

## Case Report

# Microvascular cutaneous coverage in wounds that expose the Achilles tendon: case report

Penelope J. Haquet-Guerrero<sup>1</sup>, Rodrigo Banegas-Ruiz<sup>2</sup>, Hector A. Morales-Yépez<sup>3</sup>,  
Eric Contreras-Sibaja<sup>4</sup>, Daniel Pichardo-Esquivel<sup>5</sup>, Luis M. Hernández-García<sup>5</sup>,  
Paúl Robledo-Madrid<sup>6</sup>, Julián O. Ibarra-López<sup>7</sup>, Julio O. Rodríguez-Bautista<sup>7</sup>,  
Nadia A. Rodríguez-García<sup>8</sup>, Miguel Á. Canseco-Fuentes<sup>8</sup>, Erik A. Torre-Anaya<sup>9\*</sup>

<sup>1</sup>Resident of High Specialty In Hand Surgery and Microsurgery At The National Rehabilitation Institute, Luis Guillermo Ibarra Ibarra

<sup>2</sup>Department of Hand Surgery and Microsurgery, Rehabilitation, Hospital, Luis Guillermo Ibarra Ibarra, CDMX, Mexico

<sup>3</sup>Head of Service of The Plastic Surgery Service of The Hospital Central Militar, Mexico

<sup>4</sup>Head of The Burns Unit of The Hospital Central Militar, Mexico

<sup>5</sup>Physician Assigned to The Service of Plastic Surgery Hospital Central Militar, Mexico

<sup>6</sup>National Rehabilitation Institute Luis Guillermo Ibarra Ibarra, Mexico

<sup>7</sup>Specialty of Plastic Surgery of The Hospital Central Militar, Mexico

<sup>8</sup>Fellowship, Mexico

<sup>9</sup>Physician Attached to Hospital Dalinde Corta Estancia, Mexico

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### \*Correspondence:

Dr. Erik A. Torre-Anaya,

E-mail: [atorre2193@outlook.com](mailto:atorre2193@outlook.com)

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## ABSTRACT

Achilles tendon rupture, being one of the main tendon ruptures present, surgery being the most favourable option even taking into account complications such as infections and skin necrosis, it is necessary to develop techniques which help to reduce complications and increase benefits. The methods follow-up of 2 cases of patients with skin defects in the region of the Achilles tendon in patients who were treated at the "Luis Guillermo Ibarra Ibarra" national rehabilitation institute during the period 2020-2021 in the Traumatology service, treated with radial free flap forearm, using the description of the most used flaps in the literature. Results in both cases integrity of the free radial forearm flap in its entirety, functional recovery for walking, ability to put shoes back on, and without the need for reoperation, as well as a high level of satisfaction by patients. Conclusions if we are talking about an Achilles tendon rupture with a significant skin defect, the free radial forearm flap is an adequate option, if we are talking about a complete defect, the composite flap is the best option, remember that the decision on what type of flap will be used will depend on of the size of the lesion.

**Keywords:** Tendon rupture, Achilles tendon, Radial flap, Microsurgery

## INTRODUCTION

The Achilles tendon is the strongest tendon in the human body and contains several important anatomical entities,

such as the posterior tibial vessels as well as the tibial nerve.<sup>1,2</sup>

In a 2012 meta-analysis by Soroceanu et al regarding Achilles tendon rupture, "the mean age at the time of

injury among 826 patients with acute Achilles tendon rupture was 39.8 years. The lesion has a bimodal age distribution with the first peak in patients between 25 and 40 years of age and the second peak in those older than 60 years. High-energy injuries in sport are responsible for the first peak, while the second peak occurring in elderly are mainly associated with low-energy injuries, such as spontaneous rupture of degenerated Achilles tendon or rupture of Achilles tendinopathy chronic".<sup>3</sup>

The blood supply of the tendon, from the musculotendinous junction, the connective tissues surrounding tissue and the osteotendinous junction, is age dependent and decreases with age. The Achilles tendon has three main vascular areas: the peroneal artery supplies the middle section, while the posterior tibial artery supplies the proximal and distal sections. The relatively poor vascularization of the substantia media of the tendon could explain the frequent incidence of pathology at this site.<sup>4</sup>

