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STRUCTURAL ANATOMY OF GULPHA MARMA; ASSESSMENT THROUGH CADAVER DISSECTION

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ABSTRACT

This Gulpha Marma (ankle joint) is located at the junction of the leg and the foot. The ankle is the uni-axial synovial joint. Since, it is that part of the leg which touches the ground; therefore, the ankle joint is the most frequently injured areas of the body. The region of Gulpha Marma different anatomical structures; one important anatomical structure present here is the tibial nerve (posterior tibial nerve). Percutaneous stimulation of the tibial nerve is used in modern therapeutics for neuromodulation in various complaints of pelvic pain and urinary incontinence. In order to treat deformities of Gulpha, one should have the knowledge of anatomy of joint, to understand its exact anatomical position, its locomotion, internal structure vital point involve in it, it is an attempt to present a guideline about ankle joint according to Ayurveda and modern literature.

Keyword: Marma, Gulpha Sandhi, Sandhigata Marma, Bahuchala, Sakhagata, Ankle joint, Tibiofibular joint

INTRODUCTION

Ayurveda is the ancient science of life and health care. It is an intricate medical system originated thousands of years ago. Ayurveda has explained anatomy in a very broader aspect. One of the unique concepts discussed under this Marma, the vital points

of the body. The development of science of Marma took place from Saraswathi culture to the time period of Acharya Charaka, Sushrutha, Vagbhatta. According to Acharya Sushrutha, Marma point is an anatomical site where Mamsa (muscles), Sira (blood vessels), Snayu (tendons), Asthi (bones), Sandhi (joints) confluence. Prana is embodied at the site of Marma, there are 12 components of Prana. They are Agni, Soma, Vayu, Satwa, Rajas, Tamas, Bhootatma and Panchendriya. These are the basic factors to sustain life. So, Marma is considered as "the vital points" in the body. Ayurveda enumerated 107 Marmas and classified it according to region (Avayava Bhedena), composition (Asraya Bhedena), dimension (Pramana Bhedena), prognosis (Vyapath Bhedena), and number (Sankhya Bhedena). Among them, Gulpha Marma, located at the lower extremities at joint, are two in number, measuring 2 Angula in length and causes agonizing pain when injured. The associated symptoms of stiffness and limping are also noted **[1]**.

GULPHA MARMA

Derivation of word Gulpha is from the root word 'Gal' and 'Fuk' Pratyaya. Etymologically the word 'Gulpha' has been derived from the Sanskrit root 'Gal' meaning Ankle **[2]**.

It is located between Pada and Jangha with 2 Angula in length. It is classified under Rujakara Marma as the consequences of its injury are Ruja, Stabdatha and Khanjatha. Gulpha Marma is anatomically located at Gulpha sandhi. Gulpha is structurally a Kora Sandhi, it is located in both lower extremities. Main functions are weight bearing and locomotion. Functionally it is a Bahuchala Sandhi and is correlated to ankle joint between stable leg and mobile foot, which is a modified hinge joint **[3]**.

The Ayurvedic classics explain the site of Gulpha Marma is where the Paada and Jangha meet together or the part of body where the foot is connected with the leg. Gulpha is the ankle joint which includes tibiofibular and talocrural articulation. In medical terminology, "ankle" can refer broadly to the region or specifically to the talocrural joint. The main bones of the ankle region are the Talus (in the foot), and the Tibia and Fibula (in the leg). Among the 12 components of Prana, there is a predominance of Agni and Vayu in Gulpha Marma. Any trauma to the site causes excruciating pain as Vayu is the basic humour which causes pain in the body. Gulpha Marma is a Sandhi predominant Marma, or one which is located over a joint. But other structures are also (Mamsa, Sira, Snayu, Asthi, Sandhi & Dhamni) involved in the Marma **[4]**.

