Is the Plantaris Muscle a Significant Deforming Force in the Equinus Pathology?

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BACKGROUND & OBJECTIVES

Equinus is a pathology that is ubiquitous in treating lower extremity pathologies. The superficial posterior muscle group involved in this deformity consists of the gastrocnemius (gastroc), soleus, and plantaris muscle-tendon units. The plantaris originates from the lateral supracondylar ridge of the femur alongside the lateral head of the gastroc muscle, courses distally and medially between the gastroc and soleus muscles, and then inserts into the calcaneus at the medial aspect of the Achilles tendon. There is no consensus on its prevalence within the population, being reported present anywhere from 80-100%. For many years, the plantaris was thought to be a vestigial muscle with poor functional abilities. More recently, it has been reported to function as a proprioceptive organ for the larger gastroc and soleus muscles, with fine motor function rather than power or stabilization during gait. It is more taut than the other posterior group muscles and the Achilles tendon, however, its potential affect in equinus deformity has not been described in the literature.

The primary objective of this study was to determine the role of the plantaris tendon in equinus deformity of the lower extremity. A secondary study aim was to report the incidence of the plantaris tendon in the treated patient population.

STUDY DESIGN & METHODS

This is a prospective study that includes data from patients having a clinical diagnosis of equinus deformity amenable to an elective intramuscular gastroc recession. The patient population belongs to four surgeons whom all perform this procedure using the same, reproducible technique, as described below. Elective surgical consent and authorized consent to collect research data were obtained pre-operatively. Data collection was performed intra-operatively while the patients were under anesthesia, providing optimal conditions without patient interference.

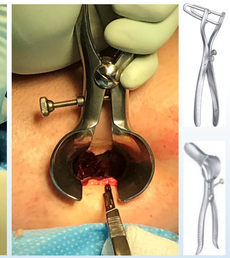
It was recorded if the plantaris was not appreciated. When it was present, there were three reproducible measurement points of ankle dorsiflexion throughout the procedure: prior to skin incision (baseline), after transection of the isolated plantaris tendon (cut 1), and after incision of the gastroc aponeurosis (cut 2). Measurements were performed by a single individual in order remove any user discrepancies. Bisections of the fibula and 5th metatarsal were marked as standardized anatomical landmarks traditionally used to determine equinus deformity. These measurements were recorded onto a sterile gown placard with the foot held in a supinated and dorsiflexion position.

The measured baseline and correction values were used to determine change in ankle dorsiflexion after cut 1, as well as after cut 2. These data points were then used to calculate average and total change in ankle dorsiflexion.

SURGICAL PROCEDURE

1. Incision at the medial calf
2. Blunt dissection to deep fascia
3. Incise deep fascia + find plane between gastroc & soleus muscles

4. Evaluate for plantaris & sharply transect



5. Incise gastroc aponeurosis under direct visualization (retractors to right recommended)

*Normally, Steps 4 & 5 are done in reverse fashion

Bisections for measurement landmarks – fibula & 5th met

Recording measurements onto sterile gown placard

Dorsiflexion at baseline & post-recession

RESULTS

There were 43 consecutive patients over a 4 month period included into this study. The plantaris tendon was not identifiable in 6 (15%) of these patients.

Change in Ankle Dorsiflexion Measured (37 pts)

	Avg	Min	Max
Baseline – Cut 1	8.5	3	15
Cut 1 – Cut 2	7.4	3	14
Total Correction	15.9	6	29

CONCLUSIONS

The results of this study show that the plantaris plays a significant role in equinus deformity. Historically, a high proportion of patients suffering from equinus end up requiring surgery. There are multiple methods to correct the deformity, though this study focuses on a controlled, sequential, intramuscular gastroc recession similar to that described by Baumann and Koch. We found that >50% of the correction from this technique comes from release of the plantaris tendon alone. Further, an average of about 16 degrees in total can be obtained with an intramuscular gastroc recession technique.

The plantaris is only isolated within this technique, though is likely transected during the other common TAL and Strayer techniques as well. With this, it is worth searching for the tendon to complete a gastroc recession and optimize correction. The tendon was not appreciated in 14% of the patients within this study, which corresponds to the current literature. This may be a congential factor, however, we believe this is moreso due to previous rupture of the plantaris or indescernable adhesion to the gastroc aponeurosis.

Patients that rupture their plantaris (reported incidence of 4-9%) are often overlooked, but heal in a self-limiting fashion without loss of function. Patients that have their plantaris stripped in treating chronic Achilles tendinosis heal over a short period of time with minimal complications. In the end, we may be able to dial in mild-moderate correction with a simple release of the plantaris tendon for safer and more efficient intervention when surgically treating equinus.

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