



Floor-level Indian Toilet Seats and Shooting Stones: Unusual Causes of Open Achilles Tendon Ruptures among the Pediatric Age Group in Rural India

Inodoro en cuclillas y caída de piedras: Causas inusuales de desgarros abiertos del tendón de Aquiles entre el grupo de edad pediátrica en la India rural

Manik Sehgal¹ Towseef Ahmad Bhat¹ Rubinder Kaur² Sarvesh Singh¹ Gurjant Singh Sandhu³

¹ Department of Orthopedics, Pt. JLNMC Chamba, Himachal Pradesh, India

² Department of Anesthesia, SGRD Medical College Amritsar, Punjab, India

³ Department of Orthopedics, Dr. RPGMC Tanda, Kangra, Himachal Pradesh, India

Address for correspondence Manik Sehgal, M.B.B.S., M.S., Department of Orthopedics, Pt. J.L.N.G.M.C., 176310, Chamba, Himachal Pradesh, India (e-mail: Maniksehgal2001@gmail.com).

Rev Chil Ortop Traumatol 2023;64(1):e1–e4.

Abstract

Context Isolated Achilles tendon (AT) injuries are rarely reported in the pediatric age group. There are only few case reports of traumatic AT injuries in children. Floor-level Indian toilet seats and shooting stones from mountains make such injuries reasonably common in northern India.

Aims To identify similar patterns of AT rupture in the pediatric age group from floor-level Indian toilet seats and shooting stones.

Materials and Methods We report a series of 13 patients in the age group between 8 and 18 years who presented to our hospital between January 2019 and January 2021 with open AT injuries. All the patients were operated on after wound washing and debridement. Standard injectable antibiotic coverage was given to all. In the statistical analysis, the values were expressed as means and medians.

Results In 10 out of the 13 patients, the toilet seat induced the AT injury; for the remaining 3 patients, the injury was induced by shooting stones. A total of two patients had postoperative wound complications, and one patient needed flap coverage. All the patients did well by the final follow up.

Conclusion The main aim of the present study was to show the unusual causes of an injury rarely reported in pediatric age group. We observed that open AT ruptures in children are reasonably common in our region as compared with the rest of the world.

Keywords

- ▶ Achilles tendon
- ▶ pediatric
- ▶ Indian
- ▶ new pattern
- ▶ trauma

received
August 10, 2021
accepted
January 10, 2022

DOI <https://doi.org/10.1055/s-0042-1743544>.
ISSN 0716-4548.

© 2022. Sociedad Chilena de Ortopedia y Traumatología. All rights reserved.

This is an open access article published by Thieme under the terms of the Creative Commons Attribution-NonDerivative-NonCommercial-License, permitting copying and reproduction so long as the original work is given appropriate credit. Contents may not be used for commercial purposes, or adapted, remixed, transformed or built upon. (<https://creativecommons.org/licenses/by-nc-nd/4.0/>)

Thieme Revinter Publicações Ltda., Rua do Matoso 170, Rio de Janeiro, RJ, CEP 20270-135, Brazil

Indian toilets can be replaced with Western toilets or modified so they have a less slippery surface, in order to prevent such injuries in children.

Resumen

Contexto Las lesiones aisladas del tendón de Aquiles (TA) rara vez se informan en el grupo de edad pediátrica. Hay pocos informes de casos de lesiones traumáticas del TA en niños. Los inodoros en cuclillas, también conocidos como inodoros indios, y las caídas de piedras desde las montañas hacen que tales lesiones sean razonablemente comunes en el norte de India.

Objetivo Identificar un patrón similar de desgarro del TA en el grupo de edad pediátrica por la utilización de inodoros en cuclillas y la caída de piedras.

Materiales y métodos Presentamos una serie de 13 pacientes en el grupo de edad entre 8 y 18 años que presentaron al nuestro hospital entre enero de 2019 y enero de 2021 con lesiones abiertas del TA. Todos los pacientes fueron intervenidos tras lavado y desbridamiento de la herida. Se brindó cobertura antibiótica inyectable estándar a todos. En el análisis estadístico, los valores fueron expresados como medias y medianas.

Resultados En 10 de los 13 pacientes, las lesiones fueron causadas por los inodoros indios, y los 3 restantes tuvieron lesiones inducidas por caídas de piedras. Un total de 2 pacientes tuvieron complicaciones postoperatorias de la herida, y un paciente necesitó cobertura con colgajos. Todos los pacientes evolucionaron bien al final del seguimiento.

