

Allograft Reconstruction of Spontaneous Tibialis Anterior Tendon Rupture in a Diabetic Patient

Don Koh Thong Siang¹, Astuti Pitarini², Kevin Koo¹

Learning Point of the Article:

We have demonstrated good short-term outcomes with the use of TA allograft in the repair of TA tendon ruptures.

Abstract

Introduction: The tibialis anterior (TA) is a powerful dorsiflexor of the ankle. Ruptures of the TA can be a distressing condition that needed a surgical intervention. Fortunately, despite being the third most common lower limb tendon rupture (after Achilles and patellar tendon), ruptures of the TA remain a rare clinical entity. We present a case of spontaneous rupture of the TA in an elderly diabetic lady as well as our successful repair using a TA allograft to bridge the defect gap.

Case Report: A 73-year-old known diabetic lady complains of a 6-month history of progressive right ankle pain and swelling over the dorsum of her foot. She did not recall any trauma or twisting injury. She had tenderness over the anterior ankle, an erythematous cystic soft tissue mass, and weakness in ankle dorsiflexion. In addition, she demonstrated notable prominent first metatarsophalangeal hyperextension on ankle dorsiflexion. Loss of contour of normal TA anatomy was noted over anterior aspect of ankle joint. Magnetic resonance imaging reported a complete rupture of the TA tendon with a 4.2 cm tendon gap. Surgical repair using a TA allograft whip stitched side to side to the proximal TA stump and the remaining allograft secured on the medial cuneiform with bio absorbable screw. Rehabilitation consisted of a structured program with protected weight bearing. At 3 months after surgical repair, the patient was able to return to daily activities.

Conclusion: This case report highlights the successful use of a TA allograft in the repair of a chronic TA rupture in an elderly diabetic patient. This repair has demonstrated to be reliable at 12-month post-surgery and allows prompt return to daily activities.

Keywords: Tibialis anterior, surgical repair, tendon rupture, surgical technique, allograft.

Introduction

The tibialis anterior (TA) is a powerful dorsiflexor of the ankle. Ruptures of the TA can be a distressing condition that needed a surgical intervention [1, 2]. Fortunately, despite being the third most common lower limb tendon rupture (after Achilles and patellar tendon), ruptures of the TA remain a rare clinical entity [3]. Most spontaneous ruptures of the TA occur in patients with clinical predisposition for tendinopathy or mechanical overload [4]. Risk factors include diabetes mellitus [4], gout, inflammatory arthropathy [2], as well as regional corticosteroid application [5]. We present a case of

spontaneous rupture of the TA in an elderly diabetic lady. We share how this clinical presentation can be easily missed due to its rare incidence as well as our successful repair using a TA allograft to bridge the defect gap.

Case Report

We present an atraumatic rupture of TA tendon in a 73-year-old female. This patient was a known diabetic who was referred from our medical colleagues complaining of a 6-month history of progressive right ankle pain and swelling over the dorsum of

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Dr. Don Koh Thong Siang



Dr. Astuti Pitarini



Dr. Kevin Koo

¹Department of Orthopaedic Surgery, Singapore General Hospital, 20 College Road, Academia Building Level 4, 169856, Singapore,
²Department of Orthopedic and Traumatology Surgery, St. Carolus Hospital, Jakarta, Indonesia.

Address of Correspondence:

Dr. Don Koh Thong Siang,
Department of Orthopaedic Surgery, Singapore General Hospital, 20 College Road, Academia Building Level 4, 169856, Singapore.
E-mail: don.koh@mohh.com.sg



Figure 1: (a) Anteromedial incision made along the tibialis anterior (TA), centered over the pseudotumor (circled). (b) Superior extensor retinaculum excised revealing underlying hematoma. (c) Tendon defect gap in neutral. (d) Tendon defect gap in maximum ankle dorsiflexion. (e) Whipstitch of TA allograft onto proximal stump. (f) Use of 7mm bio absorbable screw to anchor allograft into medial cuneiform.

her foot. She did not recall any trauma, insect bites, or puncture of skin over the right foot. The patient declined seeking treatment as she was still able to ambulate. Focal abscess collection was an initial concern, but the patient was afebrile and initial laboratory investigations showed that C-reactive protein, erythrocyte sedimentation rate, as well as white cell count (TW) were not raised. On examination, she presented with a classical triad of tenderness over the anterior ankle, an erythematous warm cystic pseudotumor mass over the anterior ankle, and weakness in ankle dorsiflexion. She experienced discomfort on weight-bearing, with weakness in dorsiflexion and a notable prominent first metatarsophalangeal hyperextension on ankle dorsiflexion. Loss of contour of normal TA anatomy was noted over anterior aspect of ankle joint. Distal pulses were present with no sensory or motor deficits. X-ray of the right foot and ankle revealed extensive soft tissue swelling over the dorsum of the ankle but no bony abnormalities. Magnetic resonance imaging was ordered to characterize the swelling and it revealed a complete rupture of the TA tendon with a 4.2 cm tendon gap.

