

# **Prosthetic Considerations in the Diabetic Amputations**

인제대학교 부산 백병원 재활의학과 김 현 동

# Goals of amputation

- Survival
- Allow the best function to the patients with a residual limb
- Surgical credo
  - “To retain as much length as possible”

- Partial foot amputation have increased.
  - ∴ Improvements in vascular disease treatment
    - advances in diagnostic methods for determining circulatory status
    - improved vascular surgery

# Distal amputation

## ● Benefits

- Improved appearance
- Energy conservation
- Better function

## ● Detriments

- Risk of skin breakdown
- Foot length discrepancy

# Partial foot amputations

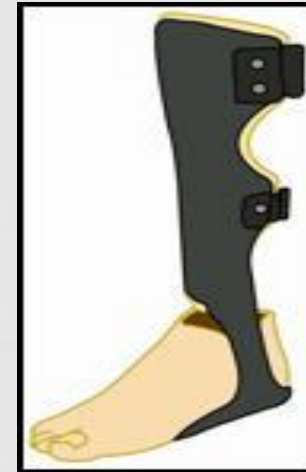
1. Small toe amputation
2. Great toe amputation
3. Ray amputation
4. Partial foot amputations
5. Transtarsal amputations

# Partial foot amputation prosthesis

- Book on partial foot amputations
  - Partial Foot Amputations, Söderberg et al-
  - 44 potential design options
  - three very broad categories
    1. carbon fiber footplates, either built into shoes or put into shoes with filler prosthesis
    2. simple sockets with filler prosthesis
    3. immobilizing devices, comprised of either essentially leather lined solid ankle AFOs or carbon fiber devices

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# Partial foot amputation prosthesis



Chukka boot with toe filler on removable insole  
Photo courtesy of Hersco Orthotic Labs



# **Requisite for recovery of function**

- Adequate soft tissue coverage
- Overall condition of the residual limb
- Appropriate prosthetic devices



# Small toe amputation

- Usually require No replacement
  - do not affect ambulation



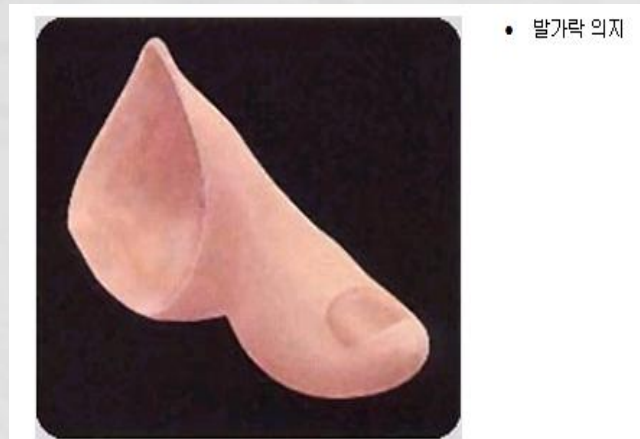
# Two or more digits amputation

- Rigid footplate with a rocker bottom shoe sole
  - diminishes the weight bearing area
  - restore walking and forefoot contour



# Great toe amputation

- Use of a resilient **toe filler** or spring steel shank and a molded insole with arch support
  - Restore push –off force
  - Maintain the alignment of the amputated foot



# Ray amputation

- Custom-molded foot orthosis/prosthesis with filler
  - mediolateral balance of the forefoot
    - Single 1<sup>st</sup> or 5<sup>th</sup> ray: N-S
    - Multiple central ray: wide stance base



# Transmetatarsal amputations

- ◉ Insert with shoe filler fitted to the shoe
- ◉ Shoe modification
  - spring steel shank extending to the metatarsal heads, rocker sole, and/or padding of the tongue of the shoe
- ◉ Socket fitted to the AFO/prosthesis
  - thin bony fragment apply considerable force against the distal skin closure during the late stance phase of gait



# Transtarsal amputations (Chopart/Lisfranc)

- Custom prosthetic foot with a self suspending socket or forefoot lever
- AFO extending proximal to the ankle