Its rupture represents one of the most frequent tendon ruptures, its incidence in some studies in the general population is approximately to 10 per 100,000 and in others is greater.<sup>5,6</sup> There are many reasons why rupture may occur such as traumatic rupture from direct trauma, diabetes mellitus, tendinopathy drug-induced, fibrosarcoma, secondary to disease microangiopathy peripheral artery, among others.<sup>7</sup> There is a male to female ratio of 20:1 and the average age is 30 to 50 years.<sup>7</sup> Some of the risk factors that may be related to this rupture diabetes mellitus, smoking, arthritis rheumatoid arthritis in corticosteroid therapy and stress trauma.

There is no clear consensus on the optimal treatment of acute tendon rupture Achilles. Recently, studies have shown the fundamental role of Functional rehabilitation in the treatment of Achilles tendon rupture. Therefore, a growing number of surgeons seeking to treat the condition prefer the treatment conservative without the risk of complications from surgery. However, the treatment Surgical is still considered a more reliable treatment option for rupture acute Achilles tendon.<sup>3</sup> In young patients with acute sports injuries, conservative treatment is usually enough for tendon healing. However, rupture of the degenerated tendon in the elderly requires a different treatment approach because the tendon remains vulnerable to further rupture even after the operation.<sup>3</sup>

Surgical treatment has become the mainstay of therapy for acute rupture of the Achilles tendon in recent decades, mainly due to the increased risk of rupture after non-surgical treatment. Previously reported meta-analyses concluded that the re-rupture rate varied from 3.5% to 4.3% in the surgical group and in the 8.8% to 9.7% in the non-surgical group. They also found that the rate of rupture was higher after conservative treatment and complications other than rupture occurred significantly more often with surgical treatment. Therefore,

orthopaedic surgeons have preferred surgical repair for acute Achilles tendon rupture.<sup>8</sup>

Surgical complications such as secondary rupture, skin necrosis, seroma, fibrotic reaction, wound dehiscence, and infection with tendon exposure have been reported.<sup>5</sup> being that surgical repair reduced the risk of recurrence of the tendon rupture compared to conservative management, which showed a risk ratio of 0.414, recurrent rupture after surgery has an incidence of 2-8%.<sup>7</sup> Wound infection after surgery has an incidence ranging from 1.7% to 12.2%, and wound dehiscence occurs in 11.8% of cases.<sup>9</sup>

The goals of treatment should be the creation of durable tissue coverage soft with sufficient shear strength, approaching previous functionality to injury, new richly vascularized area that responds to neuroendocrine drug stimuli, resisting shearing forces, withstands repetitive friction by walking, achieves an aesthetic result, allows smooth gliding of the tendons and allows the use of normal footwear.<sup>5,10</sup>