Conclusión El objetivo principal del estudio fue mostrar las causas inusuales de una lesión raramente reportada en el grupo de edad pediátrica. Observamos que las rupturas abiertas del TA son razonablemente comunes en niños en nuestra región en comparación con el resto del mundo. Los inodoros indios pueden reemplazarse por otros occidentales, o modificarse con una superficie menos resbaladiza para evitar este tipo de lesiones en niños.

Palabras clave

- ▶ tendón de Aquiles
- ▶ pediátrico
- ▶ indio
- ▶ nuevo patrón
- ▶ trauma

Introduction

The Achilles tendon (AT) is the strongest and the most ruptured tendon in the human body.¹ Its location makes it prone to injuries involving sports, sharp weapons, and road traffic accidents. Most of the published literature²⁻⁴ is on closed AT injuries. There are very few studies^{5,6} on open AT injuries, as they are rarely reported in both developing and developed countries.

Isolated open AT injuries are seldom reported in children, and the exact incidence of AT injuries in the pediatric age group is not known.⁷ Bicycle and motorcycle spoke injuries to the heel and AT have been reported in young people, but such injuries mostly damage the heel pad.⁸ There are few case reports⁹ of traumatic AT ruptures in the pediatric age group.

We herein present a case series of isolated open AT injuries of unusual cause in the pediatric age group. To the best of our knowledge, there is no study published on isolated open AT injuries in children. The present study is a series of cases of open AT ruptures in children caused by entrapment of the foot in floor-level Indian commodes and shooting stones in a hilly state in northern India.

Materials and Methods

Between January 2019 to June 2021, 13 children presented to our hospital with open AT injuries. The patients were aged between 8 and 18 years, and the time from the injury to the presentation at the hospital ranged from 2 to 16 hours. In total, ten patients reported directly to our hospital, and three patients were referred from peripheral hospitals where the wounds were washed and cleaned. History of entrapment of a foot in a floor-level toilet seat was reported by ten patients. Some of the patients reported a history of breakage of the toilet seat during this process (► Fig. 1a, 1b). In 3 patients, the injury occurred due to shooting stones from mountains while doing agricultural work. None of the patients had history of any associated illnesses or of prolonged drug use. All of the patients were initially examined in emergency room. Their wounds were thoroughly washed and cleaned with normal saline and iodine. Hydrogen peroxide wash was also performed for all of the patients. Complete TA rupture was observed in 11 patients, while 2 of them had incomplete ruptures. All patients with complete tears were operated on under spinal anesthesia, and the two patients with incomplete tears were operated on under local anesthesia.

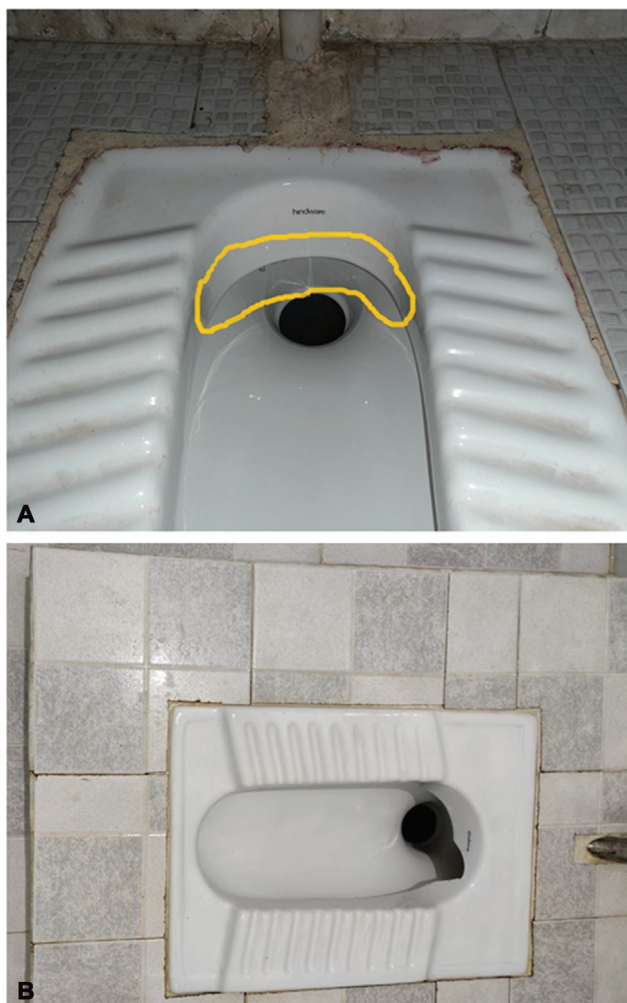


Fig. 1 (A) Rounded but prominent margin of floor-level toilet seat, most likely the cause of an AT injury. (B) Photo of a broken toilet seat in which a child trapped his foot; the sharp broken edge caused further damage.

