

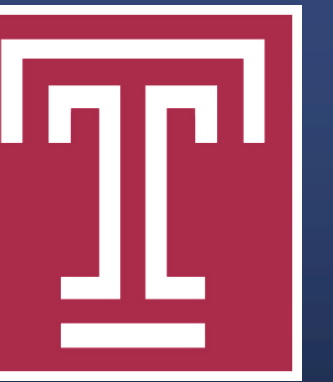
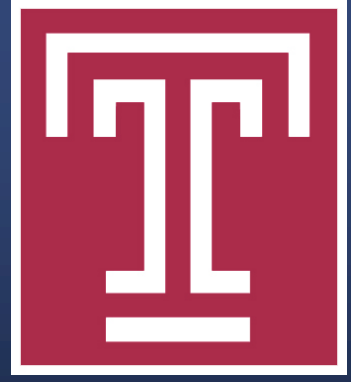
Incidence of Achilles Tendon Ruptures Utilizing the Kuwada Classification and MRI Findings at an Urban Level 1 Trauma Center

Sara Mateen, DPM^a, Jennifer Skolnik, DPM^a, Son Tran, BS^b, Andrew Bloom, BS^b, Jennifer C. Van, DPM, FACFAS^c

^aResident, Temple University Hospital Podiatric Surgical Residency Program, Philadelphia, Pennsylvania

^bStudent, Temple University School of Podiatric Medicine, Philadelphia, Pennsylvania

^cAssistant Professor, Department of Podiatric Surgery, Temple University School of Podiatric Medicine, Philadelphia, Pennsylvania



Statement of Purpose and Literature Review

The Achilles tendon is the largest and strongest tendon in the body which can predispose it to a high incidence of overuse injuries and ruptures.^{1,2} Aside from clinical examination, one of the most reliable imaging studies to evaluate rupture is magnetic resonance imaging (MRI), with 94% sensitivity in correlation with surgical findings.³ While conservative management is recommended for partial tears or tendinitis, surgical treatment is often required for complete tears.⁴ In 1990, the Kuwada classification was published which classified Achilles injury based on the severity of the tear and outlined management options based on the degree of Achilles injury. Partial Achilles tears were classified as Type I injuries and casting/immobilization were recommended. Type II injuries were described as complete tears with less than a 3 cm defect, with primary Achilles repair recommended for treatment. Type III injuries were complete tears measuring between 3 cm to 6 cm, and type IV injuries were described as complete tears greater than 6 cm. For type III and type IV injuries, secondary tendon repair was recommended.⁵

The purpose of the present study was to determine the incidence of Achilles tendon ruptures utilizing the Kuwada classification based on MRI findings in patients who underwent primary or secondary repair of ruptured Achilles tendon with or without grafting in an urban setting at a level I trauma center.

Methodology

A retrospective review of the electronic medical record at a level one trauma center was performed from 2008 to 2018 using CPT codes 27650 (repair, primary, open or percutaneous, ruptured Achilles tendon), 27652 (repair, primary, open or percutaneous, ruptured Achilles tendon; with graft, includes obtaining graft), and 27654 (repair, secondary, Achilles tendon, with or without graft), to evaluate patients with Achilles tendon rupture. Patients were excluded from the present study if there was no MRI or MRI record available for review in the electronic medical record, if they did not have at least a partial tear of the Achilles tendon, or if they had other concomitant injuries necessitating surgical repair with Achilles tendon repair, such as fracture repair. Length/size of tendon defect were obtained directly from the MRI report or if not available, manually measured by one investigator (SM). Once the measurements were obtained, the length of rupture was grouped according to the Kuwada classification as type I, II, III, or IV injury. Incidence rates as grouped by Kuwada classification were then calculated and comparison was made between each type of intervention. Incidence rates of those receiving each of the three different categories of treatments were also evaluated.

Results

Of all patients found using CPT codes 27650, 27652, and 27654 for this retrospective review, 40 of 72 (55.56%) met inclusion criteria. Of the included patients, 17 (42.5%) had Kuwada type I injury, 8 (20%) had Kuwada type II injury, 13 (32.5%) had Kuwada type III injury, and 2 (5%) had a Kuwada type IV injury (Table 1). 19/40 (47.5%) patients underwent primary repair, either with or without grafting. 21/40 (52.5%) underwent secondary repair, with or without grafting. In the Type I population, 4 patients underwent primary repair and 13 patients underwent secondary repair with possible tendinous grafting. Incidence rates of each type of injury based on the Kuwada classification undergoing each of the three types of repair are included below (Tables 2-4).

