

ORIGINAL ARTICLE

Medicine Science 2023;12(4):1337-40

What is the prevalence of plantar tendon used as tendon graft in the Somali population?

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Received 18 September 2023; Accepted 19 October 2023

Available online 24.10.2023 with doi: 10.5455/medscience.2023.10.203

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Abstract

The plantar muscle is fusiform, attaching to the calcaneus, starting behind the knee. Plantaris muscle formation has been reported in humans at a rate approaching 90%. It is frequently preferred for tendon grafting and tendon transfer in hand surgery and Achilles tendon injuries. In this study, our goal is to investigate the frequency of the presence of the plantar muscle in the Somali population. We retrospectively analyzed 607 knee MRI scans performed at Recep Tayyip Erdoğan Training and Research Hospital in Mogadishu between January 2019 and March 2022. The clinical and demographic characteristics of the patients were recorded. Patients with muscle trauma and previous surgery involving muscles, proximal tibia fracture surgery, and soft tissue tumors were dropped out of the study. 469 (77.3%) of these patients were male and 138 (22.7%) were female. 182 (72%) of the male patients with right MRI saw plantaris while 68 (28%) did not. While plantaris was seen in 183 (83.5%) of the male patients who underwent left-sided MRI, plantaris was not seen in 30 (16.5%). Plantaris was seen in 62 (79.5%) of the female patients who had right-sided MRI, while plantaris was not seen in 16 (20.5%). Left plantar was present in 55 (91.7%) and absent in 5 (8.3%) female patients who underwent left-sided MRI. Since the plantaris muscle is used as a tendon graft, pre-op evaluation of its presence is important in terms of surgery and can change the surgical procedure. The presence of the plantar tendon can be revealed by using knee MRI in the Somali population living in the African continent.

Keywords: Achilles tendon, plantaris tendon, autologous graft

Introduction

The plantaris tendon is often used as a graft donor in upper and lower extremity surgery. The plantaris tendon (PT) may be absent in some people and was thought to be a vestigial muscle with poor functional capabilities (Figures 1,2 and 3). Donor sites have been of greatest interest to surgeons, and the plantar tendon has often been used as a graft to repair such as the Achilles tendon, lateral ligaments of the ankle, peroneal retinaculum, and long flexors of the digit [1-3].

The plantar muscle (PM) is fusiform, attaching to the calcaneus, starting behind the knee. It has been reported to contribute to knee and ankle flexion, but this contribution is negligible. It is reported to be present in up to 90% of humans [4,5].

Magnetic resonance imaging can be said to be a screening tool to determine the presence of plantar tendons.

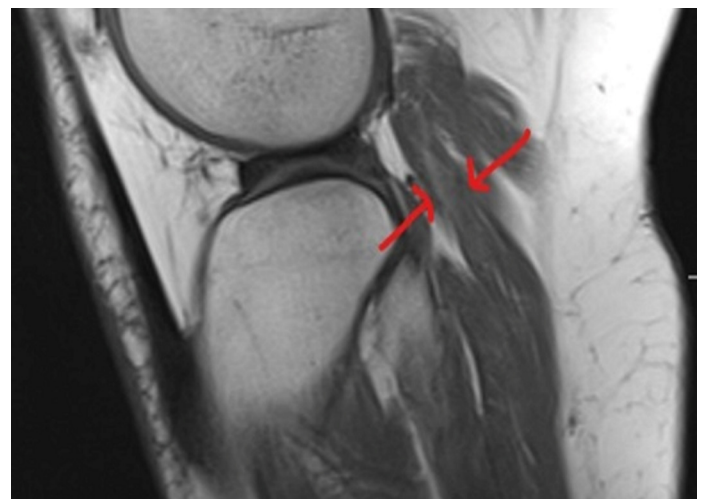


Figure 1. Sagittal MRI plantar muscle

CITATION

Etli I, May H, Cicek EI, et al. What is the prevalence of plantar tendon used as tendon graft in the Somali population?. Med Science. 2023;12(4):1337-40.



