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Case Report

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Kager's sign; an underestimated radiographic feature in detecting acute Achilles tendon rupture: A report on two cases

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Abstract

This research aimed to show the role of the number of transferred embryos on pregnancy outcomes of the oocyte donation cycles (ODC). This retrospective cohort study included 122 ODCs performed at a private in vitro fertilization (IVF) center between 2020 June - 2021 January. Cases with severe male infertility, tuboperitoneal, and endometrial factors were not included in the study. The median (interquartile range) recipient age was 43 (30–54) years. ODC results revealed that 10.7% of the cases were negative, 4.9% were biochemical pregnancies, and 84.4% were clinical pregnancies. Pregnancy outcomes were checked; miscarriage, preterm, and term delivery rates were 5.7%, 3.9%, and 90.4%, respectively. The rate of recipients for the younger than 40 years was 32%, between the 40–44 years was 27%, and between 45–54 years was 41% respectively. Statistically significant difference was not observed between age groups in terms of endometrial thickness ($p = 0.059$), number of transferred embryos ($p = 0.857$), number of ODC attempt ($p = 0.666$), live birth rate ($p = 0.1$), and other pregnancy outcomes ($p > 0.05$, for all). A total of 96 (78.7%) embryo transfers (ET) resulted in a live birth. In 8.2% (n=10) of cases, single embryo transfer (SET) and in 91.8% (n=112) of cases, double embryo transfer (DET) was performed. The number of embryos transferred was statistically significantly higher among cases that resulted in live births compared to cases without live births ($p = 0.002$). Significant difference was not found in terms of the recipient age ($p = 0.392$), male age ($p = 0.108$), endometrial thickness ($p = 0.478$), and the number of attempt ($p = 0.777$) between cases resulted in live birth or not. The only parameter that affects the live birth rates in ODC is the number of transferred embryos.

Keywords: Oocyte donation cycle, live birth rate, pregnancy outcome, number of transferred embryos

1. Introduction

The Achilles tendon is the most frequently ruptured tendon in the lower extremity, usually associated with sports activities such as basketball, tennis, and diving (1). Injuries caused by abrupt strong plantar flexion or severe dorsiflexion in a plantar flexed foot are frequently noncontact injuries. Acute ruptures are more common in males in their third and fourth decades who participate in sports regularly, and they are commonly misdiagnosed (2). Because the findings of the history and physical examination may be ambiguous (3), radiographic imaging plays a key role in diagnosis in emergency situations. Although Kager's sign has been defined as a radiographic sign of Achilles tendon rupture, its diagnostic efficacy has not been well studied and has not been frequently used in clinical practice (4). Magnetic resonance imaging (MRI) is the gold standard imaging method in the diagnosis of tendinopathies (5), however, it has disadvantages such as being impractical in emergency situations, not being accessible in all facilities, and being expensive. Although bedside ultrasound imaging is increasingly used to assess tendon pathologies (6), it is still operator dependent and not available in many health centers. Due to the advantages, including being easily accessible, rapid and low-cost, radiography should be into focus in the early detection of Achilles tendon rupture. The objective of this report was to present two cases of traumatic Achilles tendon rupture diagnosed early with a positive Kager's sign-on radiographic imaging.

2. Case Report

Case 1

A 55-year-old male patient was referred to the emergency service with acute pain in his left ankle after shifting his weight onto his left leg. There was no audible 'pop,' but he felt sharp pain in his lower leg and couldn't bear weight. He had no previous surgeries or injuries to the affected ankle, and he had no medical history or medications. There was no edema or deformity on the dorsum of the foot or the anterior of the ankle during the physical examination. Tenderness in

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the left retrocalcaneal region was palpable. Thompson test, which has a sensitivity of 96% and a specificity of 93% (7), was negative in our case. The patient's osseous and soft tissues were assessed with lateral radiography of the ankle, and Kager's triangle's deformed edges were observed (Fig. 1).

