



Sleeve fracture of the upper pole of the patella : A case report

TOM VAN ISACKER, HUGO DE BOECK

From the University Hospital of the Vrije Universiteit Brussel, Brussels, Belgium

Sleeve fractures of the upper pole of the patella in children are rare ; only 2 cases have been reported in the English literature and 1 case in the German literature. We present a case of this unusual lesion in order to stress the importance of being aware of the existence of upper pole sleeve fractures of the patella. We review the literature and we describe the symptoms, the clinical and radiological signs and the treatment. The diagnosis may be missed, the treatment is relatively simple and rewarding, and un- or mistreating this fracture leads to permanent disability.

Keywords : patelle ; sleeve fracture ; upper pole ; children

INTRODUCTION

The incidence of patellar fractures in children is 1% (5). A literature review over the past 25 years shows that 57% of patellar fractures in children are sleeve fractures, mostly located at the distal pole (5). To our knowledge only two cases of sleeve fractures of the upper pole of the patella in children have been reported in the English literature and one case in the German literature. We report the case of a 7-year-old girl with an upper pole sleeve fracture. We point out the pitfalls of this rare lesion and review the literature.

CASE REPORT

A healthy 7-year-old girl presented at the emergency department after a fall with a step. She

complained of pain around the left knee, was unable to stand on her left leg and was anxiously holding the knee in flexion. The pain appeared immediately after the fall. The exact mechanism of the trauma was not clear, but it appeared to be an indirect trauma, as there were neither skin lacerations nor bruises. Physical examination showed intra-articular accumulation of fluid. Active extension was clearly diminished but possible for a few degrees starting from full extension. Active flexion of the knee was possible. Plain radiographs showed a small bone flake at the upper pole of the patella and this was diagnosed as an avulsion fracture of the upper pole of the patella (fig 1). An plaster cast was applied with the knee in extension, and the patient was referred to the paediatric orthopaedic department the next day. The radiographs were checked and showed a low position of the patella – patella infera – and a sleeve fracture of the upper

■ Tom Van Isacker, MD, Resident in Orthopaedic Surgery and Traumatology.

■ Hugo De Boeck, MD, PhD, Professor and Head of the Paediatric Orthopaedic Department.

University Hospital of the Vrije Universiteit Brussel, Belgium.

Correspondence : Tom Van Isacker, Sleekxlaan 83, 1030 Brussels, Belgium. E-mail : tvanisacker@yahoo.com.

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Fig. 1. — Lateral plain radiograph of the left knee on the day of trauma.

pole of the patella was suspected rather than a simple avulsion. This was confirmed by sonography (fig 2). A surgical intervention was planned.

Surgery was performed two days after trauma. The lesion was approached through a transverse suprapatellar incision. A small osseous fragment surrounded by a large cartilaginous and periosteal shell was found at the upper pole of the patella. An associated tear of the lateral retinaculum was present. The fragment was anatomically reduced and fixed with 3 non resorbable transosseous sutures.

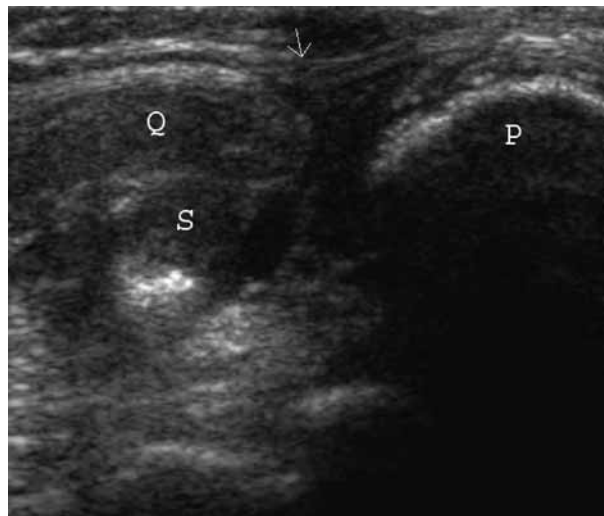


Fig. 2. — Sonography of the left knee, one day after trauma. Q : Quadriceps tendon ; P : Patella ; S : Sleeve fracture.