# Rehabilitative concerns

- preservation of the limb
  - management of stresses contributing to destructive forces on the foot
    - pressure
    - friction
    - shearing forces.
- allow the best function
  - issues relating to the restoration of gait function



# Pressure

- Ill-fitting footwear(too small/narrow)
- Too small contact area
  - about 27 mmHg of constant pressure for 30 minutes or more can lead to loss of tissue viability
- ∴ Socket fabrication to assure that all pressures are equally distributed over as wide an area as

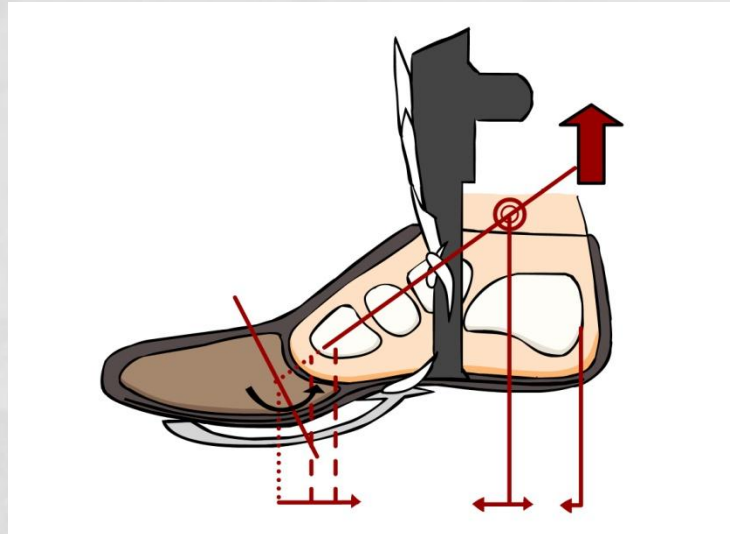
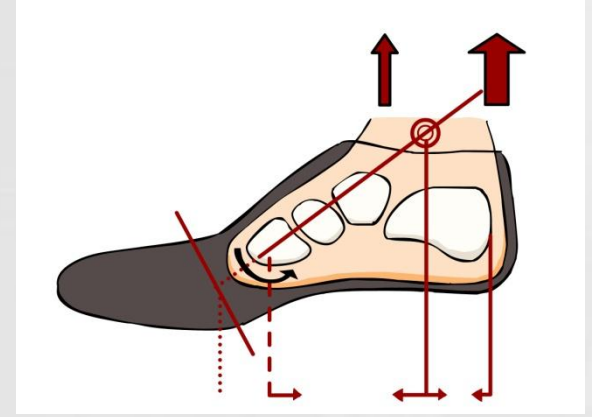
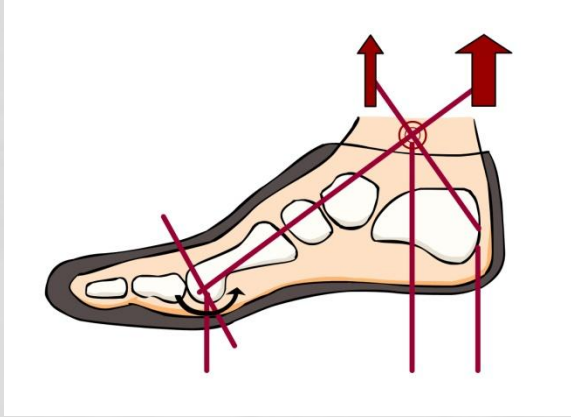