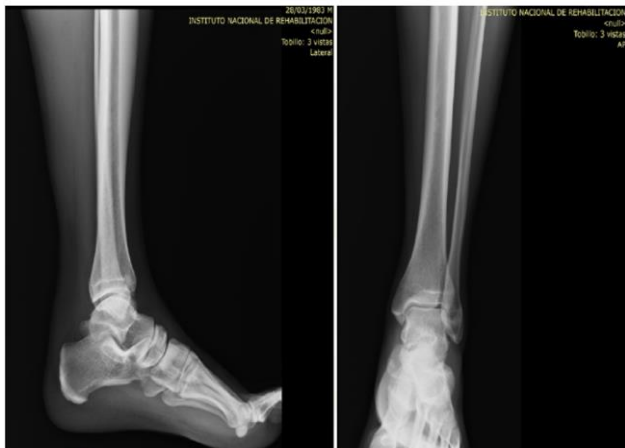
## CASE REPORT

### Case 1

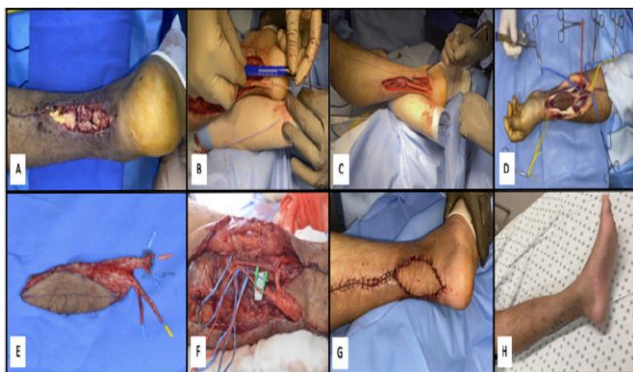
A 37 years old masculine patient, without significant personal pathological history; non-pathological personal reports positive starting smoking at 17 years to date, with smoking index of 10 and positive alcoholism since 17 years old a rate of 2 times a week without reaching the state of intoxication. Start of current illness on 11.15.19 when playing basketball, suffering contusion due to the foot of a third person in the posterior region of the ankle, triggering pain and inability to move the ankle, which was getting worse, which is why which goes to the emergency assessment of this institution on 11.01.20 where rupture of the left Achilles tendon is diagnosed and repair of the left Achilles tendon is performed. Left Achilles with solar technique, graduating without complications. Subsequently goes to the emergency service on 02.22.20, referring to the previous days to present support accidentally of the affected extremity without crutches, evolving with infection of soft tissues and wound dehiscence in the distal third of the left leg, for which reason decides his hospital admission, performing a first surgical stage on 02.26.20 consisting of scarification and debridement of the left Achilles tendon finding necrotic and friable skin, poor quality tendon, not bleeding with tissue liquefied, with presence of inflammation around the suture, without graft integration on the calcaneus, placing a vacuum system and antibiotic therapy, management is performed definitive on 03.04.20 through a Chinese flap for a skin defect on the leg left + transfer of the long flexor of the left hallux to the leg progressing favourably and without major complications during his intra and extra stay hospital in follow-up by the outpatient clinic (Figure 1 and 2).

## Case 2

A 40 years old masculine patient, without significant personal pathological history; non-pathological personal reports positive starting smoking at 17 years to date, with smoking index of 2.7. Onset of current illness on 06.10.19 after presenting sensation of ax blow during sports activities, reports partially improving with physical therapy until 11.12.19 when it worsened and not being able to perform plantar flexion going to this institute for evaluation on 11.28.19 where a rupture of the tendon of the right Achilles undergoing repair of the right Achilles tendon with technique solar on 12.18.19, graduating without complications and in follow-up by the service of traumatology for the outpatient consultation where stitches were removed on 01.03.20 without complications, however, it evolves with distal wound dehiscence without presenting improvement and worsening with the passage of time, so it is decided to admit him to skin coverage, and performed on 07.04.20 skin coverage of the right leg with Chinese flap, progressing favourably and without complications (Figure 3 and 4).



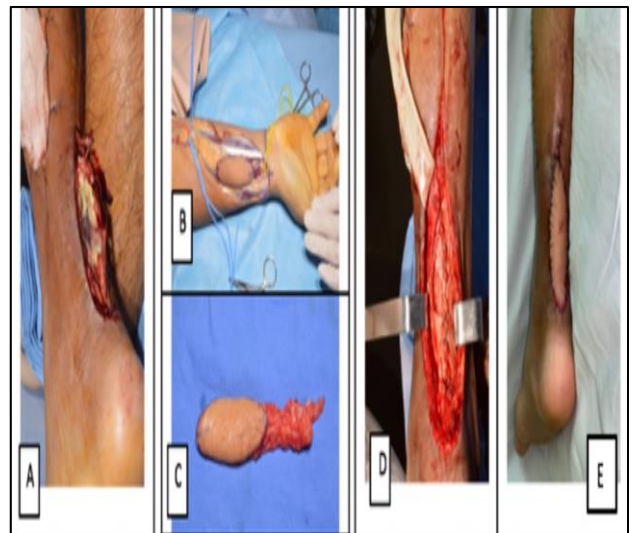
**Figure 1: AP and lateral view of the left ankle.**