Surgical technique

The patient underwent surgical reconstruction of the TA tendon 9 days after initial presentation. An anteromedial incision along the TA centered over the pseudotumor (Fig. 1a), extending proximally from the superior extensor retinaculum and distally to the medial cuneiform. Both the superior and inferior extensor retinaculum were released. Hematoma collection was noted at the rupture site and was evacuated.

Unhealthy tendon was debrided (Fig. 1b). The tendon gap was noted to be 4.3 cm in ankle neutral (Fig. 1c) and 3.5 cm when the ankle was maximally dorsiflexed (Fig. 1d). In view of the size of the tendon gap and limited distal tendon stump, an allograft was used. A 7 mm diameter TA allograft (AlloSource®, South Troy Circle, Centennial, United States) was whipstitched side to side to the proximal stump with a 1-0 braided non-absorbable suture (ULTRABRAID Suture, Smith & Nephew, York, United Kingdom) (Fig. 1e). The medial cuneiform was identified with the aid of an image intensifier and a 7 mm bone tunnel was created with the aid of a guidewire. The distal end of the allograft was passed into the bony tunnel and tensioned with the ankle in maximum dorsiflexion. Its position was fixed with 7 mm × 23 mm bioabsorbable screw (Tenodesis Screw™, Arthrex, Naples, Florida, United States) (Fig. 1f). The superior extensor retinaculum was repaired and layered closure was performed. The foot was kept in maximum dorsiflexion at all times with the aid of an assistant until a back slab was applied. The patient put on 6 weeks of non-weight-bearing protocol with the back slab kept on for 2 weeks. She was converted to a non-weight-bearing air cast boot with wedges for a further 4 weeks. At 6 weeks after surgery, she was reviewed and physiotherapy was started with focus on passive range of motion. She was allowed to weight bear as tolerated and at 3 months after surgery was ambulating well. At 9-month post-surgery, no complications were reported.

Discussion

Atraumatic rupture of the TA is rarely encountered clinically and can be easily be misdiagnosed resulting in delayed treatment [6]. Astute clinical history and a focused physical examination are required to promptly diagnose and manage this condition. This patient presented with the commonly described triad of “pseudotumor” over the anteromedial aspect of the affected ankle, loss of tendon contour, and weakness in dorsiflexion [2, 5, 7]. Other features include a slapping gait due to dorsiflexion weakness as well as the hyperextension of the toes on ankle dorsiflexion due to the compensatory use of the extensor hallucis longus (EHL) and extensor digitorum longus [2, 3]. Diabetes mellitus predisposes patients to tendon ruptures [4, 8]. While the underlying mechanism is relatively unknown, it is hypothesized that the non-enzymatic glycosylation of collagen results in rigid sugar-derived cross-links. As a result, fibrin diameter enlarges and becomes irregular and more tightly packed. This rigid construct thereby predisposes diabetic patients to tendon ruptures [9, 10]. In addition, diabetic patients suffer from micro- and macrovascular complications, poor distal perfusion, and diabetic neuropathy further compromise the integrity of the TA. In this patient, the site of TA rupture was located distally, 2 cm from its

insertion – corresponding to the hypovascular segment [3]. Although the patient had no history of injury or trauma, the duration of symptoms (i.e., 6 months) and a sizable tendon gap due to retraction are more suggestive of a chronic rather than an acute rupture. Early detection of this condition may allow primary tendon repair, which is a simpler and shorter operation, with less risk and complications. This should be the aim in managing TA ruptures. However, if in doubt, preparation should always be made for a possible reconstruction of a sizable tendon gap that is not reparable. Surgery remains the mainstay of management for TA ruptures. Diabetic patients are at higher risk of post-operative morbidities such as poor repair healing and chronic wound infections. However, surgical repair enables the ability to restore ambulatory function, avoids the use of orthotics, and preserves normal plantar pressures. Ambulatory function enables activity and translates to better glycemic control while the avoidance of orthotics and preservation of normal plantar pressures avoids the development of pressure sores – worthy goals for our diabetic patients. While primary repair of ruptured tendons remains the surgical technique of choice for most authors, it requires adequate tendon length and mobilization. In chronic ruptures, defect gap post-debridement results in the need of alternative techniques such as tendon transfers, autograft, or allograft reconstruction. The most common technique in literature employs the EHL transfer in the repair of chronic TA ruptures [3, 5, 11, 12]. Patel and Fallat [11] as well as Jain et al. [5] demonstrated good post-operative dorsiflexion with minimal loss great toe interphalangeal joint extension strength with EHL transfer. Despite early return to activity, these reports, however, did not include long-term outcomes. In chronic ruptures, however, larger defect sizes may require graft reconstruction. There is little consensus as to whether free tendon autografts or allograft reconstructions are superior. The largest series to date consists of 19 patients with 11 cases being chronic ruptures [1]. 3 of 11 cases were successfully managed with direct repairs. Sammarco et al., however, opted for free tendon autograft (namely, plantaris tendon, extensor digitorum longus, or Achilles tendon) repairs – achieving significant improvements in post-operative strength. No distinction was made regarding the outcomes

