

## Ideas and Innovation

### Our Experience with Achilles Tendon Reconstruction with Semitendinosus Graft Wrapped in Fascia Lata

Touqeer Hussain,<sup>1</sup> Fahad Hanif Khan,<sup>2</sup> Mirza Shehab Afzal Beg<sup>3</sup>

<sup>1-3</sup>Plastic Surgery Department, Liaquat National Hospital, Karachi

#### Abstract |

**Background:** Achilles' tendon rupture leads to significant disability causing abnormal gait. With time, the cut ends of the tendo-Achilles retract creating a huge gap in between which needs reconstruction by a tendon graft like semitendinosus, gracilis, flexor hallucis longus tendon, and tensor fascia lata. However, they are not sturdy enough to replace the powerful Achilles tendon. We used a novel technique to make a suitable replacement for the Achilles' tendon in which the semitendinosus tendon was wrapped in fascia lata and this combination was used to bridge the gap between cut ends of the Achilles tendon.

**Methodology:** All the patients who presented with chronic Achilles tendon injury (>6weeks of injury) from Jan 2017 to Dec 2020 were included. The gap between the retracted ends of tendo-Achilles was bridged by semitendinosus tendon wrapped in fascia lata. The postoperative splint was given on the anterior leg in a plantar flexed position for 6 weeks which gradually converted to 90 degrees of ankle flexion. MRC grade of ankle plantar flexion and gait of the patient was observed at 12 weeks and 6 months postoperatively.

**Results:** Five patients were operated on in four years. The average MRC grade at 12 weeks post-operative was 3 which increased to 5 in all patients at 6 months with the help of post-operative physiotherapy. Observed gait was normal at 6 months of 4 patients and near-normal of 1 patient.

**Conclusion:** Further reinforcement of semitendinosus graft with fascia lata is an innovative technique that constitutes a strong and tough substitute for a broken Achilles tendon.

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**Corresponding Author** | Prof. Dr. Mirza Shehab Afzal Beg, Email: shehabbeg@hotmail.com, Contact number: 0345-2967067

Mailing Address: Department of Plastic Surgery, Wajid Ali complex, Liaquat National Hospital, Karachi

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#### Introduction

Achilles tendon is a combined tendon of gastrocnemius and soleus muscle that inserts on the calcaneum's posterior surface. It is the most common tendon to rupture in the lower extremity.<sup>1</sup> Traumatic rupture of the Achilles tendon is far more common than spontaneous rupture in our region.<sup>2</sup> Traumatic ruptures are common in road traffic accidents, spoke wheel injuries, and sharp lacerations on the lower posterior leg while spontaneous rupture usually occurs in athletes during strenuous sports.<sup>3</sup> The Achilles tendon is vital for ankle plantar flexion

and its rupture leads to significant disability causing difficulty in walking and abnormal gait. Primary repair of the Achilles tendon is only possible in acute injuries while chronic rupture of the Achilles tendon requires complex reconstruction.<sup>4-6</sup> With time the cut ends of tendo-Achilles retract creating a huge gap in between which needs to be reconstructed by a tendon graft.<sup>7</sup>

Commonly used tendon grafts to bridge the gap between the retracted ends of ruptured Achilles include semitendinosus, gracilis tendon, tensor fascia lata, and flexor hallucis tendon.<sup>8-11</sup> However, all the

above-mentioned tendons are not sturdy enough to replace the powerful Achilles tendon. Therefore, we used a novel technique to make a suitable replacement for the Achilles tendon in which we harvested semitendinosus tendon and wrapped it in fascia lata and we secured the combination with multiple polyester sutures and the combination was used to bridge the gap between the retracted ends of tendo-Achilles.