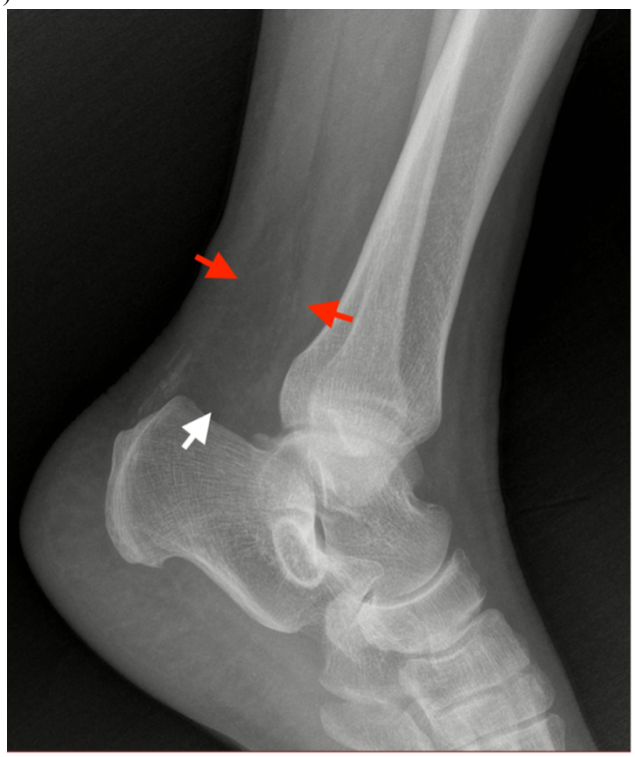

Fig.1. Lateral radiography imaging of the left ankle shows distorted anterior and posterior borders (red arrows) of Kager's triangle with regular inferior border (white arrow).

The patient was diagnosed with acute Achilles tendon rupture without further imaging and was admitted to the hospital with an early operation decision. The patient was placed in a short leg splint with the ankle in limited plantar flexion and admitted to the hospital for surgery. In the operation performed the next day, tendon rupture was surgically confirmed and repaired. The patient recovered completely within two months following the operation.

Case 2

A 23-year-old male patient presented to the emergency service with penetrating trauma in his left ankle from a profile cutting machine. On his physical examination, his vital signs were normal, capillary refill time, skin temperature, and mottling score were in the normal range for both lower limbs. A deep two cm transverse laceration was observed in the posterior left ankle. The limitation of motion in the ankle joint was observed, and the Thompson test was found to be positive. After primary wound closure, a dose of a tetanus vaccine for prophylaxis and empirical antibiotic treatment of 2 g cefazolin and 5 mg/kg gentamicin were given. On lateral ankle radiography, the borders of Kager's fat pad were distorted, but there was no osseous abnormality (Fig. 2a). On Magnetic Resonance Imaging (MRI) which was performed to evaluate the thickness of the tear, a total rupture of the Achilles tendon was observed (Fig. 2b).

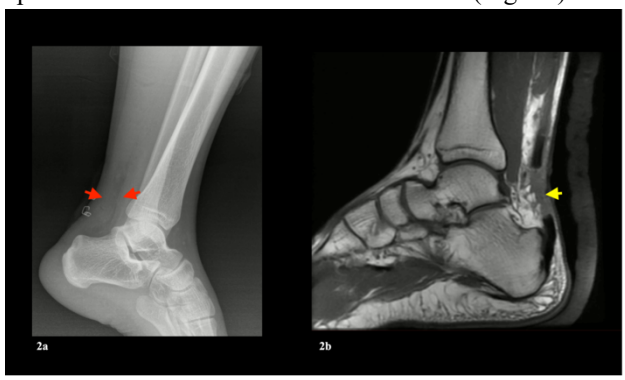

Fig.2. Lateral radiography imaging of the left ankle shows distorted borders of Kager's triangle (red arrows) **(2a).** Magnetic resonance T1W images show a disrupted Achilles tendon with increased thickness and a gap between retracted ends (yellow arrow) **(2b).**

The patient was admitted to the hospital, and the ruptured tendon received surgical repair after 16 hours of injury. The patient recovered completely within four months following the operation.

3. Discussion

Early detection of Achilles tendon rupture is critical since delayed treatment can lead to long-term complications such as ankle joint stiffness and limitation of motion, gait asymmetry or abnormality, and pain. In delayed cases, even if the area between is filled with healing tissue, there is weakness in ankle movement (8).

A positive Thompson test and a noticeable defect around 2-6 cm proximal to the insertion site are common physical examination findings in the diagnosis of Achilles tendon rupture. A quarter of acute Achilles tendon ruptures are misdiagnosed due to a false negative Thompson test, a large hematoma, or plantar flexion caused by extrinsic ankle flexors (9). The significance of recognizing the Achilles tendon rupture by radiography is revealed when the rupture is not detected during a physical examination.

Although magnetic resonance imaging (MRI) is accepted as the gold standard imaging approach for diagnosing Achilles tendon rupture, radiography should be encouraged, which is less expensive and more accessible and can simultaneously evaluate bone, air, and soft tissue.

