MEDICAL EDUCATION RESOURCE

Sole of Foot: FAQs, MCQs and Viva Voce

Frequently Asked Questions – Sole of the Foot

1. What are the functions of the sole of the foot?

? Weight bearing, shock absorption, locomotion, protection of vessels and nerves, and maintenance of foot arches.

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2. Why is the skin of the sole thick and hairless?

? To resist friction and pressure during walking and standing; hairless for better tactile sense and grip.

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3. What maintains the stability of the arches of the foot?

? **Static factors:** ligaments and plantar aponeurosis.

? **Dynamic factors:** muscles like tibialis posterior, peroneus longus, and intrinsic plantar muscles.

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4. How many muscles are present in the sole?

? 20 muscles arranged in 4 layers.

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5. Name the nerves supplying the sole.

? Branches of the **tibial nerve:**

- **Medial plantar nerve** (larger).
- **Lateral plantar nerve** (smaller).

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6. Which nerve of the sole corresponds to the median nerve of the hand?

? **Medial plantar nerve.**

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7. Which nerve of the sole corresponds to the ulnar nerve of the hand?

? **Lateral plantar nerve.**

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8. Which muscles are supplied by the medial plantar nerve?

? Abductor hallucis, Flexor digitorum brevis, Flexor hallucis brevis, and 1st lumbrical.

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9. Which muscles are supplied by the lateral plantar nerve?

? All remaining 14 intrinsic muscles of the sole.

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10. What are the terminal branches of the posterior tibial artery?

? Medial plantar artery and Lateral plantar artery.

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11. What forms the plantar arch?

? Continuation of the **lateral plantar artery**, completed medially by the **deep branch of the dorsalis pedis artery.**

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12. What are the branches of the plantar arch?

? Four plantar metatarsal arteries that divide into plantar digital arteries for adjacent sides of toes.

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13. Which muscle helps maintain the transverse arch of the foot?

? **Peroneus longus.**

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14. Which muscles help maintain the medial longitudinal arch?

? **Tibialis posterior, Flexor hallucis longus, Abductor hallucis,** and **Flexor hallucis brevis.**

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15. What is the importance of plantar aponeurosis?

? Supports the longitudinal arch, protects deep structures, and provides firm grip on the ground.

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16. What is the plantar reflex?

? Stroking the lateral sole causes plantar flexion of toes.

? Dorsiflexion of great toe with fanning of others = **Babinski sign** (UMN lesion).

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17. What is the nerve root value of plantar reflex?

? **L5–S1.**

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18. What is Morton’s neuroma?

? Thickening of a plantar digital nerve between the **3rd and 4th metatarsals**, causing burning pain.

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19. What is jogger’s foot?

? Entrapment of the **medial plantar nerve** under abductor hallucis ? pain in medial arch and first toe.

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20. What are claw toes?

? Deformity caused by paralysis of lumbricals and interossei ? hyperextension at MTP joints, flexion at IP joints.

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21. What are the differences between medial and lateral plantar arteries?

? Medial plantar artery: smaller, along medial border, supplies medial sole.

? Lateral plantar artery: larger, forms plantar arch, supplies majority of sole.

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22. How are the interossei arranged and what are their actions?

? **Plantar interossei (3):** unipennate, adduct toes (PAD).

? **Dorsal interossei (4):** bipennate, abduct toes (DAB).

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23. Which tendon crosses the sole obliquely?

? **Peroneus longus tendon.**

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24. What is the main blood supply to the great toe?

? **First plantar metatarsal artery** (from plantar arch) and branch from medial plantar artery.

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25. Why is plantar abscess extremely painful?

? Because tight fibrous septa of plantar fascia prevent expansion of pus ? marked pressure on nerves.

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26. What is the functional importance of lumbricals?

? Flex MTP joints and extend IP joints, helping balance during walking.

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27. What are the terminal branches of the lateral plantar nerve?

? **Superficial branch** (to skin and flexor digiti minimi) and **Deep branch** (to adductor hallucis and interossei).

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28. What are the effects of injury to the tibial nerve in the tarsal tunnel?

? Paralysis of intrinsic muscles of the sole, loss of plantar flexion and sensation over sole.

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29. Which artery supplies the heel region?

? **Calcanean branches** of posterior tibial and peroneal arteries.

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30. What is the clinical importance of the plantar arch?

