Case Report

Fracture-avulsion of tibial tubercle apophyseal in two Cameroonian adolescents

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ABSTRACT

Introduction: Avulsion-fractures of the tibial tubercle apophysis are a rare lesion of active adolescent. They are relatively uncommon injuries that occur in the active adolescent. We described cases of tibial tubercle apophysis avulsion-fractures in two Cameroonian adolescents.

Cases: We observed 2 cases which occurred in boys after contraction of the quadriceps during sports activity (high jump and football). The lesions were classified as Type IV by Ryu and Debenham (case 1) and type IA by Ogden (Case 2). The treatment was surgical by double screwing (case 1) and orthopedic by plaster knee brace (Case 2). The functional result was excellent without complications.

Discussion: Non-displaced fracture of the anterior tibial tubercle I type IA Ogden has good prognosis and responding very well to non-surgical treatment. It should be considered as a separate entity. The other cases of displaced fracture generally require surgery which enables an assessment of often associated lesions. Type IV can required supplemental plate fixation to stabilize the proximal tibia. The prognosis of displaced fractures is poor due to the associated lesions and potential complications. Functional results are excellent despite a few cases of previous pain limiting sports activity.

Conclusion: Avulsion fractures of the anterior tuberosity in adolescents remain rare in Africa and worldwide. The circumstances of the occurrence are stereotypical. If treated properly, the outcome is usually good.

Introduction

Avulsion-fractures of the tibial tubercle apophysis are a rare lesion of active adolescent [1] with a reported incidence between 0.4% to 2.7% [2,3]. They occur after eccentric contracture of the quadriceps. They are well described [4,5,6] then classified from 1955 to 1985 by Watson-Jones [6], Ogden [4], Ryu and Debenham [5]. Its relation to Osgood-Schlatter disease, much more frequent, occurring earlier, but often found in the antecedents, remains to be clarified [7]. We described cases of tibial tubercle apophysis avulsion-fractures in two Cameroonian adolescents treated at Adlucem hospital in bonamoussadi-Douala.

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Case 1

A 16-year-old male teenager sustained injuries after an eccentric quadriceps contraction while jumping during a high jump sporting event. At presentation, he was hemodynamically stable and we observed a swelling of the knee next to tibial tubercle apophysis. Active knee extension was not possible. Radiographs confirmed a tibial tubercle fracture with the presence of posterior-inferior metaphyseal fracture extension, classified type IV A [5] (Fig. 1 ). The treatment was surgical by vertical midline approach. Open reduction and internal fixation using two cortical screws (50 mm fully threaded 3.5 mm screw and 55 mm fully threaded 4.5 mm screw) was done (Fig. 1). Patellar tendon was intact. At his six month’s outpatients’ clinic appointment, radiographs showed callus at the tibial tubercle fracture, and the mobility of the knee was normal.

Case 2

A 12-year-old male teenager sustained injuries after an eccentric quadriceps contraction while jumping during a football match. At presentation, his knee was tender associated with pain and swelling. The active extension was not possible. Radiographs showed a tibial tubercle fracture without displacement classed type I [4–6]. The treatment was non-operative by immobilization plastered, the knee in extension. Plastered knee brace was in place for 6 weeks and gradual mobilization from the 7th week. Active extension was possible without from the 8th week. At his four month’s outpatients’ clinic appointment, radiographs showed callus, and

Fig. 1. Tibial tubercle fracture of Case 1.
A: Fracture with the presence of posterior-inferior metaphyseal fracture extension, classified type IV A.
B: Fixation using two cortical screws.
the mobility of the knee was normal. In the 6th month the patient resumed sports activity.

Discussion

Avulsion-fractures of the tibial tubercle apophysis are rare. Few cases are described in the literature in Africa and in the world [1,7,8,9,10]. They occur in adolescents on average at the age of 15 (between 10 and 19 years) [1]. There is a clear male predominance although a few cases of avulsion of tibial tubercle apophysis have been described in girls [1]. We observed 2 cases which occurred in boys after contraction of the quadriceps during sports activity (high jump and football). According to the literature, the sports concerned are high jump, basketball, jumping over hurdles and handball, more rarely running, football and gymnastics [1]. Three cases have been reported during walking [5,11] and two cases during diving [12,13]. The association between avulsion of APD and Osgood-Schlatter disease remains frequent (nine cases out of 15 for Ogden and Murphy [4], five cases out of five for Peyroux and Mathevon [14]. However, these are two pathologies completely different [5]. In Osgood-Schlatter disease, the primary lesion appears to be an avulsion of the anterior part of the epiphysis and/or the center of ossification of the tuberosity, whereas the Tuberosity tears separate the entire tuberosity including the epiphysis and especially the underlying metaphysis. Osgood-Schlatter disease alters the biomechanical response of the tuberosity cartilage by increasing the proportion of columnar cartilage relative to the fibrocartilage, before adequate maturation of the secondary nucleus of ossification [7]. Associated lesions (28/182) such as patellar ligament lesions, meniscal lesions, damage to the central pivot and sprain of the medial collateral ligament are described [1]. These lesions have been described in Ogden type IB, II or III fractures (167 cases) [1]. A type IV fracture has a tibial tubercle fracture with the presence of posterior-inferior metaphyseal fracture extension. We did not observe any in our 2 patients.

Treatment depends on classification and displacement. In type IA fractures and more rarely in strictly non-displaced type II or III fractures, treatment is non-operative [8]. The type IV treatment proposed by Ryu and Debenham is poorly described and must be treated with surgery. Surgery can be performed by several types of approach and screwing with or without a washer. Some authors recommend the use of a lateral approach to avoid sectioning the infra-patellar nerve threads of the saphenous nerve [1]. Others the direct anterior approach which allows perfect reduction of the fragments. Bony. We used the direct anterior approach and double screwing without washer. The use of the washer is associated with late rupture of the patellar ligament (by devascularization at its insertion on the TTA) and premature epiphysiodesis (with recurvatum and shortening of the tibia) [1]. Type IV fractures can required
supplemental plate fixation to stabilize the proximal tibia [8]. Childhood APT fractures are known to be benign and their prognosis is generally very good. Complications occur with Ogden type IB, II, III fractures. They can be early or late. The most frequently reported and feared early complication is compartment syndrome, due to the traumatic section of the branches of the recurrent tibial artery anterior to contact with the TTA [1]. Pulmonary embolism [1] is also described. Although we do not have enough follow-up for our two cases it is described late complications such as patella baja, persistence of a quadriceps atrophy, iterative tibial fractures, limb length inequality and mal union [1]. The functional results in our 2 patients were excellent, they were able to restart sports activity at the same level without pain or discomfort. In the literature, functional results after avulsion fracture of APT in children are also excellent in the vast majority of cases. A few cases of previous pain (sometimes related to calcifications of the patellar ligament) limiting sports activities and stiffness in flexion have been noted [1]. Long-term follow-up would allow us to know the evolution and impact of these symptoms [1].

Conclusion

Avulsion fractures of the anterior tuberosity in adolescents remain rare in Africa and globally. The circumstances of occurrence are stereotypical (brutal flexion of the knee against a tense and contracted quadriceps). The therapeutic and prognostic results depend on the stage of classification. If treated well, the result is usually good, with no growth disturbances or knee recurvatum.

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CRediT authorship contribution statement

Freddy Mertens Bombah: Conceptualization, Data curation, Writing-original draft.
Théophile Nana: Conceptualization, Writing-review & editing.
Daniel Biwolé: Writing-review.
Boukar Yannick Ekani: Writing-review & editing.
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Declaration of competing interest

None.

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