

Anterior Tibial Tuberosity Avulsion: A Case of Late Diagnosis

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SUMMARY

Avulsion fracture of the anterior tibial tubercle (ATT) results from an abrupt traction of the patella tendon mostly occurring in adolescent males. Early diagnosis is critical for proper patient management. We report a case of an 18-year-old male student with a sixteen months history of pain in the anterior aspect of the right knee and inability to fully extend the right knee following injury sustained while playing football. The patella tendon was not palpable when the knee was extended, with a palpable bony mass floating below the patella. Lateral X-Ray of the right knee showed a triangular bony mass below the lower pole of the Patella. A diagnosis of an anterior tibial tuberosity avulsion was made.

Key words: Anterior Tibial Tuberosity Avulsion, Missed diagnosis

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Introduction

Avulsion fracture of the anterior tibial tubercle (ATT) occurs in adolescents, predominantly males (approx. 98%)¹; the injury resulting from an abrupt traction of the patella tendon, facilitated by local conditions related to skeletal maturity, usually during the transitional phase of physeal closure just prior to completion of growth,². This fracture is most often an isolated injury related to a push-off or landing while jumping as the quadriceps contract to support the weight of

the individual. It is said to be associated with Osgood-Schlatter syndrome especially if bilateral,³ though this has not been proven. Osteogenesis imperfecta is also known to be a contributory factor,⁴. Diagnosis may be missed or is often late due to late presentation and difficulty in proper management.

Avulsion fracture of the ATT represents 3% of all injuries of the proximal tibia and 0.4% to 2.4% of all epiphyseal fractures,^{5,6}. More than 250 cases have been described and reported in the literature. A bilateral case was described by Borsch-Madsen in 1954,⁷; with many more cases reported thereafter,^{8,9,10}. There is also associated patella ligament avulsion, but is uncommon,¹¹.

We report a case of late presentation sixteen months after injury occurred.

Case Summary

An 18-year-old student came to us at a private Orthopaedic facility in Maiduguri with a sixteen months' history of inability to fully extend the right knee. His was said to have developed a sharp pain on the anterior aspect of the right knee while playing football. He

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was then rushed to a clinic where first aid was given and discharged home after application of a plaster of Paris (POP) which was removed after four weeks. He however noticed that he could not walk properly especially while coming down stairs and pain persisted. He was then taken to a traditional bone setter (TBS) who applied splints for another six weeks. Pain was said to have gotten less but inability to climb or come down stairs persisted. He then visited a government hospital where he was asked to go for physiotherapy. After about sixteen months with no improvement, the father decided to bring him to us.

He was found to be a healthy-looking young man, not pale and not in any painful distress except that he walked with difficulty at toe-off on the right lower limb. Examination revealed scarification marks (TBS) below the right patella which was found to be high riding. The patella tendon was however not palpable when patient was asked to extend the knee. There was also a palpable bony mass that was floating below the patella and moved with it. The quadriceps on the ipsilateral side appeared wasted with an extension lag of 60 degrees. A diagnosis of fracture of the inferior pole of the right patella was made and an AP and Lateral X-Ray of the right knee were done.

The X-Ray revealed an intact patella with a triangular-shaped bony mass about 2cm below the lower pole of the patella. The physis was not visible with the anterior part of the epiphysis missing.

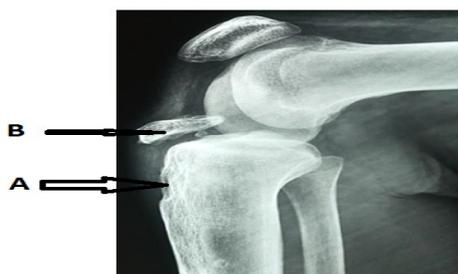


Figure 1. X-Ray of the affected knee at presentation showing area of avulsed tuberosity (B) and its empty bed (A)

The left knee showed no abnormality. A diagnosis of an anterior tibial tuberosity avulsion was made and patient was worked up for surgery. Other parameters such as packed cell volume, serum electrolyte, urea and creatinine were essentially normal.