During surgery, no extension of skin incision was performed, except in two cases in which small paramedian incisions were made to reach the retracted proximal end. Since this area is less vascularized and prone to wound complications, we tried to minimize the skin damage. In all of the patients, the distal part of the stump was to some extent crushed and needed proper debridement before the end-to-end closure.

Results

The sample was composed of nine boys and four girls with ages ranging from 8 to 18 years. The right side was involved in eight cases, and the left side, in five patients. There were no cases of bony injury, and 11 patients had complete tears, and 2 had incomplete tears.

Upon examination, we observed that all of the AT injuries were between 3 cm to 6 cm from the site of insertion. All of the patients had skin damage ranging from 2 cm to 10 cm. Before the debridement, samples were sent for culture and an assessment of the sensitivity. Injectable antibiotics were administered, such as cefoperazone with sulbactam, amikacin, and metronidazole against Gram-positive bacteria, Gram-negative bacteria, and anaerobe organisms before shifting to culture-specific antibiotics. All the patients were submitted to anti-tetanus prophylaxis.

Entrapment of a foot in a floor-level toilet seat was the cause of the injury in 10 patients; the distal part of the stump was crushed in most of these patients (→Fig. 2a,2b). In three patients, the injury was due to shooting stones/rocks from mountains while doing agricultural work with their families. Primary closure of the damaged tendon was performed in every case with non-absorbable sutures. Skin closure was performed with silk sutures (→Fig. 2c,2d). In patients with toilet-seat injuries, the culture reports were of mixed flora, with *Klebsiella* as the most common organism, while in patients with injuries due to shooting stones, *Escherichia coli* was the most common organism found. One patient with a toilet-seat injury ended up with wound dehiscence and was transferred to the Department of Plastic Surgery for flap coverage, and another patient presented wound infection and needed repeated wound lavage and multiple debridements.

A total of 11 patients had uneventful satisfactory recovery. Wound-related complications were observed in patients who presented more than 12 hours after the injury, and were referred from peripheral hospitals. During the follow-up after one year, wound-related complaints were not reported, and the ankle movements were comparable to those of the normal side. There was no case of rerupture. All of the patients were active in sports, with no functional problems.

Discussion

The AT is the strongest tendon in the human body. Its subcutaneous vertical location in the posterior aspect of

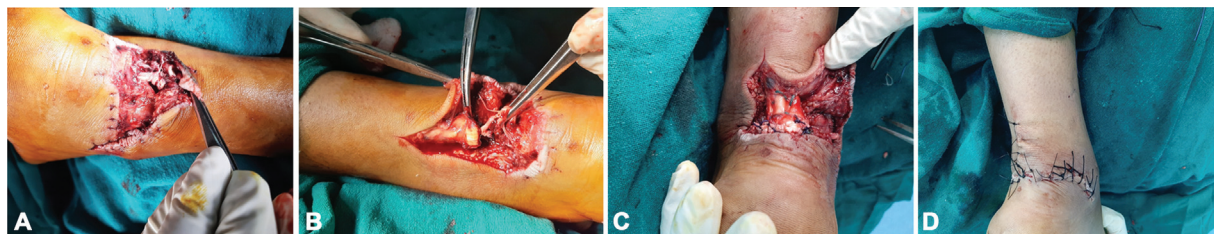


Fig. 2 (A) Open AT rupture in a 16-year-old boy due to entrapment in a toilet seat. (B) Crushed distal stump of the AT. (C) Primary closure of the AT. (D) Image after skin closure.

the leg prevents it from suffering trauma from anterior impaction, but makes it prone to those from posterior impaction. To the best of our knowledge, no study on open AT injuries in children has been published to date. The exact incidence of AT injuries in the pediatric age group is not known. Almost all of the published studies are on closed injuries,²⁻⁴ and very few of them^{5,6} are on pediatric AT injuries.

In their study, Awe et al.¹⁰ observed that people aged < 40 years are more prone to suffer open AT injuries, with road traffic and farming accidents as the most common cause of trauma; however, most of the patients in this study were adults. Dar et al.¹¹ and Chatterjee et al.,¹² studied open AT injuries induced by toilet seats in Indian adults, but none of their patients was in the pediatric age group.

Many studies¹³ have reported motorcycle spoke injuries of the heel and AT in the pediatric age group. However, in most of the studies the authors have observed that it is the heel pad which is primarily damaged or avulsed. Isolated AT injuries caused by motorcycle spokes are rare.

