe tissue injuries.**

How PTB AFO Improves Comfort & Mobility

5. Energy efficiency

Modern PTB AFOs may use carbon fiber materials that store and return mechanical energy during gait.

- **Benefits include:**
- Reduced muscular effort
- Improved gait efficiency
- Increased plantarflexor power
- Reduced fatigue during long-distance walking

Conclusion

PTB AFO is an effective orthotic solution for unloading the distal lower limb while preserving functionality and mobility. It is especially valuable in diabetic foot management, fractures, trauma, and postoperative rehabilitation.

The orthosis works by transferring body weight proximally to the patellar tendon region, thereby reducing plantar pressure and protecting injured tissues

Modern technological advances such as carbon fiber materials and 3D printing have improved orthotic comfort, durability, efficiency, and patient satisfaction.

Any questions?

Thank you