

# Tendon Transfers in the Treatment of Achilles' Tendon Disorders

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## KEYWORDS

- Tendon transfer • Achilles tendon rupture • Achilles tendinosis • V-Y advancement
- Turndown • Flexor hallucis longus tendon

## KEY POINTS

- Chronic Achilles tendon disorders may benefit from tendon transfer procedures to relieve pain and improve function.
- There are numerous options to harvest in the posterior leg, including the flexor hallucis longus, flexor digitorum longus, peroneus longus and brevis, and plantaris, among others.
- The most commonly used tendon is the flexor hallucis longus, given its proximity to the Achilles, options for varying lengths, good power, and phase of action. This tendon can be harvested through the same incision as the Achilles procedure with minimal morbidity or can be harvested at the midfoot if additional tendon length is needed. Multiple studies attest to good functional results with these techniques.
- There is no available literature directly comparing different transfers, so surgeon judgment should be used in selecting the appropriate procedure. In general, good functional results and pain relief can be expected for these interventions.

## PRINCIPLES OF TENDON TRANSFERS FOR ACHILLES RECONSTRUCTION

Following the principles of tendon transfers for procedures around the Achilles will help to ensure optimal outcomes.

Assessment of the soft tissue envelope is paramount. One of the most common complications of procedures around the Achilles tendon is wound-healing problems.<sup>1</sup> Consideration of previous incisions, infections, and scarring aids in appropriate

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surgical planning, including incision location and choice of donor tendon and the potential need for staged procedures.

Although not commonly an issue for these types of Achilles' pathology, any other contractures that will affect postoperative function should be addressed with lengthening or release procedures. This may involve tendon or joint releases.

Choosing the donor tendon involves evaluation of the muscle-tendon location, strength, phase of gait, and line of pull. It is generally accepted that a transferred tendon will lose 1 grade of strength, especially if transferred out of phase. Therefore, care must be used in ensuring that the donor muscle-tendon unit has adequate preoperative power to effect the intended gain in postoperative function. In addition, the tendon transfer should not create weakness or compromise a patient's function. The relative strength compared with the native Achilles tendon of donor tendons need to be considered. For restoring Achilles tendon function, the flexor hallucis longus (FHL) and flexor digitorum longus (FDL) have the most advantageous line of pull given their location in the posterior compartment.

Biomechanical studies<sup>2,3</sup> have shown that the FHL tendon has relatively good strength, is an in-phase tendon, and is anatomically desirable and therefore a good donor source. The peroneal tendons are also located posterior, but in a slightly less advantageous position on the more postero-lateral aspect of the leg. The posterior tibial tendon also has a posterior muscle location, but is less commonly used because of its important native function. Furthermore, the distal muscle belly of the FHL may bring improved vascularity to the surgical area (Table 1).

Optimal reconstruction, regardless of the technique or specific tendon used, requires achieving normal resting tension with viable, healthy tissue.

## ANATOMY

### Posterior Compartment

#### *Gastrocnemius and soleus*

The gastrocnemius/soleus complex is the most dominant muscle group in the posterior leg. The gastrocnemius originates along the posterior femoral condyles, whereas the soleus arises from the proximal aspect of posterior fibula and tibia. The gastrocnemius lies posterior to the soleus, and the 2 muscles coalesce into a single tendon at 10 to 15 cm above the insertion of the Achilles into calcaneus. Branches of the S1 nerve root traveling in the tibial nerve innervate the muscles. Sural branches of

Silver et al, <sup>3</sup> 1985 (Based on Muscle Weights)		Jeng et al, <sup>2</sup> 2012 (Based on Muscle Volume)	
Gastroc-soleus	49	Gastroc-soleus	63.6
Post-tib	6.4	Post-tib	6.5
FHL	3.6	FHL	4.3
FDL	1.8	FDL	1.6
Peroneal Longus	2.6	Peroneal Longus	3.5

*Abbreviations:* FDL, flexor digitorum longus; FHL, flexor hallucis longus; Gastroc-soleus, gastrocnemius/soleus; Post-tib, posterior tibialis.

*Data from* Silver RL, de la Garza J, Rang M. The myth of muscle balance. A study of relative strengths and excursions of normal muscles about the foot and ankle. *J Bone Joint Surg Br* 1985;67(3):432-7; and Jeng CL, Thawait GK, Kwon JY, et al. Relative strengths of the calf muscles based on MRI volume measurements. *Foot Ankle Int* 2012;33(5):394-9.

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