In the present study, none of the patients had heel-pad avulsion or any bony injuries. Most of the patients (10/13) got injured on Indian toilet seats, which are at the level of the floor, so a person has to squat to use it. With a slippery floor, the foot can go into the toilet bowl with a great deal of force. A powerful frictional force of the AT against the posterior part of the bowl can be the cause of an AT rupture. A reflex powerful attempt to take out the foot can cause further damage. Sometimes the bowl is broken during this process, and sharp edges of the broken bowl can also be the cause of AT rupture. However, none of the patients in the present study reported a history of breakage of the toilet.

Said et al.¹⁴ have also observed that floor-level toilet seats were the cause of open TA ruptures in a significant number of patients. However, all of the patients in their study were adults. We did not report any cases of bicycle spoke injuries with isolated AT rupture, which have been reported in many studies¹⁵ as a cause of heel-pad and AT injuries. This could be due to the fact that teenagers usually ride motorcycles and also because of the accident-prone hilly topography of the area.

Falling rocks/shooting stones from mountains are one of the most common causes of trauma in our hospital, and they were the cause of injury in three patients working in their fields. The hilly topography makes people in all age groups susceptible to such injuries. None of the studies published to date has reported this as the cause of injury, since all of them were conducted in urban centers.

The main aim of the present study was to show the unusual causes of an injury rarely reported in the pediatric

age group. We observed that open AT ruptures are reasonably common in children in our region as compared with the rest of the world. Indian toilets can be replaced with Western toilets or modified so they have a less slippery surface, in order to prevent such injuries in children.

Informed Consent

Written informed consent was obtained from all patients and/or their families.

Conflict of Interests

The authors have no conflict of interests to declare.

References

- Maffulli N, Waterston SW, Squair J, Reaper J, Douglas AS. Changing incidence of Achilles tendon rupture in Scotland: a 15-year study. *Clin J Sport Med* 1999;9(03):157-160
- Möller A, Astron M, Westlin N. Increasing incidence of Achilles tendon rupture. *Acta Orthop Scand* 1996;67(05):479-481
- Gulati V, Jaggard M, Al-Nammari SS, et al. Management of achilles tendon injury: A current concepts systematic review. *World J Orthop* 2015;6(04):380-386
- Yang X, Meng H, Quan Q, Peng J, Lu S, Wang A. Management of acute Achilles tendon ruptures: A review. *Bone Joint Res* 2018;7(10):561-569
- Ochen Y, Beks RB, van Heijl M, et al. Operative treatment versus nonoperative treatment of Achilles tendon ruptures: systematic review and meta-analysis. *BMJ* 2019;364:k5120
- Langer V. Toilet seat injury of the Achilles tendon: Another culprit. *Foot Ankle Surg* 2013;19(01):65-69
- Tudisco C, Bisicchia S. Reconstruction of neglected traumatic Achilles tendon rupture in a young girl. *J Orthop Traumatol* 2012;13(03):163-166
- Mine R, Fukui M, Nishimura G. Bicycle spoke injuries in the lower extremity. *Plast Reconstr Surg* 2000;106(07):1501-1506
- Eidelman M, Nachtigal A, Katzman A, Bialik V. Acute rupture of achilles tendon in a 7-year-old girl. *J Pediatr Orthop B* 2004;13(01):32-33
- Awe AA, Esezobor EE, Aigbonoga QO. Experience with managing open achilles tendon injuries in a tertiary hospital in southern Nigeria. *J West Afr Coll Surg* 2015;5(04):30-40
- Dar TA, Sultan A, Dhar SA, Ali MF, Wani MI, Wani SA. Toilet seat injury of the Achilles tendon a series of twelve cases. *Foot Ankle Surg* 2011;17(04):284-286
- Chatterjee SS, Sarkar A, Misra A. Management of acute open tendo- achilles injuries in India lavatory pans. *Indian J Plast Surg* 2006;39:29-30
- Mak CY, Chang JH, Lui TH, Ngai WK. Bicycle and motorcycle wheel spoke injury in children. *J Orthop Surg (Hong Kong)* 2015;23(01):56-58
- Said MN, Al Ateeq Al Dosari M, Al Subaai N, et al. Open Achilles tendon lacerations. *Eur J Orthop Surg Traumatol* 2015;25(03):591-593
- Zhu Y, Xu Y, Li J, Yag J, Ouyang Y, He X, Chen H, Fan X. Treatment of spoke heel injuries in children. *ZhonggyoXio Fu Chong Jian Wai Ke Za Zhi* 2009;23(10):1180-1182