between acute and chronic TA tendon ruptures. Sammarco et al., however, demonstrated low complications with free tendon transfers, with a one case of wound dehiscence in the group with delayed repairs. Donor site morbidity is a common sequelae of free tendon autograft. There is a growing trend toward the use of allograft reconstructions. TA, semitendinosus, gracilis, as well as Achilles tendon have been applied successfully within literature though mostly confined to case reports or series. Huh et al. remained the single largest series today, studying 11 chronic ruptures employing allograft repairs [13]. In six cases, TA tendon allograft was applied, achieving good post-operative strength as well as the American Orthopaedic Foot and Ankle Society scores >80. Despite the risk of disease transmission and potentially longer incorporation time, most authors report low complication rates with allograft reconstruction. From our understanding, we are the first study to report the successful use of TA allograft in the repair of TA rupture in a diabetic patient. We hope that the sharing of our technique will contribute to the existing literature. Larger series will be needed to ascertain the optimal repair option for this rare clinical entity.

Conclusion

This case report highlights the successful use of a TA allograft in the repair of a chronic TA rupture in an elderly diabetic patient. This repair has demonstrated to be reliable at 12-month post-surgery and allows prompt return to daily activities. We encourage the use of a TA allograft in chronic ruptures of the TA, where the gap is significant and irreparable.

Clinical Message

TA ruptures present with a classic triad of tenderness over the anterior ankle, pseudotumor mass over the anterior ankle, and weakness in ankle dorsiflexion. Early surgical intervention yields the best outcome in tendon ruptures. We have demonstrated good short-term outcomes using an allograft to repair a TA tendon rupture.

References

1. Sammarco VJ, Sammarco GJ, Henning C, Chaim S. Surgical repair of acute and chronic tibialis anterior tendon ruptures. *J Bone Joint Surg Am* 2009;91:325-32.
2. Funk SS, Gallagher B, Thomson AB. Repair of chronic tibialis anterior tendon ruptures. *Orthopedics* 2016;39:e386-90.
3. Harkin E, Pinzur M, Schiff A. Treatment of acute and chronic tibialis anterior tendon rupture and tendinopathy. *Foot Ankle Clin* 2017;22:819-31.
4. DiDomenico LA, Williams K, Petrolia AF. Spontaneous rupture of the anterior tibial tendon in a diabetic patient: Results of operative treatment. *J Foot Ankle Surg* 2008;47:463-7.



5. Jain K, Asad M, Joshi Y, Syed A. Tibialis anterior tendon rupture as a complication of first tarsometatarsal joint steroid injection: A case report and review of literature. *Foot (Edinb)* 2015;25:179-81.
6. Markarian GG, Kelikian AS, Brage M, Trainor T, Dias L. Anterior tibialis tendon ruptures: An outcome analysis of operative versus nonoperative treatment. *Foot Ankle Int* 1998;19:792-802.
7. Rajeev A, McDonald M, Newby M, Patterson P. Traumatic avulsion of tibialis anterior following an industrial accident: A case report. *Int J Surg Case Rep* 2015;14:125-8.
8. Maffulli N, Longo UG, Maffulli GD, Khanna A, Denaro V. Achilles tendon ruptures in diabetic patients. *Arch Orthop Trauma Surg* 2011;131:33-8.
9. Bai P, Phua K, Hardt T, Cernadas M, Brodsky B. Glycation alters collagen fibril organization. *Connect Tissue Res* 1992;28:1-2.
10. Reddy GK. Glucose-mediated in vitro glycation modulates biomechanical integrity of the soft tissues but not hard tissues. *J Orthop Res* 2003;21:738-43.
11. Patel R, Fallat L. Surgical techniques for repair of atraumatic tibialis anterior tendon ruptures: A Report of two cases. *J Foot Ankle Surg* 2017;56:1343-9.
12. Velan GJ, Hendel D. Degenerative tear of the tibialis anterior tendon after corticosteroid injection augmentation with the extensor hallucis longus tendon, case report. *Acta Orthop Scand* 1997;68:308-9.
13. Huh J, Boyette DM, Parekh SG, Nunley JA. Allograft reconstruction of chronic tibialis anterior tendon ruptures. *Foot Ankle Int* 2015;36:1180-9.

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