In the theatre, under spinal anaesthesia, the right lower limb was exsanguinated and tourniquet applied. The area around the knee was cleaned and draped. A Lazy-S incision was made to expose the distal half of the patella, the patella tendon and the entire bed of the anterior tibial tuberosity. The avulsed tuberosity was mobilized with the patella tendon and cleaned of fibrous tissue exposing bone, while the tibial side was debrided exposing cancellous bone, avoiding the joint capsule until there was adequate area of the tibia to accommodate the avulsed tuberosity, Figure 3. The tuberosity was then held down with two cancellous screws, Figure 4. Reinforcement was achieved by placating the parapatellar tendon facia, Figure 5. Wound was closed in layers over a drain and a back slab applied. On the 10th day post Op, the slab was removed, skin sutures removed and an above knee cast applied and patient discharged home on non-weight bearing with axillary crutches. After six weeks check X-Ray was done showing good union between the avulsed tubercle and the tibia, Figure 6. Cast was removed and was commenced on partial weight bearing and gentle quadriceps exercises. Six months after surgery, patient is doing well and can fully extend the knee.



Figure 2, shows the normal contralateral knee

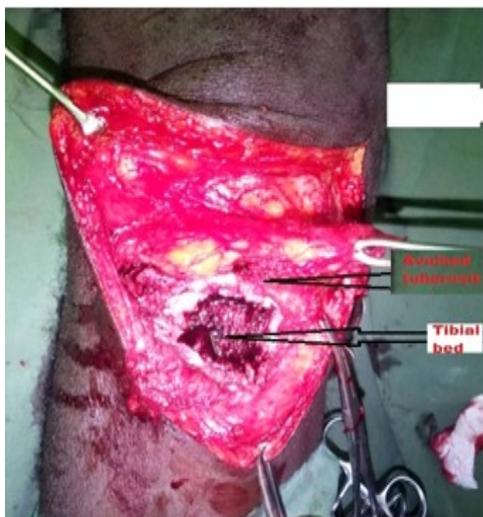


Figure 3. Photograph of the debrided avulsed tubercle intra-OP



Figure 4. Photograph showing intra-Op fixation of the tubercle and immediate post-OP X-Ray



Figure 5. Photograph showing reinforced fascia before closure



Figure 6. X-Ray showing good union after six weeks post-OP

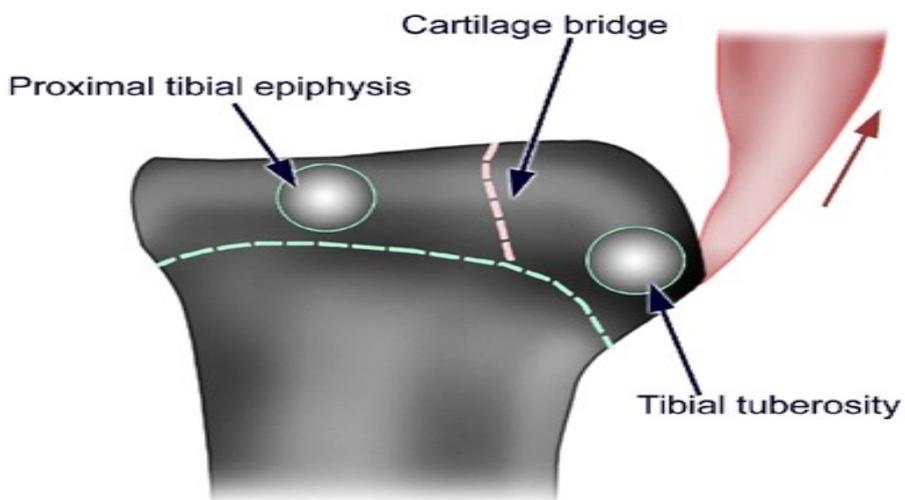


Figure 7. Diagram of the developmental anatomy of the proximal tibial epiphysis

Discussion

Since 1935, the issue of anterior tibial tuberosity (ATT) avulsion-fracture has received a lot of attention. This ranged from the developmental anatomy to various classifications of the pathology. In 1976, Watson-Jones described three types: type I, an avulsion fracture of the distal part of the tibial tubercle; type II, a displacement of the lip of the anterior part of the tibial epiphysis; type III, a fracture of the base of the lip with propagation into the knee joint,¹². In 1980¹³, Ogden added three sub groups A or B, taking into account a possible intra-articular extension of the fracture as well as a comminution. To accommodate more extensive injuries, Ryu and Debenham introduced type IV, an injury involving the complete tibial epiphysis,¹⁴, while Mckoy and Stanitski recently introduced type V; a two-part fracture, involving an avulsion and an intra-articular extension,¹⁵. In series of 336 tibial avulsion fractures in adolescent patients, there were 8 (2%) patella quadriceps tendon avulsion, 6 (2%) menisci tear, 3(1%) increased ligamentous laxity and 12 (4%) compartment syndromes.¹⁶