Table 1	
Site	**Sakha-lower limb**
Size	**2 Angula**
Composition	**Sandhi Marma**
Consequences of trauma	**Rujakara**
Symptoms	**Ruk, Stabdatha, Khanjatha**

LITERATURE REVIEW

Gulpha Marma is one among them, which is located at joint of ankle and foot with a measurement of 2 Angula. It is classified under the group of Marma which results pain when injured. The other symptoms are stiffness and limping. Anatomical correlation of Gulpha Marma is given to the ankle joint, the most frequently injured sites as it is located between the stable leg and mobile foot. Abnormal and excessive force will bring injuries to the joint, such as sprain, ligament injury, fracture etc.so the observational study of Gulpha marma on 30 samples with Gulpha Marma Abhighata was done to know structural and functional changes in ankle joint. The ankle joint injuries showed Gulpha Marma Abhighata lakshana of Ruja, Sthabdatha and Khanjatha. Structural changes were evaluated with radiological study. The Gulpha Marma Abhighata leads to Ruja and Stambha, further if it is not treated that may leads to the disability of the joint i.e., Vaikalyakara **[5]**.

The location of Gulpha Marma is nothing but the joint between tibia, fibula and talus and other structures related to lateral aspect of ankle joint. Marma chikitsa gives Tridosha Triguna Samanya as there is a site of Prana at these points. This chikitsa acts as the pain reliever or prevention aspect of these vital sites or Marma. The injuries related to these Marma can be studied under tendons, ligaments, vessels and bones. These can be considered as Siravedhya and Vatavyadhi and treated accordingly. Based upon the above observations and study we can conclude the exact location, effect of injury, relation with ankle joint of Gulpha Marma **[6]**.

Gulpha Marma is ankle joint, where distal articular surface of the tibia and fibula; medial collateral ligament (deltoid ligament) and lateral collateral ligament meet and form ankle joint. So, the lesion is Sandhi Marma proved. Gulpha Marmaghata Parinama is Ruja; movement restriction of joint, stiffness and limping; because of Gulpha Marma is Rujakara Marma, where severe pain present. Due to trauma in this lesion rupture of medial collateral ligament and lateral collateral ligament; fracture-dislocation of malleoli seen; Due to rupture of tibio-fibular ligament pain; swelling and stiffness of joint present. In 80 percent of cases fracture of distal articular surface of tibia and fibula; spiral fracture of lower end of fibula; malunion of joint/degenerative osteoarthritis seen; because of malunion of

joint\ degenerative osteoarthrosis swelling; pain and stiffness of joint seen. Then restriction of joint movement and lameness present. So according to Acharya Sushruta Gulpha Marmaghata Parinam is pain swelling; stiffness of joint and lameness of leg proved. In every fracture or fracture-dislocation of tibio-fibular joint pain; swelling and stiffness of joint present **[7]**.

In Ayurveda Gulpha is explained under Marma Sharira as Gulpha Marma, it is Adhoshakhagata Sandhi of 2 in number, it comes under kora variety of Chesthavanta Sandhi. it is most vulnerable to damage due to exerted stress, which may produce severe pain, stiffness, swelling, sprain, fracture as per Ayurveda Gulpha Marma located between pada and Jangha compared with modern anatomy, it is found out that it is lies in ankle joint. The Gulpha Marma Abhighata leads to Ruja and Stambha, further if it is not treated that may leads to the disability of the joint i.e., Vaikalyata. The Khanjata means disability, the Khanjata is due to the deformity of structures involved in the Gulpha Sandhi Marma. We need to take care of ankle joint and do regular exercise and oleation for its smooth functioning, based on above review and discussion, we can conclude that ankle joint is vital part of body, hence it is vulnerable, which need to be protected from trauma or injury **[8]**.

Gulpha is explained under Marma Sharira as Gulpha Marma, in Sandhi Sharira as Gulpha Sandhi, in Paribhasha Sharira as Asthisanghata also as situation of jaala. So, there is need to clarify such different aspects of Gulpha. Most of these structures are made up of Mamsa (Muscles), Sira (Vessels and nerves), Snayu (Ligaments and Tendons), Asthi (Bones) and Sandhi (Joints). Also, in modern science tarsal tunnel is a structure in the foot that is formed between the underlying bones of the foot and the overlying fibrous tissue. The flexor retinaculum constitutes the roof of the tarsal tunnel and is formed by the deep fascia of the leg and the deep transverse fascia of the ankle. So, injury to this Gulpha i.e., Gulpha Marma and tarsal tunnel leads to pain, structural and functional deformity of the affected area i.e., tarsal tunnel syndrome **[9]**. Gulpha Marma is anatomically correlated with Flexor hallucis longus and brevis, tibialis posterior and flexor digital longus muscle, posterior tibial artery and vein. Injury to the joint will cause swelling and impair the function of the flexion and extension. Injury to these Marma in sports lead to different kind of symptoms varying from pain to immediate death **[10]**.