(Ethibond, ETHICON, Inc., a Johnson & Johnson Company, Somerville, NJ, USA). The retinaculum tear was repaired as well. Postoperatively, the knee was kept in an extension cast during 4 weeks. After removal of the cast, physiotherapy was started. Eight weeks after trauma, the patient could walk normally, was pain free and able to perform a full range of motion with excellent quadriceps function (fig 3).

DISCUSSION

As far as we know, we describe here the fourth reported case of upper pole sleeve fracture of the patella in a child. The data of three other patients are summarized in table I. A sleeve fracture of the patella is a traumatic avulsion of the lower or upper pole. The fragment contains articular cartilage on the deep surface and cartilage and periosteum on the subcutaneous surface. The sleeve may or may not contain osteochondral tissue (5). Sleeve fractures are attributed to a forceful contraction of the quadriceps against resistance. Two of the three previous papers describing sleeve fractures of the upper pole of the patella report such trauma.

Kumar reported this mechanism in a 14-year-old girl (8) and Kaivers in an 8-year-old boy (7).



Fig. 3. — Lateral plain radiograph of the left knee 4 weeks after trauma.

Bishay *et al* reported a direct trauma in a 9-year-old girl (1). The only known adult with an upper pole sleeve fracture is an adult with osteogenesis imperfecta type I (6). Our patient was considered to have sustained an indirect trauma. The diagnosis can be missed for different reasons (5). Patella infera is not always present. The fracture can be incomplete or minimally displaced.

Active extension can still be possible with the leg internally rotated, using the tensor fasciae latae and the remaining parts of the extensor mechanism. Plain radiographs, as illustrated in our case, can be misleading. The sleeve fracture can be misinterpreted as a small bone avulsion of the pole of the patella or may be unrecognized if there is no ossified bone in the cartilaginous sleeve. On the other hand, patella infera associated with radiological signs of knee effusion on the lateral plain radiograph raises suspicion of an interruption of the extensor mechanism proximal to the patella. Sonography is a useful examination that confirms the diagnosis (3). When looking at the two possible therapeutic options – conservative treatment or surgical repair – one must take into account that the fracture runs through tissue with an osteogenic potential, and healing with callus formation in case of displacement will lead to enlargement or even duplication of the patella and consequently to dysfunction of the extensor apparatus of the knee (4). Minimally displaced sleeve fractures – less than 2 mm – may be amenable to closed treatment with cast immobilisation, although the results may be poor (2, 4, 5). An undisplaced or minimally

Table I. — Summary of the previous case reports

Author	Bishay (1)	Kumar (8)	Kaivers (7)
Mechanism of trauma	Direct trauma	Indirect trauma	Indirect trauma
Age	9 years	14 years	8 years
Gender	Female	Female	Male
Concomittant lesion/disease	None	Dislocation of the patella	None
Treatment	Figure-of-8 suture	Anchor suture	Transosseous sutures
Immobilisation	5 weeks	6 weeks	6 weeks
Result	Full ROM at 9 weeks, good quadriceps power	Full ROM at 16 weeks, normal quadriceps power	Full ROM at 8 weeks

displaced fracture may become displaced because of the pull of the quadriceps muscle. Therefore we recommend, as in the case presented here, surgical treatment with anatomic reposition and stable fixation. Whether the fixation is achieved by a figure-of-eight suture, with anchors or with transosseous sutures, appears unimportant as long as the reduction is anatomical and the fixation is solid. The period of immobilisation varies between 5 and 6 weeks. Bishay (1) kept his patient during 5 weeks in an extension cast, Kumar and Knight (8) and Kaivers *et al* (7) during 6 weeks. We immobilized our patient during 4 weeks. Two of the three previous cases (1, 8) had quadriceps strengthening exercises after removal of the cast ; one did not (7).

We prescribed physiotherapy and our patient regained full function at 8 weeks. With or without physiotherapy, full range of motion with satisfying strength was achieved at 8 to 16 weeks. We conclude that it is important to remember the existence of this rare lesion in skeletally immature patients. The diagnosis may be missed due to lack of familiarity with this lesion. Plain radiographs may be misleading but sonography is a useful diagnostic tool, easy to obtain. Anatomical repair is recommended for good clinical outcome.

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