Kager's triangle is defined as the area filled with adipose tissue, bounded posteriorly by the Achilles tendon, anteriorly by the flexor hallucis longus muscle, and inferiorly by the calcaneus bone (3). Because it is densely packed with fat, Kager's triangle looks like a radiolucent triangle having sharp edges rising beyond the calcaneus on standard lateral ankle radiography. In cases of complete or partial rupture of the Achilles tendon, lateral ankle radiographs show that the soft tissue density increases in the Kager's triangle, its sharp contour disappears, and its borders become unclear and deformed (10). The triangle shrinks, loses transparency, and is

enclosed in a shadowy mesh.

In a study, it was reported that the Kager's sign was positive in the lateral ankle radiograms of all patients with Achilles tendon rupture and confirmed by surgery. During the initial physical examination, 18% of the patients were misdiagnosed, and although all of the patients had Kager's sign, it was not recognized by clinicians (11). Although this suggests that Kager's sign has a good ability to detect Achilles tendon ruptures, clinicians are not much aware of it, and it has not been frequently used in clinical practice.

Surgery is still the most reliable and long-term beneficial method of treatment, and it has been reported that surgery performed within the first 48 hours has superior results (12, 13), highlighting the significance of early diagnosis again.

The clinical use of Kager's sign, which facilitates the radiological diagnosis of Achilles tendon rupture in the early period, especially in emergency departments, should be increased, and further studies should be conducted on its diagnostic value.

Patient's consent

Informed consent was obtained from both of the patients.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

1. Józsa L, Kvist M, Bálint BJ, et.al. The role of recreational sport activity in Achilles tendon rupture. A clinical, pathoanatomical, and sociological study of 292 cases. Am J Sports Med. 1989 May-Jun;17(3):338-43. doi: 10.1177/036354658901700305.
2. Hattrup SJ, Johnson KA. A review of ruptures of the Achilles tendon. Foot Ankle. 1985 Aug;6(1):34-8. doi: 10.1177/107110078500600107.
3. Ufberg J, Harrigan RA, Cruz T, et al. Orthopaedic pitfalls in the ED: Achilles tendon rupture. Am J Emerg Med 2004;22: 596–600. doi: 10.1016/j.ajem.2004.09.007
4. Belyea CM, Krul KP, Lause G, et.al. The Reliability of Kager's Triangle in Detecting Acute Achilles Tendon Ruptures. Orthopedics. 2020 Mar 1;43(2):e91-e94. doi: 10.3928/01477447-20191212-05. Epub 2019 Dec 16
5. Kayser R, Mahlfeld K, Heyde CE. Partial rupture of the proximal Achilles tendon: a differential diagnostic problem in ultrasound imaging. Br J Sports Med. 2005 Nov;39(11):838-42; discussion 838-42. doi: 10.1136/bjsm.2005.018416.
6. Aminlari A, Stone J, McKee R, et al. Diagnosing Achilles Tendon Rupture with Ultrasound in Patients Treated Surgically: A Systematic Review and Meta-Analysis. J Emerg Med. 2021 Nov;61(5):558-567. doi: 10.1016/j.jemermed.2021.09.008. Epub 2021 Nov 17.
7. Maffulli N. The clinical diagnosis of subcutaneous tear of the Achilles tendon. A prospective study in 174 patients. Am J Sports Med. 1998 Mar-Apr;26(2):266-70. doi: 10.1177/03635465980260021801.
8. Kerr J. Achilles tendon injury: assessment and management in the emergency department. Emerg Nurse. 2005 May;13(2):32-8. doi: 10.7748/en2005.05.13.2.32.c1186.
9. Mazzone MF, McCue T. Common conditions of the achilles tendon. Am Fam Physician. 2002 May 1;65(9):1805-10. PMID: 12018803.
10. Ly JQ, Bui-Mansfield LT. Anatomy of and abnormalities associated with Kager's fat Pad. AJR Am J Roentgenol. 2004 Jan;182(1):147-54. doi: 10.2214/ajr.182.1.1820147.
11. Cetti R, Andersen I. Roentgenographic diagnoses of ruptured Achilles tendons. Clin Orthop Relat Res. 1993 Jan;(286):215-21. PMID: 8425349.
12. Kokulu K, Akça HŞ. The Kager's Fat Pad Sign. J Emerg Med. 2017 Nov;53(5):760-761. doi: 10.1016/j.jemermed.2017.08.014. Epub 2017 Oct 4.
13. Misir, A., Kizkapan, T.B., Arikan, Y. et al. Repair within the first 48 h in the treatment of acute Achilles tendon ruptures achieves the best biomechanical and histological outcomes. Knee Surg Sports Traumatol Arthrosc 28, 2788–2797 (2020). doi: 10.1007/s00167-019-05536-w.