? Rich anastomosis ensures collateral circulation; injury may cause deep hematoma due to its deep location.

Multiple Choice Questions – Sole of the Foot

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1. The thick central part of the deep fascia of the sole is known as:

A. Flexor retinaculum

B. Plantar aponeurosis

C. Palmar aponeurosis

D. Fibrous sheath

? **Answer:** B — *Plantar aponeurosis*

? It protects deep structures and maintains the longitudinal arch of the foot.

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2. The plantar aponeurosis is attached posteriorly to:

A. Base of fifth metatarsal

B. Navicular bone

C. Medial process of calcaneal tuberosity

D. Cuboid bone

? **Answer:** C — *Medial process of calcaneal tuberosity*

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3. The plantar aponeurosis divides the sole into how many compartments?

A. Two

B. Three

C. Four

D. Five

? **Answer:** B — *Three* (medial, lateral, and central compartments).

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4. The plantar aponeurosis gives rise to vertical septa forming compartments of the sole. Which muscle lies in the medial compartment?

A. Abductor hallucis

B. Flexor digitorum brevis

C. Flexor digiti minimi brevis

D. Quadratus plantae

? **Answer:** A — *Abductor hallucis* (along with flexor hallucis brevis).

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5. The plantar reflex is mediated through which spinal segments?

A. L1–L2

B. L3–L4

C. L4–L5

D. L5–S1

? **Answer:** D — *L5–S1*

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6. Dorsiflexion of the great toe with fanning of other toes on plantar stimulation indicates:

A. Lower motor neuron lesion

B. Upper motor neuron lesion

C. Peripheral nerve injury

D. Posterior tibial nerve injury

? **Answer:** B — *Upper motor neuron lesion* (Babinski sign).

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7. The plantar arch is mainly formed by:

A. Medial plantar artery

B. Dorsalis pedis artery

C. Lateral plantar artery

D. Peroneal artery

? **Answer:** C — *Lateral plantar artery* (completed by deep plantar branch of dorsalis pedis).

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8. The number of plantar metatarsal arteries arising from the plantar arch is:

A. Two

B. Three

C. Four

D. Five

? **Answer:** C — *Four* plantar metatarsal arteries.

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9. Which nerve supplies the medial 3½ toes and medial sole?

A. Lateral plantar nerve

B. Sural nerve

C. Medial plantar nerve

D. Saphenous nerve

? **Answer:** C — *Medial plantar nerve.*

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10. Which muscle is supplied by the medial plantar nerve?

A. Adductor hallucis

B. Flexor digiti minimi brevis

C. Flexor hallucis brevis

D. Quadratus plantae

? **Answer:** C — *Flexor hallucis brevis.*

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11. Which nerve of the sole corresponds to the ulnar nerve of the hand?

A. Medial plantar nerve

B. Lateral plantar nerve

C. Sural nerve

D. Calcanean branch

? **Answer:** B — *Lateral plantar nerve.*

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12. Which of the following muscles is NOT supplied by the lateral plantar nerve?

A. Adductor hallucis

B. Quadratus plantae

C. Flexor digiti minimi brevis

D. Abductor hallucis

? **Answer:** D — *Abductor hallucis* (supplied by medial plantar nerve).

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13. Which muscle of the second layer of sole straightens the pull of the flexor digitorum longus tendon?

A. Flexor hallucis brevis

B. Quadratus plantae

C. Lumbricals

D. Adductor hallucis

? **Answer:** B — *Quadratus plantae.*

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14. The lumbricals of the sole are supplied by:

A. Only medial plantar nerve

B. Only lateral plantar nerve

C. Both medial and lateral plantar nerves

D. Deep peroneal nerve

? **Answer:** C — *Both:* 1st lumbrical by medial plantar; remaining three by lateral plantar.

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15. Which muscle abducts the great toe?

A. Abductor digiti minimi

B. Abductor hallucis

C. Adductor hallucis

D. Flexor hallucis longus

? **Answer:** B — *Abductor hallucis.*

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16. Which muscle maintains the transverse arch of the foot?

A. Peroneus brevis

B. Peroneus longus

C. Tibialis anterior

D. Soleus

? **Answer:** B — *Peroneus longus.*

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17. Which structure passes obliquely across the sole from lateral to medial side?

