

Avulsion Fracture Of The Tibial Tubercle In An Adult Treated With Tension-Band Wiring: A Case Report

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Citation

K AJ, L P. *Avulsion Fracture Of The Tibial Tubercle In An Adult Treated With Tension-Band Wiring: A Case Report*. The Internet Journal of Orthopedic Surgery. 2009 Volume 18 Number 1.

Abstract

Avulsion fractures of the tibial tubercle are very uncommon injuries, with only 170 cases reported since 1853 [ii],[iii]. They account for less than 3% of all physeal injuries in children [iv]. These injuries are extremely rare in adults, with only case reports in the literature. The mechanism of injury in adults is likely to be related to direct injury to the tubercle, rather than by indirect contraction of the quadriceps muscle as seen in children [v]. We described a case report of an 88-year-old female who suffered an avulsion fracture of the tibial tubercle after a simple fall. We performed an open reduction and internal fixation of the tibial tubercle using a cannulated screw and tension-band wire. She had a good functional recovery after 3 months of follow up. Bolesta MJ, Fitch RD. Tibial tubercle avulsions. *J Pediatr Orthop* 1986; 6: 186-192[ii] Ergun M, Taskiran E, Ozgurbuz C. Simultaneous bilateral tibial tubercle avulsion fracture in a basketball player. *Knee Surg Sports Traumatol Arthrosc* 2003; 11:163-166[iii] Watson-Jones R. *Fractures and joint injuries* Vol. 2. 5th ed. Baltimore: Williams & Wilkins; 1976. pp. 1048-1050.[iv] Hamilton SW, Gibson PH. Simultaneous bilateral avulsion fractures of the tibial tuberosity in adolescence: a case report and review of over 50 years of literature. *Knee* 2006; 13:404-407[v] Vella D, Peretti G, Fra F. One case of fracture of the tibial tuberosity in the adult. *Divisione di Ortopedia, Ospedale San Lazzaro, Alba (Cuneo)*

CASE REPORT

An 88-year-old female presented with right knee pain after tripping in the bathroom. She was unable to weight-bear. On examination she had swelling and deformity anteriorly along the proximal tibial shaft, as well as a moderate effusion. She was unable to actively extend her knee and could not straight leg raise. She had a medical history of ischaemic heart disease, hypertension, hypercholesterolaemia and mild dementia. She previously mobilised independently and lived by herself.

Plain radiographic examination of the knee revealed an avulsion fracture of the tibial tubercle with extension of the fracture proximally into the joint space [figure 1]. A concomitant fracture of the inferior pole of the patella was also noted. A CT scan was performed to obtain a better understanding of the fracture fragments, however the quality of the images was degraded by movement artefact [figure 2].

Figure 1

Figure 1: Lateral radiograph of the knee revealing an avulsion of tibial tuberosity with extension into the proximal joint space. A fracture of the inferior pole of the patella was also noted.

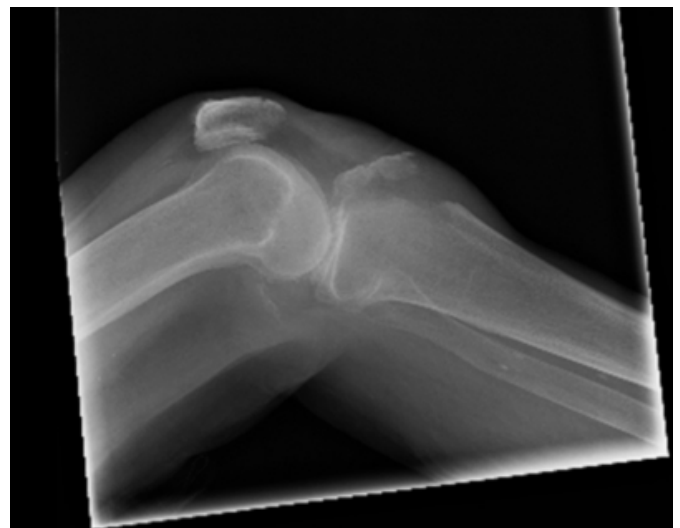
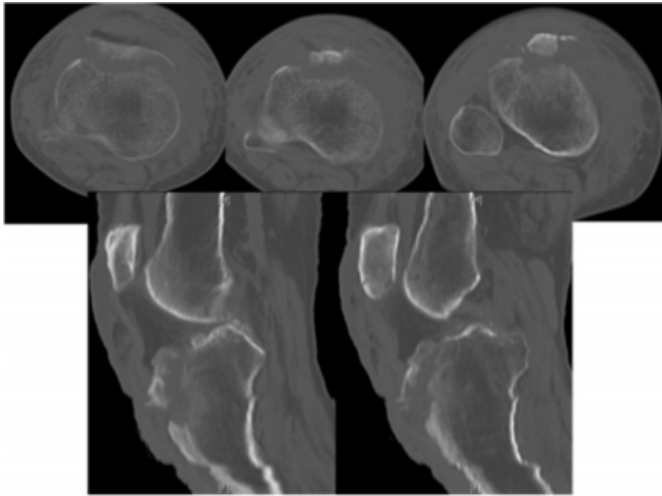