The ankle is the uni-axial synovial joint. Since it is that part of the leg which touches the ground therefore, the ankle joint is the most frequently injured areas of the body. In today's modern and fashionable world,

wearing high heels (in females) is considered as a symbol of high standards. This leads to various problems to the ankle, e.g., Ankle sprain etc So, to study the clinical importance related to Gulpha Marma, it is necessary to understand in detail about the Gulpha Marma (ankle joint) and study its clinical anatomy **[11]**.

DISSCUSSION

Gulpha Marma is a Shakha gatha Marma located between Paada and Jangha (the foot and the leg) which is anatomically correlated with the ankle joint region. The vulnerability of the ankle joint is due to the presence of vital point, the Gulpha Marma. Various traumas to the ligaments, tendons and bones leads to the impairment of normal functioning of ankle joint. Ruja, Sthabda paadatha, Khanjatha, Sopha, Asthi Vikruthi Lakshana are observed at ankle joint as a result of several pathologies. If any type of trauma occurs on Gulpha Marma Pradesha, there is a maximum chance of joint injury and main symptom appears is Ruja, so it is a Rujakara Marma **[12]**.

In ankle injuries the Gulpha Marma Abhighata Lakshana of Ruja (pain), Sthabda Paadatha (restricted movement) and Khanjatha (limping) were noted which in turn represents the biomechanical dysfunction of the ankle joint. Various injuries due to strenuous activity, falls, accidents, sports, dance etc at the Gulpha Marma, cause various structural defects **[13]**.

Gulpha Marma is a Sandhi predominant Marma, or one which is located over a joint. But other structures are also (Mamsa, Sira, Snayu, Asthi, Sandhi, Dhamni) involved in the Marma. All these structures may be collectively present at the site, completely or partially. Compositions of Gulpha Marma are correlated with that of ankle joint as:

MAMSA- Peroneus longus, peroneus brevis, superior fibular retinaculum.

SIRA- Perforating branch of Fibular Artery, Fibular nerve

SNAYU- Lateral ligament of the ankle which consists of three separate ligaments 1. Anterior talofibular ligament, 2. Calcaneofibular ligament, 3. Posterior talo-fibular ligament.

ASTHI – Tibia, Lateral malleolus of Fibula and Talus.

SANDHI - Joint between Tibia, Fibula and Talus.

Angula Pramana of Gulpha Marma is 2 Angula which means that area where there is maximum chance of injury to the Gulpha Marma and in ankle region maximum chances of injury is at the lateral side because of weaker lateral collateral ligament **[14]**.

Anatomy of Ankle joint (Talocrural joint) ankle is actually made up of two joints. Subtalar joint 1. It consists of a talus on the top and Calcaneus on the bottom

2. the subtalar joints allows side to side-to-side motion of the foot.

True ankle joint – composed of three bones – 1. The Tibia – which forms the inside or medial portion of the ankle. 2. The Fibula – These forms the lateral or outside portion of the Ankle. 3. The Talus underneath. 4. The true Ankle joint is responsible for up and down motion of the foot.

Articular Surface –

upper articular surface – formed by 1. The lower end of Tibia including medial malleolus. 2. The lateral malleolus of Fibula. 3. The inferior transverse tibiofibular ligament.

Inferior Articular Surface is formed by – 1. Upper aspect of Talus. 2. Lateral aspect of Talus. 3. Medial aspect of Talus.

Superior articular surface is formed by – 1. The downward projection of medial and lateral Malleoli, on the corresponding sides of Talus. 2. The inferior transverse tibiofibular ligament.

Ligaments – Medial ligament or deltoid ligament 1. Posterior Tibiotalar ligament 2. Anterior Tibiotalar ligament 3. Tibio-calcaneous ligament 4. Tibio-navicular ligament. Lateral ligament 1. Anterior Tibiofibular ligament 2. Calcaneofibular ligament **[15]**.