In managing ATT avulsion fracture, one needs to understand the developmental anatomy of the proximal tibial epiphysis (tibial plateau) in relation to the tibial tuberosity epiphysis. The later is a continuation of the former, separated by a cartilage bridge, Figure 7, giving two ossification centers. The tibial tuberosity is initially composed of fibrocartilage that has a good tensile strength but during ossification, it is populated by columnated cartilaginous cells with poor tensile strength, a window (between fibrocartilage and ossified matrix) that puts it at the risk of avulsion fractures. Also, the proximal tibial physis (along with that tibial tuberosity) closes from posterior to

anterior, with that of the tuberosity closing last. This usually happens at the end of growth when the area comes under more and more stress, making the anterior part most vulnerable to avulsion because the individual is more active and heavier. This also makes the treatment of these fractures surgically possible since the patients are at the end of their growth period, causing little or no growth disturbance.

Conclusion

It is important for all medical practitioners to always look out for anterior tibial tuberosity fractures (avulsion) in all adolescents presenting to them with pain around the knee or loss of knee extension months or years after sustaining injuries to the knee following strenuous activities such as sports, sudden quadriceps contraction or history of jumping from height and refer such patients for treatment.

Conflict of Interest

Nil

References

1. Ogden J.A, Southwick W.O Osgood schlatter's disease and Tibial tuberosity development, Clinic orthopedic related Res. 1976; (116): 180-189 [PubMed] [Google scholar].
2. Pandya NK, Edmonds EW, Roocroft JH, Mubarak SJ. Tibial Tubercle Fractures: complications, classification, and need for intra-articular assessment. J PediatrOrthop. 2012 Dec. 32 (8): 749.59 [Medline]
3. Mosier S. M, Stanitski C. L. and Levine R. S. "Simultaneous bilateral tibial tubercle avulsion fractures," Orthopedics, vol. 23, no 10, pp. 1106-1108, 2000. View at Google Scholar View at Scopus



4. Yoshino N., Watanabe N., Fukuda Y. et al., "Simultaneous bilateral Salter-Harris type II injuries followed by unilateral Salter-Harris type III injury of the proximal tibia in an adolescent with Osteogenesis imperfecta," *Journal of Orthopaedic Sciences*, vol. 15, no. 1, pp. 153-158, 2010. View at publisher. View at Google Scholar. View at Scopus.
5. Bolester MJ, Fitch RD. Tibial tubercle avulsions. *J Pediatr Orthop*; 1986; 6: 186-92.
6. Lapse PS, McCarthy RE, McCullough FL. Simultaneous bilateral avulsion fracture of the tibial tuberosity. A Case Report: *Clin Orthop Relat Res* 1988; 229: 232-235.
7. Borch-Masden P. On symmetrical bilateral fracture of the tuberositas tibiae and the eminentia intercondyloid. *Acta Orthop Scand* 1954/55; 24: 44-49
8. Georggiou G, Dimitrakopoulou A, Siakpara A, Kazakos K, Provelengios S. Simultaneous bilateral tibial tubercle avulsion fracture in an adolescent: *Knee Surg Sports traumatol Arthrosc* 2007; 15: 147-149
9. 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
10. Henard DH, Bobo RT. Avulsion fractures in adolescents. A report of bilateral fractures and a review of the literature. *Clin Orthop Relat Res* 1983; 177:182-187.
11. Frankl U, Wasilewski SA, Healy WI. Avulsion fracture of the tibial tubercle with avulsion with avulsion of the patella ligament. Report of two cases. *J Bone Joint Surg* 1990; 72-A: 1411-1413.
12. Watson-Jones R. *Fracture and joint injuries*, vol 2, 5th edition William and Wilkins, Baltimore, 1976, pp 1048-1050.
13. Ogden JA, Tross RB, Murphy RJ. Fractures of the tibial tuberosity in adolescents *J Bone Joint Surg* 1980; 62-A: 205-215.
14. R. K. N. RYU and J. O. Debenham, "An unusual avulsion fracture of the proximal tibial epiphysis. A case report and proposed addition to the Watson-Jones classification," *Clinical Orthopaedics and Related Research*, vol. 194; pp. 181-184, 1985. View at Google Scholar View at Scopus
15. Howarth WR, Gottschalk, Hosalkar HS. Tibial tubercle fractures in children with intra-articular involvement: surgical tips for technical ease. *J Child Orthop*. 2011 Dec. 5(6) 465-70. Medline.
16. Yousef M.A.A., "combined avulsion fracture of the tibial tubercle and patellar tendon rapture in pediatric population; case series and review of literature". *European journal of Orthopaedic surgery and traumatology*, vol 28(2). PP 317 - 323, 2018 [Google scholar] [Scopus].

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