# Friction

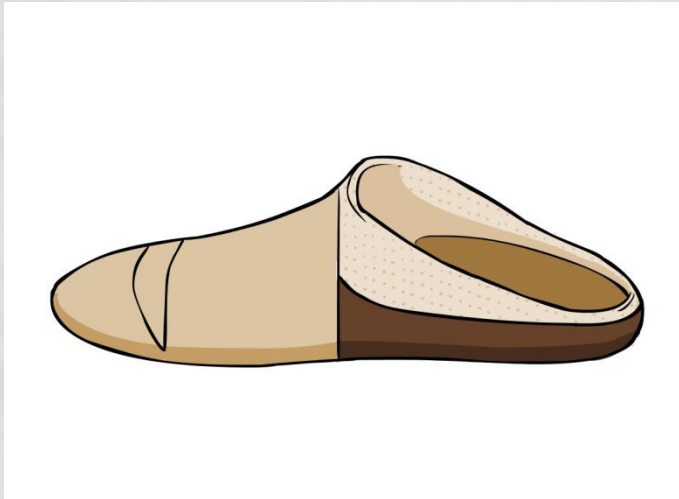
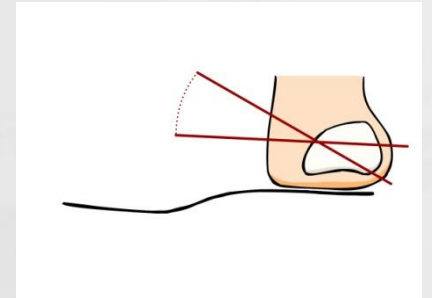
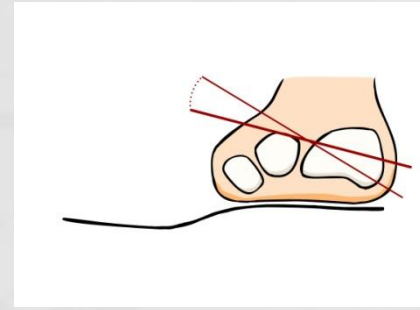
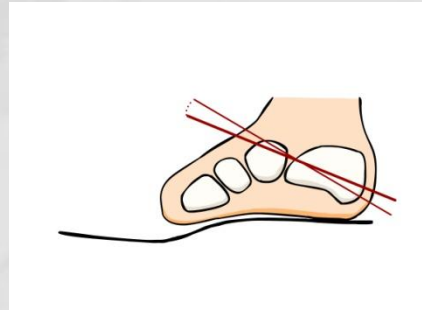
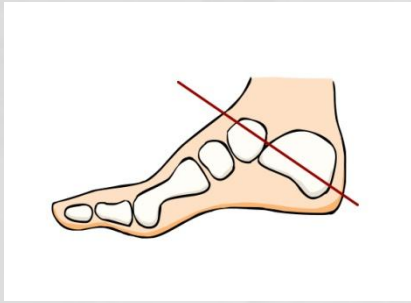
- too large socket
- too large footwear
  - the residual foot moves within that socket.
  - blisters may form that could lead to skin breakdown.
- ∴ socket fabrication
  - even pressure distribution of the foot within the socket
  - without allowing the residuum to move within the socket.

# Shearing forces

- the most destructive of all forces
- Anatomical shearing is created by bone moving on the inside of the skin, creating soft tissue breakdown from the inside out.
- ∴ the goal is to restore the length of the lost lever arm.
  - a carbon fiber footplate
  - shoe break



# Leg length discrepancy



# CONCLUSION

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# 법륜스님 인도 방문기



“나는 인도에서 수많은 여인네가 아기를 안고 입과 배를  
가리키며 나에게 돈을 구걸하길래 처음엔 안쓰런 생각에  
돈을 주었다. 하지만 한 지인이 돈을 주면 벌려 하지 않고  
평생 구걸만 하게 될 거라는 말을 듣고 아차했다. 그 이후에  
는 모든 구걸하는 사람에게 한 푼도 주지 않았다. 이 후 어떻  
게 하는 것이 옳은지 많이 생각하고는 깨달은 것이 바로 교육  
이다. 학교를 짓기로 했다”

# Conclusion

- Replacement of a missing body part
- Create an optimal environment that serves to preserve the integrity of the residual “ at risk” foot and restore gait function



경청해 주셔서 감사합니다.

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