Results

value adjusted for multiple comparisons. were compared statistically with a one way Anova and partial T test with the p were calculated. The location of the failure was noted. The tendon groups modulus of the linear region of load-elongation curve and the ultimate stress at 10 N per second. Load and separation of the clamps were recorded. The tendons were loaded to failure from slipping out while being loaded. The tendons were loaded to failure at 10 N per second. Load and separation of the clamps were recorded. The modulus of the linear region of load-elongation curve and the ultimate stress were calculated. The location of the failure was noted. The tendon groups were compared statistically with a one way Anova and partial T test with the p value adjusted for multiple comparisons.

Methods:

Ten fresh frozen cadaver feet were acquired from the university anatomical gift program. The feet were thawed, the tendons harvested and refrozen. On the day of testing, the tendons were thawed to room temperature. The cross-sectional area of each tendon was measured using an oval confining area micrometer under a constant transverse compressive stress. The tendons were then clamped in cryo-grips. The Peroneus Longus was tested as a double strand and the Tibialis Anterior and the Tibialis Posterior where tested as a single strand due to the length taken up by the grip. The grips were then attached to a servo-hydraulic testing machine. The initial distance between the clamps was measured. Dry ice was added to the grips and the tendon was frozen at the grips area. The tendons were frozen in the clamps to prevent them from slipping out while being loaded. The tendons were loaded to failure at 10 N per second. Load and separation of the clamps were recorded. The modulus of the linear region of load-elongation curve and the ultimate stress were calculated. The location of the failure was noted. The tendon groups were compared statistically with a one way Anova and partial T test with the p value adjusted for multiple comparisons.

Discussion:

Torn ligaments, such as the Anterior Cruciate Ligament in the knee, can significantly limit physical activity and potentially lead to chronic joint problems. Ligament reconstruction with tendon autografts has been shown in some cases to improve joint function and provide a long term improvement in quality of life. However, harvesting a tendon autograft can cause tissue morbidity and should be avoided in some patient groups such as the elderly. Also, a repeat surgery on a ligament reconstruction which has failed cannot use the same donor site to obtain another tendon graft. For these reasons, allograft tissue is used in some cases for ligament reconstruction. This, too, has limitations since the donor availability is not great from the younger (<50 years) population, which is thought of as being optimal for tendon allografts. Thus, it would be advantageous to use as many of the different tendons as possible from each donor to maximize the supply of allograft tendons. The purpose of this study, therefore, was to characterize the biomechanical properties of three tendons, the Peroneus Longus, Anterior Tibialis and Posterior Tibialis, in order to determine if they could function as acceptable substitutions in ACL/PCL reconstructions.

Conclusions:

Given the limitations of obtaining only one graft from any donor, using a combination of tendons rather than using only one can maximize available tissue. The Peroneus Longus, Anterior Tibialis and Posterior Tibialis have similar mechanical properties and are all adequate for allograft use. Therefore, it is possible to consider using a combination of these tendons to obtain a double or triple graft. Given these limitations however it is useful to know the strength of the allograft tissue in-vitro as a means of comparison between the different tissues. While the intent of this study was not to contrast the properties of these three ligaments there was no significant differences among them. This data when compared to historical measures of other allograft tendon mechanical properties (Noyes, 1983) indicates that these materials when considered as a double strand are comparable to other tendon graft material which is commonly used for Anterior Cruciate Ligament Reconstruction.

Conclusion:

The Peroneus Longus, Anterior Tibialis and Posterior Tibialis have similar mechanical properties and are all adequate for allograft use. Therefore, it is possible to consider using a combination of these tendons to obtain a double or triple graft. Given these limitations however it is useful to know the strength of the allograft tissue in-vitro as a means of comparison between the different tissues. While the intent of this study was not to contrast the properties of these three ligaments there was no significant differences among them. This data when compared to historical measures of other allograft tendon mechanical properties (Noyes, 1983) indicates that these materials when considered as a double strand are comparable to other tendon graft material which is commonly used for Anterior Cruciate Ligament Reconstruction.

Reference:


Figure 1: Ultimate load for the Peroneus Longus (PL), Anterior Tibialis (TIB ANT) and Posterior Tibialis (TIB POST) Tendons. There was no significant difference between the tendons.

Figure 2: Ultimate stress of the Peroneus Longus (PL), Anterior Tibialis (TIB ANT) and Posterior Tibialis (TIB POST) Tendons. There was no significant difference between the tendons.