Kuwada Classification	Total number of Cases (%)
I	17 (42.5%)
II	8 (20%)
III	13 (32.5%)
IV	2 (5%)

Table 1: Total number of cases for each of the Kuwada classification categories for the 40 patients meeting inclusion criteria

Kuwada Classification	# of patients undergoing repair 27650 (%)	Kuwada Classification	# of patients undergoing repair 27652 (%)	Kuwada Classification	# of patients undergoing repair 27654 (%)
I	4 (30.77%)	I	0 (0%)	I	13 (61.90%)
II	3 (23.08%)	II	3 (50%)	II	2 (9.52%)
III	4 (30.77%)	III	3 (50%)	III	6 (28.57%)
IV	2 (15.38%)	IV	0 (0%)	IV	0 (0%)

Tables 2-4: Demonstrate the percentage of patients undergoing either primary repair (27650), primary repair with grafting (27652), or secondary repair based on the size of the Achilles defect as classified via the Kuwada classification



Figure 1: Represents a Type II Kuwada classification measuring approximately 1 cm complete rupture between the two tendon ends

Discussion

This study was performed to determine the incidence of Achilles tendon injury encountered at a level 1 trauma center in an urban setting as stratified by size of rupture using the Kuwada classification. Almost half of the patients, 47.5%, underwent primary repair, while 52.5% underwent secondary repair. The most common injury was seen in the present study was a Type I injury (42.5%), indicating a partial tear, followed by Type III injuries (32.5%). Type I injuries most frequently underwent secondary repair (13 patients or 76.47% of all type I injuries). Contrary to the recommendation for conservative care in the Kuwada classification for Type I injuries, a number of patients in our urban population underwent surgical repair. Additionally, four patients with type III injuries and two patients with type IV Kuwada injuries underwent primary repair, in contrast to the recommendation of secondary repair by the Kuwada classification system. Rosso et al demonstrated that there was no difference in activity level, days off from work, or other functional outcomes in patients treated with conservative therapy versus direct surgical management for Achilles tendon injuries.⁶ However, surgical repair has been implicated with lower re-rupture rates despite a higher initial complication rate as compared to conservative management.⁷

A major limitation of this study was the failure to determine whether patients with Type I injuries attempted conservative therapy before surgery was performed. Also inherent to the retrospective design, it is difficult to determine why patients received primary or secondary repair and whether any specific patient co-morbidities or characteristics contributed to this decision. The present study attempts to determine the incidence of Achilles rupture as classified using the Kuwada classification. This may be useful information for other practitioners in an urban setting in regards to likelihood of these injuries and most common treatments utilized within the urban patient population.

References

- [1] Weatherall J, Mroczek K, Tejwani N. Acute Achilles Tendon Ruptures. *Orthopedics*. 2010. doi:10.3928/01477447-20100826-21.
- [2] Clement DB, Taunton JE, Smart GW. Achilles tendinitis and peritendinitis: Etiology and treatment. *Am J Sports Med*. 1984. doi:10.1177/036354658401200301.
- [3] Kuwada GT. Surgical correlation of preoperative MRI findings of trauma to tendons and ligaments of the foot and ankle. *J Am Podiatr Med Assoc*. 2008. doi:98/5/370 [pii].
- [4] JD W. Physiologic effects of tissue oxygenation on wound healing. *Hear Lung*. 1989.
- [5] Kuwada GT. Classification of tendo Achillis rupture with consideration of surgical repair techniques. *J Foot Surg*. 1990.
- [6] Rosso C, Vavken P, Polzer C, et al. Long-term outcomes of muscle volume and Achilles tendon length after Achilles tendon ruptures. *Knee Surg Sports Traumatol Arthrosc*. 2013. doi:10.1007/s00167-013-2407-1.
- [7] Erickson BJ, Mascarenhas R, Saltzman BM, et al. Is operative treatment of achilles tendon ruptures superior to nonoperative treatment?: A systematic review of overlapping meta-analyses. *Orthop J Sport Med*. 2015. doi:10.1177/2325967115579188.