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Figure 2. Coronal MRI plantar muscle

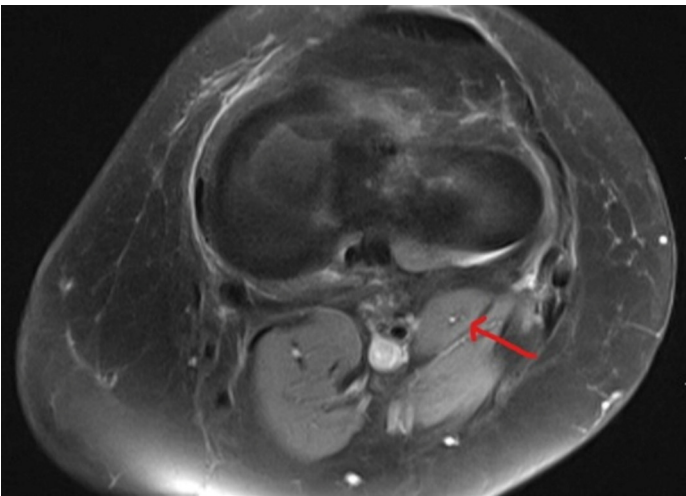


Figure 3. Axial MRI plantar muscle

A thorough knowledge of the morphological variations in this region is necessary for correct diagnosis and treatment. Anatomically, the insertion of the tendon may be more variably located than its origin. It starts from the lateral condyle of the femur and ends at the calcaneus medial to the Achilles tendon [6,7].

We aimed to investigate the prevalence of the plantaris muscle, which is frequently preferred as a tendon graft in hand surgery, Achilles tendon injuries, and tendon transfer, in Somalia.

Material and Methods

We retrospectively reviewed 607 knee MRIs performed at Recep Tayyip Erdoğan Training and Research Hospital in Mogadishu between January 2019 and March 2022. The clinical and demographic findings of the patients were obtained from the hospital records with the ethics committee's decision. This study was approved by the Ethics Committee of Mogadishu Somali-Türkiye Recep Tayyip Erdoğan Training and Research Hospital with Approval No:566 and Date:23.05.2022. All scans were obtained with a Siemens Magnetom Essenza 1.5 Tesla MRI

device with a 5 mm cross-sectional interval.MRI images were evaluated by a radiologist. Axial slices of both T1 and T2 were reviewed. The clinical and demographic characteristics of the patients were recorded. Patients with knee muscle trauma, knee surgery, soft tissue tumors, patients with soft tissue infections, obesity, and overtrained athletes were excluded from the study.

Statistical Analysis: The data in the study were examined for normal distribution using Skewness-Kurtosis, Std/Mean, Q-Q Plots, Histogram, and Shapiro-Wilk Test. Normally distributed parameters with sufficient data were expressed as standard error (MEAN±SEM) and an Independent Samples T Test was used for pairwise comparisons. The chi-square test was used for frequency analysis of categorical data included in the study. The SPSS 23.00 package program was used in the statistical analysis of the study.

Results

In our study, 607 patients were included. Of these patients, 469 (77.3%) were male and 138 (22.7%) were female.

Right radiographs were obtained in 250 (53.3%) and left MRI in 219 (46.7%) of the male patients. Plantaris was seen in 182 (72.8%) of the male patients who had right MRI, while no plantaris was seen in 68 (27.2%). Plantaris was seen in 183 (83.5%) of the male patients who underwent left MRI, while plantaris was not seen in 30 (16.5%). The frequency of plantaris was higher on the left side than on the right side in male patients and this difference was statistically significant (p<0.01) (Tables 1 and 2).

Of the female patients, 78 (56.5%) had right-sided MRI while 60 (43.5%) had left-sided MRI. Plantaris was seen in 62 (79.5%) of the female patients who underwent right-sided MRI, while 16 (20.5%) had no plantaris. Among the female patients who had left-sided MRI, 55 (91.7%) had left plantaris, while 5 (8.3%) did not have left plantaris. According to the statistical analysis, there was no difference between the left and right sides in the frequency of plantaris in females (p>0.05) (Tables 1 and 2).

In all patients who underwent MRI of the right leg, plantaris was seen in 244 (74,4%) patients, whereas plantaris was not seen in 84 (25.6%) patients. Left plantar was seen in 238 (79,4%) of all patients who underwent left leg MRI, while 41 (20.6%) patients did not have left plantar. According to the statistical analysis, the frequency of left plantaris was higher than right plantaris in all patients and this difference was statistically significant (p<0.01) (Tables 1 and 2).