A. Tibialis posterior tendon

B. Flexor hallucis longus tendon

C. Peroneus longus tendon

D. Plantaris tendon

? **Answer:** C — *Peroneus longus tendon.*

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18. The dorsal digital arteries of toes are derived from:

A. Dorsalis pedis artery

B. Plantar arch

C. Medial plantar artery

D. Peroneal artery

? **Answer:** B — *Plantar arch.*

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19. Which artery is the main blood supply to the great toe?

A. Lateral plantar artery

B. Medial plantar artery

C. Dorsalis pedis artery

D. Peroneal artery

? **Answer:** B — *Medial plantar artery* (through its superficial branches and 1st plantar metatarsal).

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20. The flexor digitorum brevis muscle inserts into which phalanges?

A. Distal phalanges of lateral four toes

B. Middle phalanges of lateral four toes

C. Proximal phalanges of lateral four toes

D. Bases of all distal phalanges

? **Answer:** B — *Middle phalanges of lateral four toes.*

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21. The lumbricals of the foot perform which action?

A. Extend MTP joints and flex IP joints

B. Flex MTP joints and extend IP joints

C. Flex all toe joints

D. Extend all toe joints

? **Answer:** B — *Flex MTP and extend IP joints.*

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22. The tarsal tunnel is located beneath which structure?

A. Inferior extensor retinaculum

B. Flexor retinaculum

C. Superior peroneal retinaculum

D. Peroneal sheath

? **Answer:** B — *Flexor retinaculum.*

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23. Injury to the tibial nerve at the tarsal tunnel leads to:

A. Foot drop

B. Loss of dorsiflexion

C. Loss of plantar flexion and sole sensation

D. Eversion deformity

? **Answer:** C — *Loss of plantar flexion and sensation on sole.*

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24. Pain between third and fourth toes during walking is characteristic of:

A. Tarsal tunnel syndrome

B. Morton’s neuroma

C. Plantar fasciitis

D. Pes planus

? **Answer:** B — *Morton’s neuroma.*

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25. The heel pad receives blood supply mainly from:

A. Dorsalis pedis artery

B. Posterior tibial artery

C. Peroneal artery

D. Both posterior tibial and peroneal arteries

? **Answer:** D — *Calcanean branches of posterior tibial and peroneal arteries.*

Viva Voce – Sole of the Foot

1. What is the main function of the sole of the foot?

? To support body weight, absorb shock, aid locomotion, and protect underlying vessels and nerves.

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2. Why is the skin of the sole thick and firmly bound?

? For protection against friction and pressure during walking and standing; fibrous septa anchor skin to deep fascia.

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3. What is the nature of skin on the sole?

? Thick, hairless, with numerous sweat glands and no sebaceous glands.

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4. What is the composition of superficial fascia in the sole?

? Fibrofatty tissue with dense fibrous septa enclosing fat lobules, vessels, nerves, and sweat glands.

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5. What is the function of superficial fascia in the sole?

? Acts as a cushion and shock absorber during weight bearing.

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6. What is plantar aponeurosis?

? Thick central part of deep fascia of the sole, triangular in shape, attached posteriorly to medial process of calcaneal tuberosity.

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7. What are the compartments of the sole formed by the plantar aponeurosis?

? Medial, Central, and Lateral compartments.

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8. What is the function of the plantar aponeurosis?

? Protects deep structures, supports the longitudinal arch, and provides grip during walking.

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9. Which muscle lies in the medial compartment of the sole?

? *Abductor hallucis* and *Flexor hallucis brevis.*

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10. Which muscles lie in the lateral compartment of the sole?

? *Abductor digiti minimi* and *Flexor digiti minimi brevis.*

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11. What are the muscles in the first layer of the sole?

? *Abductor hallucis, Flexor digitorum brevis,* and *Abductor digiti minimi.*

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12. Name the muscles of the second layer.

? *Quadratus plantae (flexor digitorum accessorius)* and *four lumbricals,* along with tendons of *flexor digitorum longus* and *flexor hallucis longus.*

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13. Which muscles are found in the third layer of the sole?

? *Flexor hallucis brevis, Adductor hallucis,* and *Flexor digiti minimi brevis.*

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14. What muscles form the fourth layer of the sole?

? *Three plantar interossei* and *four dorsal interossei.*

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15. What are the actions of lumbrical muscles?