Gulpha Marma points is located just under the ankle. It can relieve stiffness and leg fatigue also a natural analgesic or pain reliever. The joint between Pada and Jangha is said to be Gulpha. The symptoms is Aghat over Gulpha Marma are Ruja, Stabdhapadata and Khanjata,Vatakantaka, Ankle sprain, Fracture, Soccer injuries, Ankle impingement, Flexor 758 alluces longus tendinopathy, Footballers ankle, Sinus tarsi syndrome & Tarsal tunnel syndrome. Panchakarma is the best treatment in disease related to Marma. Human tissue and cells become healthy by the panchakarma therapy. Snehana (Oleation) therapy is a unique modality of Panchakarma treatment it nourishes the tissue and cells so its play of important role to heal the tissues. Swedan (Fomentation) therapy improves blood circulation so it is also helpful in healing process. Leaches suck impure blood so it is also playing important role in healing process. Panchkarma is a best modality to treat disease related in Gulpha Marma **[16]**.

The ankle joint (talocrural articulation) is a hinge-type synovial joint. It is located between the distal ends of the tibia and the fibula and the superior part of the talus. The ankle joint can be felt between the tendons on the anterior surface of the ankle as a slight depression, approximately 1 cm proximal to the tip of the medial malleolus.

LIGAMENTS OF ANKLE JOINT- The ankle joint is reinforced laterally by the lateral ligament of the ankle, a compound structure consisting of three completely separate ligaments 1. Anterior talofibular

ligament, a flat, weak band that extends anteromedially from the lateral malleolus to the neck of the talus. 2. Posterior talofibular ligament, a thick, fairly strong band that runs horizontally medially and slightly posteriorly from the malleolar fossa to the lateral tubercle of the talus. 3. Calcaneofibular ligament, a round cord that passes postero-inferiorly from the tip of the lateral malleolus to the lateral surface of the calcaneus.

BLOOD SUPPLY OF ANKLE JOINT - The arteries are derived from malleolar branches of the fibular and anterior and posterior tibial arteries.

NERVE SUPPLY OF ANKLE JOINT- The nerves are derived from the saphenous, tibial, sural, and superficial and deep fibular nerves. The superficial and deep fibular nerves are branches of the common fibular nerve **[17]**.

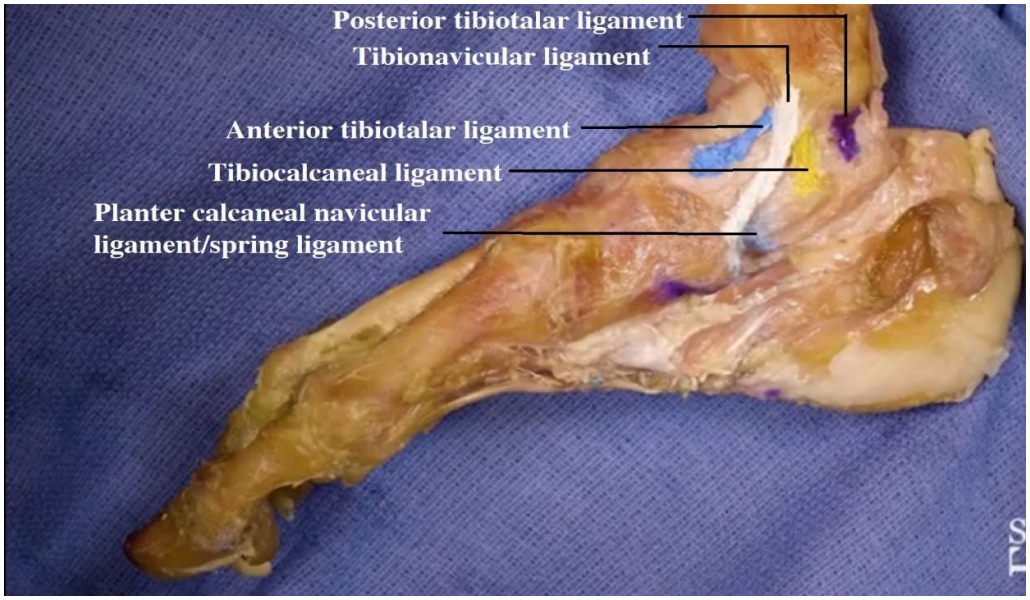

Figure 1

CONCLUSION:

It is situated at the junction of Pada (foot) and Jangha (leg) and an injury to it causes pain. rigidity or limping foot. It is a Sandhi Marma in nature, Vaikalyakara in consequences, Rujakara in injury result and extends an area of two Angula. The term Gulpha Marma is taken on the name of Gulpha Sandhi. It includes distal tibiofibular joint and talocrural joint. An injury to this joint may cause fracture or dislocation. Therefore, pain, rigidity and limping are possible symptoms in the case of Gulpha Marma.