### Methodology

It was a prospective study done between the years 2017 to 2020. All the patients who presented with chronic Achilles tendon injury (>6weeks from the day of injury) during this period were included. After obtaining the informed consent and doing baseline workup, the patients were enrolled in the study and operated under general anesthesia, with the technique mentioned below. The gap between the retracted ends of tendo-Achilles was bridged by the semitendinosus tendon wrapped in fascia lata. The post-operative splint was given on the anterior leg in a plantar flexed position for 6 weeks which gradually converted to 90 degrees of ankle flexion then continued for 6 more weeks.

Strength of reconstructed Achilles' tendon was measured subjectively by MRC grade of ankle plantar flexion in comparison to the normal side, observed at 12 weeks after surgery at the time of the removal of the splint and again at 6 months after surgery. MRC grade was measured by the operating surgeon. The gait of the patient was analyzed at 6 months post-operatively by a separate plastic surgeon and categorized subjectively as normal, near-normal, or abnormal. Complications in post-operative periods were observed and documented.

### Surgical Technique

In the prone position, a curvilinear incision was given on the lower one-third of the posterior leg. Proximal and distal ends of ruptured Achilles tendon were identified and dissected by sharp and blunt dissection in the subfascial plane. Both margins of tendon were freshened until healthy and the resultant gap measured in centimeters. A 3 to 4 cm transverse incision was given on the medial border of the popliteal fossa. Semitendinosus tendon was identified, divided at the distal end, and harvested using a circular tendon harvester. Tensor fascia lata was marked on the lateral aspect of the thigh which originates from the anterior one-third of the iliac crest and inserts on the lateral tibial condyle. A curvilinear incision was given on marked territory and fascia lata was harvested

according to the size of the defect. Semitendinosus tendon was wrapped in harvested fascia and secured with multiple 2/0 polyester sutures (Fig 1). The combination was then interposed between the ends of the tendon by the pulvertaft weave method (Fig 2-4).

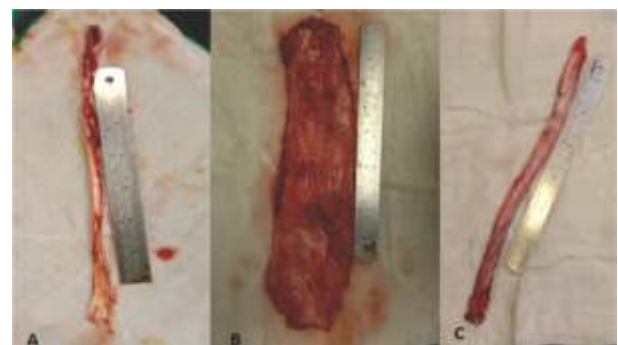
### Results

Five patients were operated on in four years. 4 were males and 1 female. The mean age of the patients was  $34 \pm 2.9$  years. The average duration of trauma to reconstruction was 7.5 weeks. The average gap between the retracted tendons was 6.2cm (4.1cm to 8.3cm). The average MRC grade at 12 weeks post-operative was 3 which increased to 5 in all patients at 6 months with the help of post-operative physiotherapy. Observed gait was normal at 6 months of 4 patients and near-normal of 1 patient. One patient had seroma formation at the donor site of fascia lata which was drained at the bedside. We used a suction drain at the donor site in all other patients. Table 1 illustrates the important results of our study.

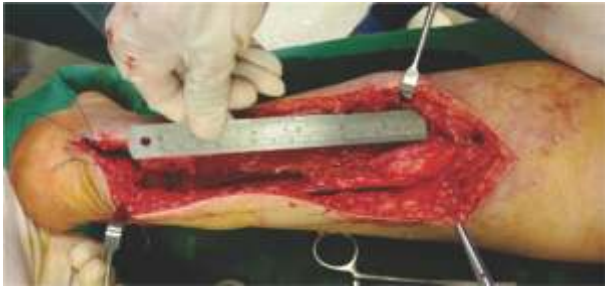
**Table 1:** Demographic data and summary of results

