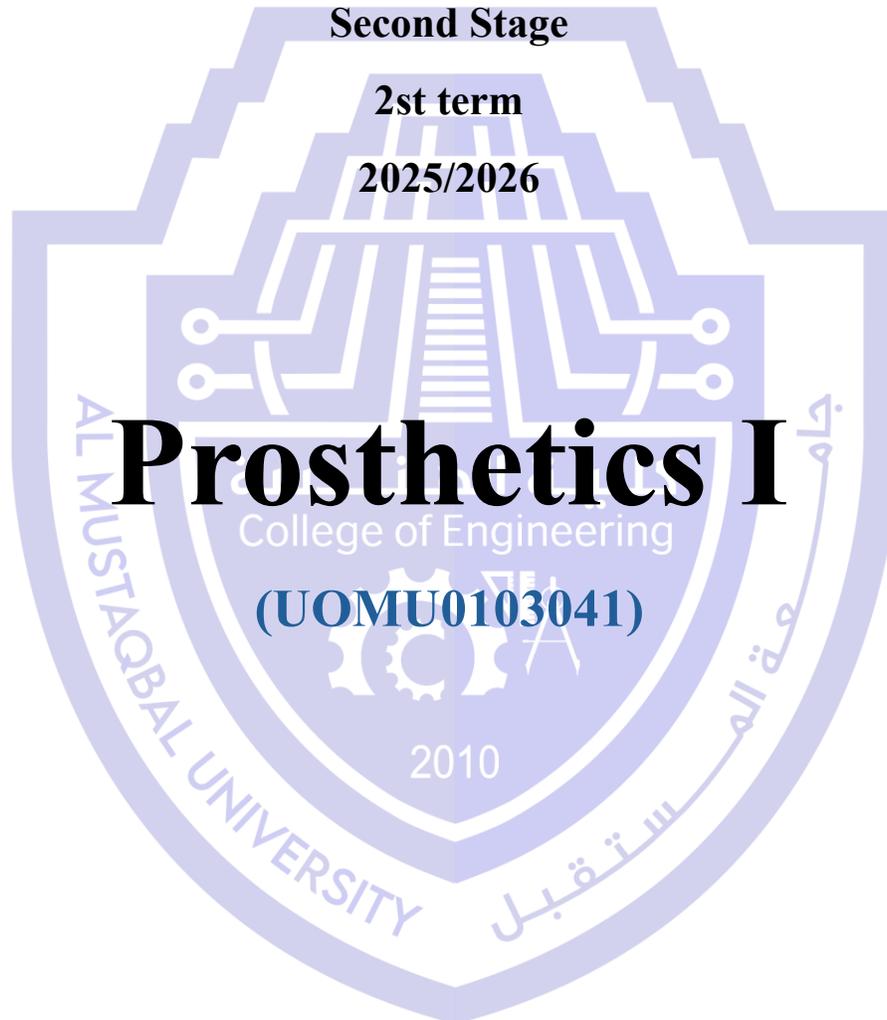




**Al-Mustaqbal University
College of Engineering
Prosthetics and Orthotics Engineering**



Lecture 6

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CHAPTER SIX

Prosthesis in Foot and Ankle Amputation

Foot amputation is done in various levels—from Syme’s ankle disarticulation, calcaneo-tibial fusion (Boyd’s and Pirogoffs), midtarsal amputation (Chopart’s), tarsometatarsal disarticulation (Lisfranc’s), transmetatarsal amputation to toe disarticulation (Fig. 6.1).

LEVELS OF AMPUTATION IN FOOT AND ANKLE

1. Toe disarticulation
2. Transmetatarsal amputation
3. Tarsometatarsal disarticulation—Lisfranc
4. Midtarsal amputation—Chopart’s
5. Calcaneotibial fusion—Boyd’s, Pirogoff
6. Syme’s amputation

TOE DISARTICULATION

- No obvious functional loss.
- *Big toe*: Some difficulty in push off.
- *Prosthesis*: Toe filling of rubber, foam, wool as spacer and to prevent hyperextension of boot at toe-break.