Gulpha Marma is a Sandhi Marma so Sandhi (joints) are dominant structure in this area mainly ankle joint and its ligament. But other structure (Mamsa, Sira, Snayu and Asthi) are also involved in Marma. Ayurvedic view and Modern Correlation of structures involved in Gulpha Marma are as follows-

Table 2: Description of Gulpha Marma

Sthana	**Gulpha Sandhi**
Parimana	**2 Angula**
Sankhya	**2**
Racana Prakara	**Sandhi Marma**
Parinama Bheda	**Rujakara Marma**
Aghat Laksana	**Ruja, Sthabdata and Khanjata**

The structure which lies in the Gulpha Marma: -

Anatomy of Ankle joint (Talocrural joint) is made up of two joints. Subtalar joint and True ankle joint, it consists of-

1. Talus on the top and Calcaneus on the bottom.
2. The subtalar joints

Mamsa (Muscles)

- Peroneus longus muscle
- Peroneus brevis muscle
- Superior fibular retinaculum.

Sira (Vessels and nerves)

- Perforating branch of Fibular Artery
- Fibular nerve
- Tibial Nerve
- Superficial peroneal nerves
- Deep peroneal nerves
- Anterior, posterior tibial and peroneal arteries

Snayu (Ligaments and tendons)

- Medial malleolar ligament
- Anterior ligament
- Longus ligament
- Deltoid ligament
- Posterior ligament
- Anterior talofibular ligament
- Posterior talocalcaneal ligament
- Fibula calcaneal ligament
- Lateral talocalcaneal ligament

Asthi (Bones)

- Tibia,
- Lateral malleolus of Fibula and Talus

Sandhi (Joints)