<b>Total no. of patients</b>	<b>5</b>
Males	<b>4</b>
Females	<b>1</b>
<b>Mean age of patients (in years)</b>	<b>34±2.9</b>
<b>The average duration from trauma to reconstruction</b>	<b>7.5 weeks</b>
<b>The average gap between the retracted tendons</b>	<b>6.2cm</b>
<b>Average MRC grade of plantar flexion</b>	
At 12 weeks	3
At 6 months	5
<b>Observed gait at 6 months*</b>	
Normal	4
Near-normal	1
Abnormal	0

\*Assessed by a clinician as not related to research



**Fig 1:** (A) Harvested Semitendinosus tendon (B) Harvested Fascia lata (C) Semitendinosus tendon wrapped in fascia lata graft



**Fig 2:** Gap between the cut ends of Achilles tendon



**Fig 3:** Securing proximal and distal ends of combination to Achilles tendon stumps.



**Fig 4:** Final result showing powerful replacement for Achilles tendon

## Discussion

The technique used in our study for Achilles' tendon reconstruction is innovative and has not been used before. The further reinforcement of semitendinosus graft with fascia lata makes it strong enough to bear weight.

Several other tendons have been tried before to bridge the cut ends of the Achilles tendon but the combination of tendon and fascia was never tried before. Pintore et al<sup>12</sup> used autologous peroneus brevis tendon graft in both acute and neglected Achilles tendon rupture and found more proficient results in acute ruptures while in chronic cases post-operative strength was not sufficient because the length of peroneus brevis is

short as compared to semitendinosus making it less ideal for chronic ruptures.

Wapner et al<sup>13</sup> introduced the use of flexor hallucis longus graft for Achilles tendon reconstruction. Since then numerous studies have been done on its use. The problem with flexor hallucis tendon is that it is not expendable. Its harvest leads to loss of great toe plantar flexion, however in Wapner et al study he did not find any re-rupture of the reconstructed tendon but he found a small decrease in range of motion, which, according to him was insignificant. One of his patients required orthoses for playing sports making use of flexor hallucis longus tendon less ideal for Achilles tendon reconstruction.<sup>11,14</sup>

Maffulli et al<sup>15</sup> used a minimally invasive technique for Achilles tendon reconstruction using semitendinosus graft. He modified the posterior calf incision into two separate small incisions, one in the proximal posterior calf and the other in the distal calf. He then passed the tendon graft under the skin bridge and secures it with proximal and distal ruptured Achilles' tendon stumps. He proposed that using two separate small incisions makes them less prone to surgical site infections as compared to the open technique. We used the open technique with a long incision on the posterior calf but none of our patients developed wound infection.

The use of fascia lata for Achilles tendon reconstruction is usually done in open wounds with associated soft tissue defects.<sup>16</sup> In such case fascia lata is harvested along with vascularized anterolateral thigh flap or tensor fascia lata flap making it a composite flap with simultaneous tendon reconstruction and wound coverage as well.<sup>17</sup> Inoue et al<sup>18</sup> harvested vascularized fascia lata along with anterolateral thigh flap and used the combination for tendon reconstruction and wound coverage and found that at 2 months post-procedure patient was able to walk normally. However but his patients requires a second session of surgery for flap thinning due to bulkiness of flap. In our patients wound was not present in spontaneous ruptures and it was already healed in chronic cases therefore vascularized fascia lata was not required in our cases.

Most of the patients in our study were male which may be because males are more involved in sports or have a laborious occupation in our region.<sup>19</sup> We only included neglected Achilles ruptures in our study because acute ruptures are usually amenable to primary repair. The major drawback of our technique is the need for two separate long incisions on the calf

and thigh making donor site morbidity a principal issue however none of our patients developed hypertrophic scarring. One patient developed seroma in the thigh wound which was identified on 7th post-operative day. It was drained at the bedside under local anesthesia. We used suction drains in all subsequent patients.

The use of the endoscopic technique for the harvest of fascia lata leads to less donor site morbidity but this technique was not available at our setup.

## Conclusion

Further reinforcement of semitendinosus graft with fascia lata is an innovative technique that constitutes a strong and tough substitute for a broken Achilles tendon.

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