Figure 2

Figure 2: Axial and sagittal computer tomography reconstructions of the knee.



The patient underwent open reduction and internal fixation via an anterior midline approach to the knee. One cannulated partially-threaded 4.5mm cancellous screw with a washer was inserted into the main fracture fragment, as well as a tension-band-wire to supplement the fixation. The figure-of-eight wire was passed deep to the patellar ligament and through a transosseous tunnel 4cm distal to the fracture. Kirschner wires provided rotational stability, and were inserted through the proximal part of the tubercle and engaged the posterior cortex of the tibia under direct guidance of image intensification [figure 3]. The fascia overlying the patella was not breached, thus it was decided to treat the patella fracture non-operatively.

Figure 3

Figure 3:



Postoperatively, the patient was placed in an extension splint for 6 weeks and allowed to weight-bear as tolerated. At her 3 month follow up she had reached her pre-morbid level of mobility, and had a painless active range-of-motion of 5 – 110 degrees. She was non-tender over both the patella and tibial tuberosity fracture sites and had no irritation from the hardware. Progress radiographs revealed maintenance of the hardware position and bony union.

DISCUSSION

Avulsion fractures of the tibial tuberosity are rare injuries in adolescents and exceedingly rare in adults, with only 3 previous case reports in adults found in the literature^{5,,.}

In the adolescent they are a type of epiphyseal plate injury and account for less than 3% of all epiphyseal plate injuries¹. They are thought to be the result of a sudden contraction of

the quadriceps against a partially flexed knee (such as in landing after a fall or a jump), The closing physis during adolescence cannot withstand the tensile forces and is avulsed.

In the adult the mechanism is not as clearly described, with a sudden contraction of the quadriceps normally disrupting the more proximal and weaker structures of the extensor apparatus, including the patella ligament or quadriceps tendon. A possible explanation would be that of direct trauma to the tibial tuberosity resulting in its avulsion.

In the previous three documented cases in adults, two are the result from a fall from a ladder and one is from direct injury to the shin^{5,7,8}. Our patient reported a simple un-witnessed fall in the bathroom. Further clarification of the mechanism was impossible due to her dementia.

In the previous reported cases in adults, one of the individuals who fell from a ladder suffered an ipsilateral undisplaced lateral tibial plateau fracture⁷, while the other case describing a direct injury also shows a more distal extension of the fracture line into the tibia⁸. Our patient also had a concomitant minimally displaced fracture of the inferior pole of the patella which is not consistent with the mechanism of a direct injury.

Various methods of internal fixation have been described for both adolescents and adults. The AO Foundation describes two novel methods for tibial tuberosity fracture fixation. One method involves fixation by lag screws in an anterior-posterior direction through the main fragment, while a second involves tension band wiring with the cerclage wire introduced through the Sharpy-fibers at the insertion of the patella ligament in the tibial tuberosity.

We used a combination of the above techniques to achieve fracture reduction. Due to the small size of the main fracture

fragment and the osteopenic bone, we could only insert one cannulated screw with a washer, and used tension band wiring to provide rotational stability, neutralize tensile forces, and aid in compression of the tuberosity to the tibia.

To our knowledge, this technique has not been described in the literature for treating this fracture pattern in adults. The potential advantage of using supplemental tension-band wire fixation is early rehabilitation and weight-bearing. In the previous cases of tibial tuberosity fractures in adults⁸, the patients were kept non-weight bearing for prolonged periods of time. In an elderly patient such as ours, this may cause deconditioning and quadriceps muscles wasting. Despite the fact that our patient was placed in an extension splint to protect the surgical repair for 6 weeks, she still recovered with an excellent range of motion and did not complain of any knee stiffness at final follow-up.

CONCLUSION

We describe a rare injury of tibial tuberosity avulsion fracture in an adult, treated effectively with a cannulated screw and tension-band wire. To our knowledge this is a technique which has not been described in the past. Our patient had an excellent functional recovery and returned to her premorbid function.

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