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A Study of effectiveness of X-Rays in diagnosing the ligamental tears of the ankle

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Abstract
Conventionally X-ray techniques have been used to diagnose ligament injuries [6, 8, 9].
Magnetic resonance imaging has opened new horizons in the diagnosis and treatment of many musculoskeletal diseases of the ankle and foot. It demonstrates abnormalities in the bones and soft tissues before they become evident at other imaging modalities, but it is expensive and time consuming. But this is still not available in the current scenario. That's why this study is an attempt to find out the effectiveness of X-rays in diagnosing the ligamental tears.

Keywords: Ankle, Ligaments, X-Rays, MRI

Introduction
The ankle joint is one of the most frequently injured joint [1, 2, 3]. The ankle injuries occur in the plantar flexed position of the foot. The lateral ligament is injured more often when compared to medial. A sprained ankle results due to tear of anterior talofibular and calcaneofibular ligaments when the foot is twisted in lateral direction. In forcible eversion of the foot the deltoid ligament may be torn. At times the deltoid ligament pulls the medial malleolus thereby causing avulsion fracture of the malleolus. Potts fracture occurs when the foot is caught in the rabbit hole in the ground and the foot is forcibly everted. In this condition at first there is an oblique fracture of shaft and lateral malleolus of fibula. The strong eversion pull on the deltoid ligament causes transverse fracture of medial malleolus. If the tibia is carried anteriorly, the posterior margin of the distal end of the tibia is also broken by the talus producing a trimalleolar fracture.
Congenital talipes equinovarus or club foot is a common skeletal anomaly affecting the foot. It carries an estimated incidence of 0.5-5 percent of live births [4, 5, 6].
Conventionally X-ray techniques have been used to diagnose ligament injuries [6, 8, 9].
Magnetic resonance imaging has opened new horizons in the diagnosis and treatment of many musculoskeletal diseases of the ankle and foot. It demonstrates abnormalities in the bones and soft tissues before they become evident at other imaging modalities, but it is expensive and time consuming. But this is still not available in the current scenario. That's why this study is an attempt to find out the effectiveness of X-rays in diagnosing the ligamental tears.

Aims and Objectives
To find the effectiveness of x-rays in diagnosing the ligamental tears of ankle joint.

Materials and Methods
This study was done in the Department of Orthopedics, Kanachur Institute of Medical Sciences, Mangalore.
This study was done from January 2019 to December 2019.
This study was done using 15 subjects who were diagnosed to have ligamental tears using MRI. The X-rays were then taken to find the measurements. Then the measurements were also taken in control group with proper consent and then the two groups were statistically studied.

Results

Table 1: Morphometry

	Control			Ligamental tear		
	Mean	Std. Deviation	Sig. (2-tailed)	Mean	Std. Deviation	Sig. (2-tailed)
Talocrural angle	13.06	1.59	0.57	14.91	1.62	Sig
Tibial overlap	10.85	0.60	0.165	8.23	0.79	Sig
Joint space a A	2.98	0.39	0.528	3.81	0.49	Sig
Joint space b B	3.06	0.36	0.963	4.1	0.43	Sig
Tibiofibular distance space	3.56	0.25	0.776	2.8	0.32	Sig

Fig: Showing the above morphometric parameters being taken using a software in Digital X-Ray.

Discussion

Ligaments of the inferior tibiofibular joint

Anterior tibiofibular ligament: It is a flat fibrous ligament. It originates from the longitudinal tubercle on the anterior border of the lateral malleolus and from the lower segment of the anterior border of the shaft of the fibula and are inserted on the anterior edge of the triangular fibular notch. Some fibres reach the anterior surface of the tibia. The fibres are directed upwards and medially.

Posterior tibiofibular ligament: It has two components, superficial and deep. The superficial component originates from the posterior border of the tubercle of fibula. The fibres are directed upward and medially and are inserted on the

posterolateral tibial tubercle. The deep component is the transverse ligament. It has a twisted arrangement. It originates from the round posterior fibular tubercle located above the digital fossa. The fibres are directed upwards, medially and posteriorly. At the posterior border of the tibial articular surface, the fibres change the direction and have a transverse arrangement. It is inserted on the lower part of the posterior border of the tibial articular surface and reaches the medial border of the medial malleolus.

Lateral ligaments of the talocrural

Anterior talofibular ligament: It is a flat, quadrilateral and a relatively strong ligament. It has two bands separated by some vascular branches. The ligament originates from the inferior oblique segment of the anterior border of the lateral malleolus. It courses anteromedially and inserts on the talar body just anterior to the lateral malleolar articular surface.

Posterior talofibular ligament: It is a very strong ligament and has a near horizontal position. The ligament originates on the medial surface of the lateral malleolus from the lower segment of the digital fossa. It courses horizontally and is inserted on lateral surface of the talus in a groove along the posteroinferior border of the lateral malleolus up to its mid segment and also to the posterior surface of the talus.

Calcaneofibular ligament: It is a strong, cordlike or flat oval ligament. It originates from the lower segment at the anterior border of the lateral malleolus. In neutral position of the foot it runs posteriorly, inferiorly and medially. It is inserted on a small tubercle located on the posterior aspect of the lateral calcaneal surface.

Medial ligament of the talocrural joint: The medial collateral ligament also called as the deltoid ligament is a strong, triangular band, attached to the apex and the anterior and posterior borders of the medial malleolus. Of its superficial fibres, the anterior also called the tibionavicular, passes forward to the navicular tuberosity, behind they blend with the medial margin of the plantar calcaneonavicular ligament. Intermediate also called the tibiocalcaneal fibres descend almost vertically to the entire length of the sustentaculum talus. Posterior fibres also called the posterior tibiotalar, passes posterolaterally to the medial side of the talus and its medial tubercle. The deep fibres (anterior tibiotalar) pass from the tip of the medial malleolus to the non-articular part of the medial talar surface [43].

Bipedalism is certainly a feature that evolved fairly early in human history. A tibia attributed to *Australopithecus anamensis* is around four million years old and indicates that this species was bipedal [10]. An efficient bipedal adaptation has been obtained by altering the foot to act as a stable support instead of a grasping limb. The modern human ankle suggests that they were better adapted for upright walking than to climb trees.

Modern humans are the only known obligate bipedals, where the body weight is transmitted to the ground through the lower limbs; each of them sharing 50 percent of the body weight in upright posture. The problem with bipedal walking is to maintain the balance of the body as well as to provide stability to the lower limb especially when one limb is off the ground. In this regard the role of the talocrural joint cannot be ignored.

Patil MS and coworkers[1] in 2012 in their study on anthropometric measurements of ankle mortise for evaluating mortise fracture reductions with an aim to develop contoured implants measured the talocrural angle, tibiofibular clear space, tibiofibular overlap and compared joint clear space at two places. Anteroposterior radiographs, of both ankles in 20 adult individuals formed the material. They agreed that the talocrural angle of two ankles of a given individual does not vary by more than 2 degrees. Tibiofibular clear space on Anteroposterior radiographs measured a mean value of 2.4 mm with a standard deviation of 1.3 mm. Tibiofibular overlap on Anteroposterior radiographs was measured as 11.2 mm with a standard deviation of 4.4 mm. Joint spaces at two levels were almost equal.

Conclusion

The X-Ray in trained hands becomes a powerful tool to diagnose the ligamental injuries of Ankle Joint.

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