- Tarsal articulation
- Tarsal articulations
- Distal tibiofibular articulation

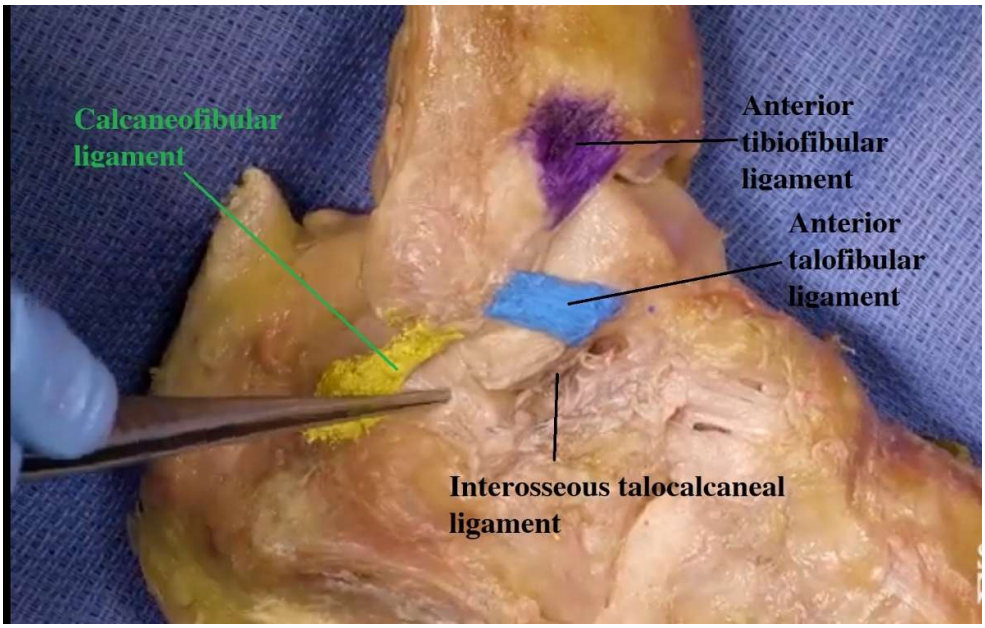

Figure 2

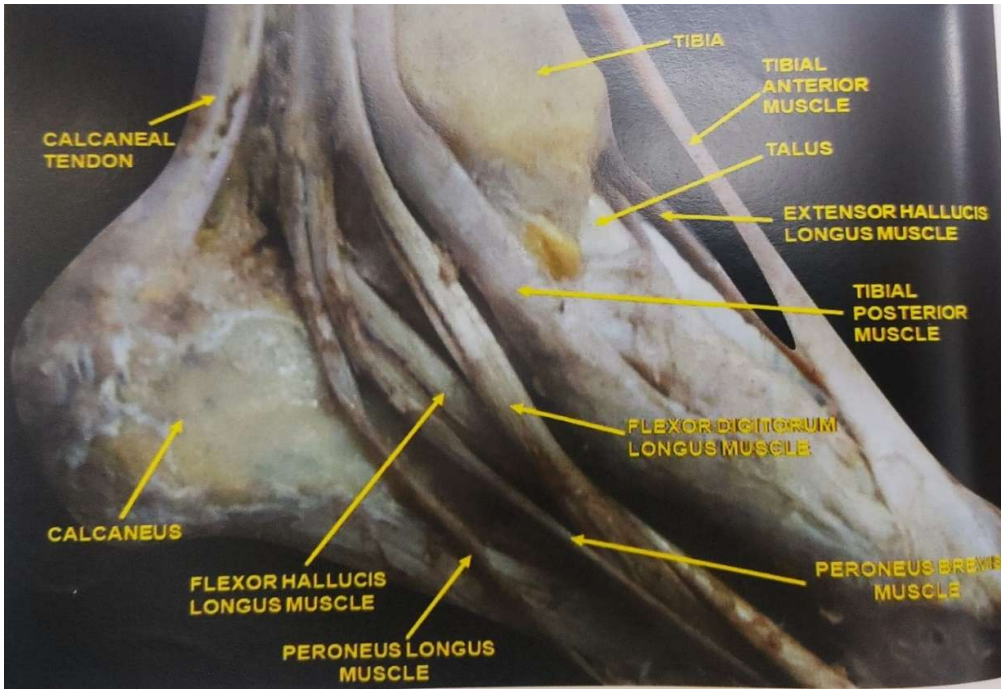

Figure 3

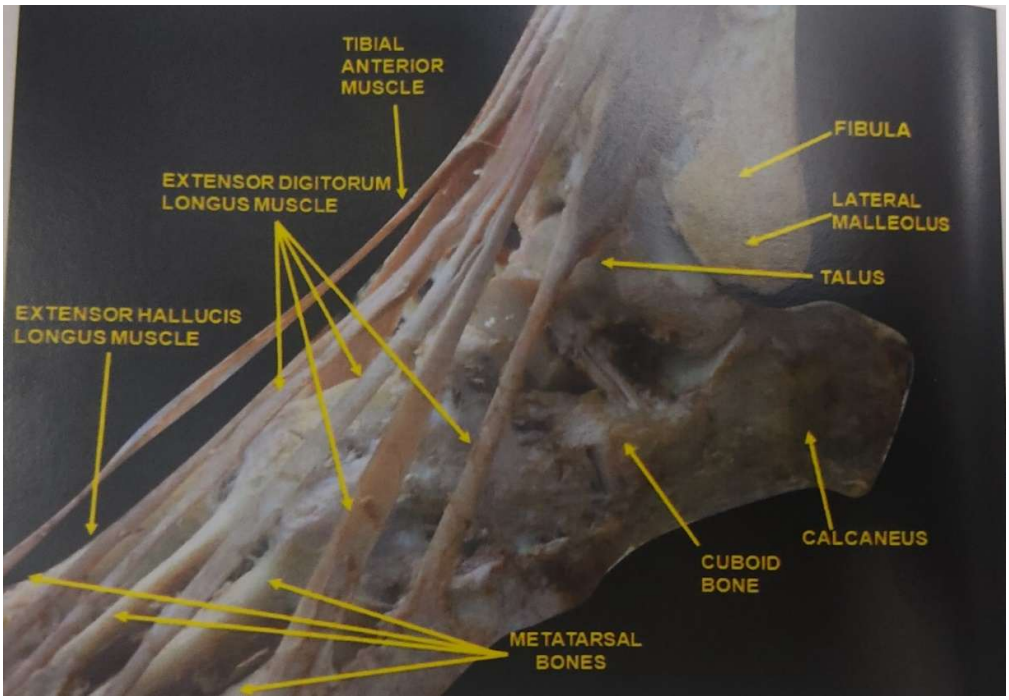

Figure 4

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