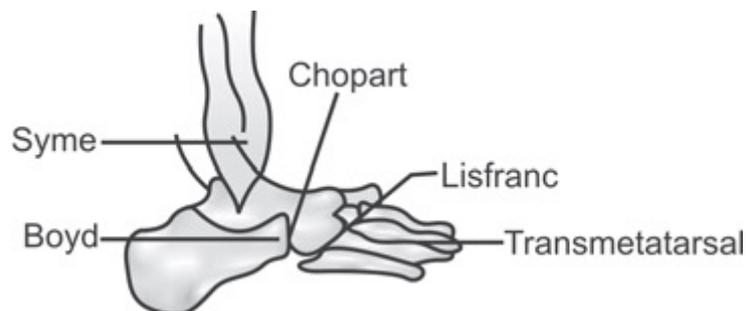


Fig. 6.1: Foot amputation

TRANSMETATARSAL AMPUTATION

- Weight bearing metatarsal head are lost
- Push off difficult, foot flat difficult
- *Prosthesis*: Boot with long steel shank, metatarsal pad and stiff insole

LISFRANC'S

- Tarsometatarsal disarticulation.
- Metatarsals and toes are removed and all tarsal retained.
- *Problems*: Equinus contracture.
- *Prosthesis*: Shoe filled with stiff insole.

CHOPART'S AMPUTATION

- Calcaneum and talus retained.
- Remaining tarsals with metatarsal and toes removed.
- Equinus contracture is the complication
- *Prosthesis*:
 - a. High collar shoe with toe filler
 - b. Syme's model prosthesis.

SYME'S AMPUTATION: Syme's amputation is done in following ways (Fig. 6.2):

- a. Original Syme's amputation
- b. Two-stage Syme's amputation
- c. Modified Syme's amputation

Original Syme's Amputation

A thin layer of tibia with both malleoli are removed. The saw cuts in horizontal plane and parallel to ground. Heel pad is fixed by either of the following techniques:

- a. External fixation with elastic straps
- b. Internal fixation with K wire or thin Steinman pin.

Two-stage Syme's Amputation

- Done in case of infective wound
- *1st stage:* Foot is removed and heel pad brought under tibia and sutured.
- *2nd stage:* After several weeks when infection is controlled both malleoli and front surface are removed. Heel pad fixed in lower end.

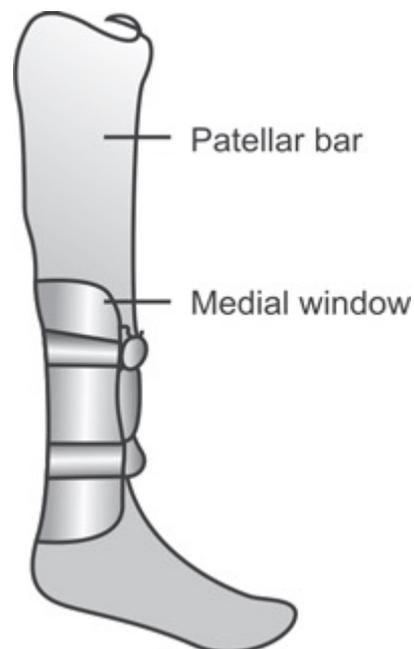


Fig. 6.2: Syme's prosthesis with medial opening

Modified Syme's Amputation

The original technique was modified to get a less bulbous and more cosmetic stump.

- a. Metaphyseal flare of tibia is removed.
- b. Distal end of fibula is beveled and size of stump is reduced.

Problems in Syme's Amputation

1. Misplaced heel pad
2. Sloping cut surface of tibia
3. Too small cross-section area of end bearing stump
4. Wobbly heel pad
5. Marginal gangrene of heel pad
6. Tender heel pad.

Syme's Prosthesis

Syme's prosthesis should have end bearing pad for shock absorption. Syme's prosthesis can be fabricated with the following types of weight bearing:

- a. Full end bearing
- b. More distal end bearing and less proximal PTB weight bearing
- c. More proximal patellar tendon weight bearing and less end bearing.

Three types of Syme's prosthesis are described hereunder.

1. Conventional

Conventional prosthesis is made of leather socket and wooden foot piece. Whole weight is end bearing. Most patients are unable to bear long time standing and distance walking.

2. Canadian Syme's Prosthesis

This prosthesis consists of:

- a. End bearing pad made of shock absorbing material
- b. Patellar tendon bar partly bears weight
- c. Medial window is given to pull bulbous end to the socket. It also provides suspension over malleoli.

3. Closed Expandable Syme's Prosthesis

This is prescribed in cases with modified Syme's amputation, where the lower end is less bulbous and there is no need for any window.

The prosthesis has an inner layer made of flexible plastic or elastic attached to the inside of socket. It extends from distal end of socket proximally to a point where the diameter of proximal leg is equal with bulbous lower end. The inner layer stretches as the end of the stump inserted within the socket. The advantages are better cosmesis and better suspension.