

Introduction/Purpose

- The Achilles tendon, despite its strength, is susceptible to injury due to the forces it experiences during activity.
- The Achilles tendon is exceptionally vulnerable because of a watershed area ~6cm from it's insertion where the blood supply is poor.
- The above factors predispose the tendon to rupture or tearing, however, in rare cases when heterotopic ossification is present, there can be a tear, or fracture, through the ossified region.
- The first documented case of a fractured Achilles is from 1932. Since then there have been 30 case reports and 4 case series.

Case Details

- 68yo female with history of transient ischemic attack presents with left ankle pain and weakness after fall downstairs 6 years ago, recently exacerbated by repeat fall nine months prior to presentation.
- Medical history significant for transient ischemic attack two years prior and diabetes. Denies nicotine use.
- Physical examination:
 - Rigid heel cord with palpable defect 10-12cm from insertion
 - Positive Matels test
 - Strength 4-/5 for plantarflexion
- Diagnostic Imaging:
 - Initial radiographs, shown in figure 1, demonstrate extensive heterotopic ossification of Achilles tendon with 1-1.5 defect present. Figure 2 demonstrates a lateral radiograph a year prior to presentation with an intact large area of ossification.
 - CT with 3D reconstruction, displayed in figure 3, re-demonstrate aforementioned ossified tendon with proximal area of separation
- Patient trialed physical therapy, however, was unhappy with the results so decided to pursue surgical management to address her pain, stiffness and weakness.



Fig 1. Lateral radiograph of left ankle. Segmented region of heterotopic ossification measuring 14.5cm superoinferior in total with 1-1.5cm defect between the two segments.



Fig 2. Lateral radiograph of the tibia. Extensive heterotopic ossification measuring 12cm superoinferior almost a year prior to clinic presentation.



Fig 3. Computerized tomography (a) and 3D reconstruction (b) of the left ankle. Confirms extent of heterotopic ossification and presence of defect.

Operation

- The patient underwent an excision of ruptured calcific Achilles tendon, flexor hallucis longus (FHL) tendon transfer to calcaneus, Achilles tendon allograft reconstruction, and calcaneal Haglund bone resection
- With patient prone a longitudinal incision medial to midline was performed from most proximal area of ossification down to insertion of Achilles. The ossified regions were dissected circumferentially prior to complete excision, seen in figure 4
- Remaining portion of distal Achilles tendon was split and a sagittal saw was used to remove the Haglund corner of the calcaneus.
- FHL was then transected and tensioned through a hole drilled into the superior portion of the calcaneus aiming towards plantar cortex. The FHL tendon was fixed into its transferred position with a tenodesis screw after appropriate tensioning.
- An Achilles allograft was then prepared in a V-shaped wedge fashion. The proximal remnant of the native tendon was interlocked with the allograft using Fiberwire suture in a locking fashion shown in figure 5. Longitudinal traction was applied to create excursion and assess appropriate tension between the remaining distal native tendon and allograft. Fiberwire suture in a locking fashion was again used and oversewn with Monocryl.
- Patient was then placed in a short leg splint in plantarflexion and made non-weight bearing. The excised region of ossification demonstrated benign bone and fibrotendinous tissue on pathology.



Fig 4. Excised areas of ossification



Fig 5. Achilles allograft attached to proximal end of native Achilles tendon

Post-op plan and Follow up

- No significant post-operative complications
- Transitioned from splint to cast at two weeks.
- Non-weight bearing for four weeks
- Transitioned to CAM boot and heel lifts with Achilles protocol
- Ten months post-op patient has completed physical therapy and wears a CAM boot intermittently for comfort. Pain has improved from pre-op although she continues to be unable to do a single-legged heel raise.

Discussion

- Achilles tendon ossification is difficult to discern; its theorized that patients with this pathology are often asymptomatic although common presenting symptoms are pain and swelling, reduced range of motion and weakness.¹
- Ossification risk factors are multifactorial but is likely the result of significant trauma, repeated microtrauma, or previous Achilles or lower limb corrective surgery.²⁻⁴
- Hypotheses surrounding heterotopic ossification include chronic tissue hypoxia leading to an inflammatory cascade that creates a shift in cell differentiation from collagen to bone.⁴⁻⁶
- Various models have demonstrated cycles of injury and inflammation influence multiple molecular signaling pathways including bone morphogenic protein, transforming growth factor-beta, Hedgehog and WNT signaling.
- In our case it is impossible to say whether any area of ossification was present during her initial injury 6 years prior to presentation; however, she had no other history of trauma or surgery to that lower extremity.
- Multiple systemic diseases has been seen in conjunction with generalized ossification include diffuse idiopathic skeletal hyperostosis, fluorosis, ochronosis, Wilson's disease, Reiter's syndrome, ankylosing spondylitis, and gout – none of which are present in our patient.
- The extent of ossification, presence of rupture, patient symptoms, and patient goals are important considerations when determining operative vs non-operative management.
- Non-operative management should be considered when there is no fracture through ossified region, mobility is preserved, are able to bear weight, and have symptomatic improvement after 3-6 months of physical therapy, NSAIDS, topical adjuvants, and weightbearing in a CAM boot.¹
- If non-operative management is unsatisfactory, or if the pain has significant pain, limitations with weight bearing or motion then operative management should be considered.
- The goal of Achilles reconstruction is to restore tendon continuity and overall function. This can be achieved through excision of the ossified region followed by use of allograft or autograft replacement. Various graft types have been studied – Achilles allograft, semitendinosus, gracilis, FHL, fascia lata autografts – although the long term outcomes and superiority has not been well published in these cases.⁷⁻⁹

Conclusion

- Achilles tendon ossification is a rare pathology with a complex and multifactorial etiology that continues to be poorly understood.
- History of previous injury, Achilles or lower leg corrective surgery are key risk factors for the development of ossification.
- In cases of with significant ossification and large residual defect and surgical excision an FHL tendon transfer with allograft may be a viable option for Achilles tendon reconstruction.
- However, in our case we are limited to a single case and further research is required before specific treatment recommendations can be made.

References

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