**Figure 2 (A-H): Skin defect with exposure and soft tissue infection. Hallux transfer flap lift. Radial flap free forearm. Terminal anastomosis to the posterior tibial system. Final post-surgical result. Results 2 months, dorsiflexion, thin, steady.**



**Figure 3: AP and lateral right ankle.**



**Figure 4 (A-E). Skin defect with exposure and soft tissue infection. Free radial forearm flap lift. Tendon repair and final postoperative result.**

## DISCUSSION

Microsurgery has revolutionized reconstructive surgery by introducing flaps free, this technique allows extracting a piece of tissue from a donor site, including the artery and vein that irrigate it.<sup>11</sup>

The free radial forearm flap is extremely useful when there is a defect important skin but the tendon can be fixed using other methods, such as Nazerali et al did so by reconstructing the Achilles tendon with the flexor hallucis longus which is the second strongest tendon in the region, then they used a free radial flap from forearm, provided good restoration of plantar flexion and stable coverage over the Achilles tendon, which allowed normal footwear.<sup>12</sup> When there is a defect skin and tendon is called compound defects, for these cases the best option is reconstruct with a free flap composed of skin and



tendon or skin and fascia that can be roll up and use as tendon.<sup>13</sup>

The free radial forearm flap with vascularized flexor carpi radialis tendon (FCR), is a composite flap for small or medium composite defects, its tensile strength resists secondary rupture of the reconstructed tendon, promotes local infection control, provides protection, sensation for the prevention of breakdown of the skin and complements the movement of the ankle.<sup>14</sup> Provides good aesthetic results with few disadvantages. Innocenti et al performed a free radial forearm flap with vascularized tendon of the flexor carpi radialis in 6 patients who had a postsurgical infection in the Achilles tendon, as a result found that all the flaps survived and no complications were recorded, optimal tendon reconstruction and range of motion was minimally reduced in compared with the contralateral side.<sup>13</sup> The anterolateral thigh free flap (ALT) with vascularized fascia lata is one of the favorite methods used by surgeons microvascular, is an excellent option for large defects, the flap harvested can have any desirable size and wide vessels and pedicle long facilitate vascular reconnection, but it requires specialized equipment and personnel and is an elevated technique as the fascia has to be dissected and then rolled into a tendon.<sup>15</sup> Some authors believe that despite its advantage, fascia will never have the same properties as a real tendon. Erl et al used this flap in patients with complex Achilles tendon defects and had a reliable and safe, achieving functional results comparable to those of the unaffected side.<sup>16,17</sup>

## CONCLUSION

The ideal procedure for a complex Achilles tendon defect depends on the patient characteristics; in younger patients, a range of motion is desired of full recovery, as well as a strong tendon that resists frictional forces.

If we are talking about a tendon rupture that can be fixed with sutures but has a major skin defect, the free radial forearm flap is a suitable option. Speaking of a complex skin and tendon defect, a composite flap is the best option, since it simultaneously treats both problems. Deciding between free flap forearm radialis with vascularized flexor carpi radialis tendon and free flap anterolateral thigh with vascularized fascia lata, which are two of the flaps most commonly used compounds will depend on the size of the defect. The radial free flap forearm with vascularized flexor carpi radialis tendon is ideal for defects combined small to medium sized flaps, while the anterolateral free flap of thigh with vascularized fascia lata has shown better results for defects large combos.

Regarding our patients presented in the clinical cases, it was observed that the management established performed with free radial forearm flap that we have used in the National Institute of Rehabilitation was adequate for both cases, although it must be take into account the similarity

in time of evolution, risk factors, age, treatment primary surgical procedure, infection and size of the defect, since they were very similar cases and management with said flap was adequate, corresponding to the rest of the literature, evidencing the adequate evolutionary process of each of the patients, thus achieving a complete recovery of ranges of motion, a strong tendon, resistant and stable skin coverage, as expected from the beginning, so which demonstrates with these examples that microsurgery is not only an option unique and economical, if not that we can count on expected and controllable results.

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