The mean age of women was statistically significantly different from that of men (p<0.001) (Table 3).

Table 1. Tabular representation of patient frequencies

	Number of Patients (n)	Right sided MRI	Left sided MRI	Right plantaris	Left plantaris
Male	469	250	219	182	183
Female	138	78	60	62	55
Total	607	318	279	244	238

Table 2. Analysis of the presence of plantar by gender and directions using the Chi-Square Test

	None	Yes	Sig. (p)
Male			
Right Plantaris			
Observed	68 ^a	182 ^b	0.005 (Pearson Chi Square Test)
Expected	55.4	194.6	
%	27.2	72.8	
Left Plantaris			
Observed	36 ^a	183 ^b	0.083 (Yates Test)
Expected	48.6	170.4	
%	16.4	83.6	
Female			
Right Plantaris			
Observed	16 ^a	62 ^a	0.083 (Yates Test)
Expected	11.9	66.1	
%	20.5	79.5	
Left Plantaris			
Observed	5 ^a	55 ^a	0.001 (Pearson Chi Square Test).
Expected	9.1	50.9	
%	8.3	91.7	
Total			
Right Plantaris			
Observed	84 ^a	244 ^b	0.001 (Pearson Chi Square Test).
Expected	67.5	260.5	
%	25.6	74.4	
Left Plantaris			
Observed	41 ^a	238 ^b	0.001 (Pearson Chi Square Test).
Expected	125	482	
%	20.6	79.4	

Table 3. Analysis of age data of the patients

	Age	Sig. (p)
Male	32.08±0.64	<0.001
Female	38.21±1.48	
Total	33.47±0.60	

Discussion

The literature has reported that up to 19% of the population does not have unilateral or bilateral plantaris. Some researchers have reported that plantar is present in all of the people studied. Van Sterkenburg et al. reported that it was present in all 107 cadaveric studies. However, in some cases, it is difficult to see because it may be adherent to the Achilles tendon distally [8]. Our study in Somalia found that approximately 80.4 percent were present and 19.6 percent were absent. Tendon grafts such as Palmaris longus are frequently used in hand surgery. However, this tendon is reported to be absent in approximately 13% of the literature. The plantaris is often sought as an alternative graft and appears to be absent in approximately 7% of cadavers. There are studies

investigating whether there is a correlation between the absence of one and the absence of the other. In only one of the 150 cadavers dissected, four tendons could not be detected. The rate of plantar absence was 7.3%. The study concludes that there is no evidence to suggest that if the palmaris longus is missing unilaterally or bilaterally, the planters will also be missing [9].

Olewnik et al. In their study of 128 lower limbs, PM was present in approximately (90.1%) and absent in 14 limbs (9.9%). Six men and five women did not have a PM (seven limbs on the left and seven on the right). There was no significant difference in the frequency of absenteeism between genders (p=0.7334) or between body sides (p=0.9964) [10].

Herzog RJ, in a retrospective study to determine the prevalence of a new accessory muscle located at the knee level by MRI, the accessory muscle was named the accessory plantaris muscle because of its close origin with the normal plantaris muscle. In a retrospective review of 1000 knee MRIs performed in patients presenting with knee symptoms; 63 of 1000 patients (6.3%) - 38 men (7.5%) and 25 women (5.1%) - had an accessory plantar muscle. The origin of 62 accessory plantaris muscles merged with the origin of the normal plantaris muscle. One merged with the origin of the lateral head of the gastrocnemius muscle. These accessory plantar muscles are inserted into the iliotibial band, lateral patellar retinaculum, or iliotibial tract. In our study, no such accessory plantar tendon was found [11].

Limitation

Since it was evaluated only on knee MR, we could not obtain any information about the tendon length, and since there was no bilateral scan, it could not be evaluated whether it was on the other side or not. No information about the variants could be obtained.

Conclusion

Since the plantar muscle is used as a tendon graft, pre-op evaluation of its presence is important in terms of surgery and can change the surgical procedure. The presence of the plantar tendon can be revealed by using knee MRI in the Somali population living on the African continent.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

This study was approved by the This study was approved by the Mogadişu Recep Tayyip Erdoğan training and research hospital, Orthopedics and Traumatology Clinic.

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