? Flex metatarsophalangeal joints and extend interphalangeal joints of toes.

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16. What are the actions of interossei muscles?

? Plantar interossei adduct (PAD) and Dorsal interossei abduct (DAB) the toes.

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17. Which nerve supplies the sole?

? **Tibial nerve**, through its branches: **medial** and **lateral plantar nerves.**

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18. Which nerve supplies the medial 3½ toes?

? **Medial plantar nerve.**

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19. Which nerve supplies the lateral 1½ toes?

? **Lateral plantar nerve.**

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20. What is the sensory supply to the heel?

? **Medial calcanean branches** of tibial nerve.

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21. Which artery forms the plantar arch?

? **Lateral plantar artery** (completed medially by deep branch of dorsalis pedis).

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22. How many plantar metatarsal arteries arise from the plantar arch?

? Four.

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23. Which artery supplies the great toe?

? **First plantar metatarsal artery** and branch of **medial plantar artery.**

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24. What are the terminal branches of the posterior tibial artery?

? **Medial** and **Lateral plantar arteries.**

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25. Which muscles are supplied by the medial plantar nerve?

? *Abductor hallucis, Flexor digitorum brevis, Flexor hallucis brevis,* and *First lumbrical.*

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26. Which muscles are supplied by the lateral plantar nerve?

? All other intrinsic muscles of the sole.

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27. Which muscle in the second layer straightens the pull of flexor digitorum longus?

? *Quadratus plantae.*

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28. What is the nerve root value of the plantar reflex?

? **L5–S1.**

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29. What is the clinical importance of the plantar reflex?

? Tests integrity of the corticospinal tract; dorsiflexion of great toe indicates UMN lesion (Babinski sign).

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30. What is Morton’s neuroma?

? Thickening of plantar digital nerve between 3rd and 4th metatarsals ? burning pain in forefoot.

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31. What is jogger’s foot?

? Entrapment of medial plantar nerve beneath abductor hallucis ? pain along medial arch and great toe.

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32. What is tarsal tunnel syndrome?

? Compression of tibial nerve beneath flexor retinaculum ? paresthesia and pain in sole.

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33. Why are plantar abscesses so painful?

? Tight fibrous septa prevent spread of pus, causing severe pressure on nerves.

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34. What is the main venous drainage of the sole?

? *Plantar venous arch*, draining into *posterior tibial veins.*

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35. What maintains the transverse arch of the foot?

? *Peroneus longus tendon, adductor hallucis (transverse head),* and *deep transverse metatarsal ligaments.*

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36. Which structure maintains the medial longitudinal arch?

? *Tibialis posterior, flexor hallucis longus, abductor hallucis,* and *spring ligament.*

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37. Which muscle corresponds to the palmaris brevis of the hand?

? *None;* the sole has no direct analogue.

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38. Which muscle corresponds to flexor digitorum superficialis of the hand?

? *Flexor digitorum brevis.*

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39. Which muscle corresponds to flexor digitorum profundus of the hand?

? *Flexor digitorum longus.*

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40. What corresponds to the deep palmar arch of the hand in the foot?

? The **plantar arch.**

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41. What corresponds to the median nerve of the hand?

? **Medial plantar nerve.**

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42. What corresponds to the ulnar nerve of the hand?

? **Lateral plantar nerve.**

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43. What is the chief action of the intrinsic muscles of the sole?

? Stabilize the arches and assist long flexors during walking.

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44. What are claw toes?

? Deformity due to paralysis of lumbricals and interossei ? hyperextended MTP joints and flexed IP joints.

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45. What is pes planus?

? Flat foot — collapse of medial longitudinal arch due to weak ligaments and fascia.

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46. What is pes cavus?

? High-arched foot caused by contracture of plantar fascia or imbalance of foot muscles.

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47. Which muscle forms the “key-stone” of the foot arches?

? *Tibialis posterior.*

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48. What is the relation between plantar fascia and calcaneal spur?

? Spur forms at the attachment of plantar aponeurosis to calcaneal tuberosity due to chronic traction.

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49. What is the direction of the plantar arch?

? Convex laterally, from the base of the fifth metatarsal to the first intermetatarsal space.

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50. What is the clinical importance of the plantar arch?

? Rich anastomosis with dorsalis pedis ensures collateral blood supply; deep position makes hemorrhage difficult to control.