



## Kager's triangle in detecting acute achilles tendon rupture; a report on two cases

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### Introduction

The Achilles tendon is the most commonly ruptured tendon in the human body (1). Mechanism of injury is often a noncontact injury, resulting from sudden forced plantar flexion or violent dorsiflexion in a plantar flexed foot. Acute ruptures occur most often in men in the third and fourth decades of life who participate in sports intermittently and are often misdiagnosed (2). Because findings may be subtle on history and physical examination, the use of readily available adjunctive studies is important for practitioners (3). One method is the analysis of Kager's triangle on lateral ankle radiographs. Obscuration of Kager's triangle has been described as a radiographic indicator of Achilles tendon rupture, but the sensitivity and specificity of this finding have been poorly reported (4). We aimed to present two traumatic Achilles tendon rupture cases diagnosed by positive Kager's fat pad sign on radiographic imaging

### Case 1

A 55-year-old male patient admitted to the emergency department (ED) with severe pain in the left ankle which occurred after placing his weight onto his left leg. No audible 'pop' was heard but he felt pain in the back of his lower leg and could not weightbear. He had no history of any medical illness nor any medications, and had no previous surgery or injuries to the affected ankle. The physical examination did not reveal any swelling or deformity on the dorsum of the foot or anterior of the ankle. Palpation revealed tenderness in the left retrocalcaneal area. The Thompson test detected as negative. Lateral radiography imaging of the ankle which was performed to assess the patient's osseous and soft tissues, revealed distorted borders of Kager's triangle (Figure 1). These findings were consistent with an Achilles tendon rupture and confirmed by ultrasonography which was reported loss of integrity of the path of the achilles tendon, hematoma formation in the gap between torn tendon ends, posterior acoustic enhancement at the edges of the tear, and alterations in the echogenicity and shape of Kager's triangle (the pre-Achilles fat pad). Surgery was recommended to the patient and the patient was admitted to the hospital. A short leg splint was placed on the patient's leg with the ankle in minimal plantar flexion. The patient was treated surgically next day and complete recovery was observed two months after surgery.

### Case 2

A 23-year-old male patient presented to the ED after his left ankle got cut with a profile cutting machine. On his physical examination, his vital signs were normal, capillary refill time, skin temperature, and mottling score were in normal range for both lower limbs. A two cm transverse laceration was observed in the posterior of the left ankle. The wound was irrigated and non-surgically debrided and a laceration on the Achilles tendon was observed. The Thompson test was positive. After primary wound closure, a dose of tetanus vaccine for prophylaxis and empirical antibiotic treatment of 2 g cefazolin and 5 mg/kg gentamicin were given. Lateral radiography imaging of the ankle revealed obscured borders of Kager's fat pad with no osseous pathology (Figure 2a). On Magnetic Resonance Imaging (MRI) which was performed to evaluate the thickness of the tear and tendinopathies, rupture of the Achilles tendon was observed (Figure 2b). A short leg splint was placed on the patient's leg and he admitted to the hospital for surgery.



**Figure 1. Lateral radiography imaging of left ankle shows distorted anterior and posterior borders (red arrows) of Kager's triangle with regular inferior border (white arrow).**



**Figure 2a. Lateral radiography imaging of left ankle shows distorted borders of Kager's triangle (red arrows), 2b. Magnetic resonance T1W images shows disrupted Achilles tendon with increased thickness and a gap between retracted ends (yellow arrow).**

### Discussion

Achilles tendon rupture is a common injury that is usually sports related, and its incidence is gradually increasing. The incidence of Achilles tendon rupture increased from 2.1/100,000 in 1979 to 21.5/100,000 in 2011. Delays in diagnosis and treatment may complicate the clinical outcome. Physical examination is critical in diagnosis of Achilles tendon rupture and findings that are usually used are: positive Thompson test and palpable defect roughly 2 to 6 cm proximal to the insertion (5). However, 25% of acute Achilles tendon ruptures have been misdiagnosed, which may be due to a false-negative Thompson test, a large hematoma, or plantar flexion secondary to extrinsic foot flexors (5-7).

When an Achilles tendon rupture is not detected on physical examination, the value of the roentgenographic examination of the Achilles tendon is revealed.

Radiography may show various signs of Achilles tendon rupture but investigation should concentrate on Kager's triangle, which is easily identified (8). The Kager triangle is bordered by the deep flexor tendons anteriorly, the Achilles tendon posteriorly, and the calcaneus inferiorly (6).

Because the Kager triangle is filled with fat, on normal lateral ankle radiographs it appears as a radiolucent triangle with sharp edges that rises above the calcaneus (9). In abnormal conditions related to the Achilles tendon (complete rupture or tear), lateral ankle radiographs show increased density of the soft tissue in the Kager triangle and obscured and distorted borders as we focused in the diagnoses of our cases (9).

In a study it's been reported that all patients with Achilles tendon rupture who were confirmed by surgery had a positive Kager's fat pad sign on lateral ankle radiography (8). Again in this study, 18% of the patients were clinically misdiagnosed during the primary examination, but the Kager's fat pad sign was positive in all of these patients.

### Conclusion

Obscuration of Kager's triangle has been described as a radiographic indicator of Achilles tendon rupture, but the sensitivity and specificity of this finding have been poorly reported.

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