CASE REPORT

Radiographic Abnormalities of the Inferior Pole of the Patella in Juvenile Athletes

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Abstract

We examined radiographs of the inferior pole of the patella in seven juvenile athletes diagnosed as having Sinding-Larsen-Johansson disease (SLJD) and discussed the etiology of the syndrome. Eight knees had tenderness at the inferior pole of the patella accompanied by radiographic abnormalities. A regular or irregular calcification was found at the inferior pole of the patella in three knees; coalescence of the calcification was found in two knees; incorporation of the calcification into the patella to yield a normal radiographic configuration of the area was found in two knees; and a small calcification separated from the patella was found in one knee. All of these findings varied and did not always correspond to the radiographic stages of the disease process identified by Medlar. One case was not clearly distinguished from either osteochondritis or stress fracture, and one case had a similar symptom to tendinitis. Thus, the etiology of the syndrome seems not to be unified, and the differential diagnosis between SLJD and osteochondritis, stress fracture, or tendinitis was difficult to arrive at. We were only able to conclude that the radiographic abnormalities and consequently the etiology of the syndrome vary, and therefore there is a limitation to call the syndrome accompanied by abnormal findings of the inferior pole of the patella under the umbrella term of SLJD. (Keio J Med 58 (1) : 50–53, March 2009)

***Keywords*: Sinding-Larsen-Johansson disease, patella, calcification, juvenile athlete**

Introduction

In 1991 and 1992 Sinding-Larsen and Johansson respectively and independently described a syndrome, in the adolescent consisting of tenderness at the inferior pole of the patella accompanied by radiographic evidence of fragmentation of the pole.[1,2] This is the Sinding-Larsen-Johansson disease (SLJD), and has been used as an umbrella term for the syndrome that causes pain of the inferior pole of the patella accompanied by fragmentation of the pole or a calcification at the pole.

Medlar identified four radiographic stages of the disease process: stage 1, normal findings; stage 2, irregular calcifications at the inferior pole of the patella; stage 3, coalescence of the calcification; stage 4A, incorporation of the calcification into the patella to yield a normal radiographic configuration of the area; and stage 4B, a coalesced calcification mass separated from the patella.[3] Clinically, however, radiographic abnormalities at the inferior patella seem to vary; there are several pathogeneses reported; apophysitis, periostitis, tendinitis, calcification accompanied by avascular necrosis, or osteochondritis.[2,4,5] The etiology of the syndrome seems not to be unified. SLJD appears to be rare, because the incidence of radiographic abnormalities at the inferior pole of the patella has been suggested to be low (2-5%) in healthy juveniles (10-14 years of age).[5] We have experienced seven cases (juvenile athletes) diagnosed as having SLJD. In this paper, we discuss the etiology of the syndrome based on our examination of radiographs of the inferior pole of the patella in the seven cases of SLJD.

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Table 1 Study subjects

Case	Age (years)	Gender	Symptomatic side	Sporting activity	Treatment for SLJD	Time until return to original sporting activity
1	11	Male	Left	Soccer/Karate	Conservative	6 weeks
2	11	Male	Left	Soccer	Conservative	12 weeks
3	11	Male	Left	Skiing	Conservative	14 weeks
4	12	Male	Left	Soccer	Conservative	8 weeks
5	13	Male	Bilateral	Kendo	Conservative	Surgery (Meniscectomy due to meniscus injury)
6	12	Male	Right	Soccer	Conservative	8 weeks
7	12	Male	Right	Soccer	Conservative	8 weeks

Conservative treatment: stopping sporting activities and stretching of the quadriceps and hamstrings.

Right knee (asymptomatic) Left knee (symptomatic)

Fig. 1 Case 1: 11-year-old male soccer/karate athlete

Right knee (asymptomatic) Left knee (symptomatic)

Fig. 2 Case 2: 11-year-old male soccer athlete

Case Reports

Table 1 shows the seven cases that we investigated in this study. All of them were male athletes, and the age of the subjects was 11–13 years.

Case 1 (11-year-old male soccer and karate athlete, **Fig. 1**): incorporation of the calcification into the patella to yield a normal radiographic configuration of the area (stage 4A) was found in the right asymptomatic knee. On the other hand, coalescence of the calcification (stage 3) was found in the left symptomatic knee. There was tenderness at the inferior pole of the patella in the left knee. Clinically, it was not clearly distinguished from either osteochondritis or stress fracture.

Case 2 (11-year-old male soccer athlete, **Fig. 2**): regular and irregular calcifications (no corresponding stage and stage 2, respectively) were found in the right asymptomatic and left symptomatic knees, respectively. Irregularity of the inferior pole of the patella was also found in the left symptomatic knee. There was tenderness at the inferior pole of the patella in the left knee.

Case 3 (11-year-old male skiing athlete, **Fig. 3**): there were no abnormal findings in the right asymptomatic knee. On the other hand, a small calcification separated from the patella (no corresponding stage) was found in the left symptomatic knee. There was tenderness at the inferior pole of the patella in the left knee. It had a similar symptom to tendinitis.

Case 4 (12-year-old male soccer athlete, **Fig. 4**): irregularity of the inferior pole of the patella and a regular calcification (no corresponding stage) were found in the right asymptomatic knee. On the other hand, coalescence of the calcification (stage 3) was found in the left symptomatic knee. There was tenderness at the inferior pole of the patella in the left knee.

Case 5 (13-year-old male kendo athlete, **Fig. 5**): incorporation of the calcification into the patella to yield a normal radiographic configuration of the area (stage 4A)

Right knee (asymptomatic) Left knee (symptomatic)

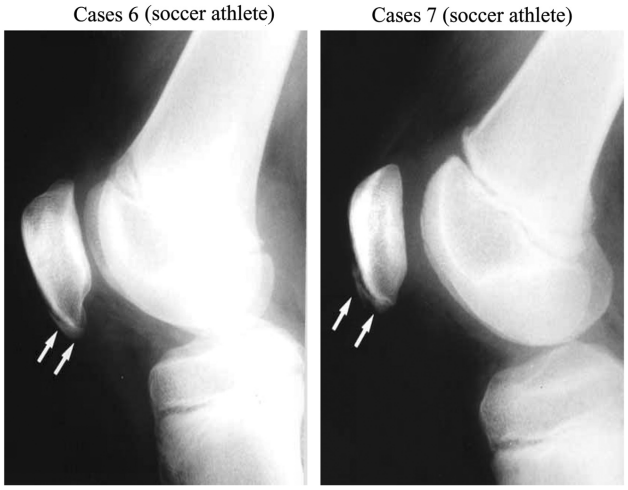
Fig. 3 Case 3: 11-year-old male skiing athlete

Right knee (asymptomatic) Left knee (symptomatic)

Fig. 4 Case 4: 12-year-old male soccer athlete

Right knee (symptomatic) Left knee (symptomatic)

Fig. 5 Case 5: 13-year-old male kendo athlete



Right knee (symptomatic) Right knee (symptomatic)

Fig. 6 Cases 6 and 7: 12-year-old male athletes

was seen in the bilateral symptomatic knees. There was tenderness at the inferior pole of the patella.

Cases 6 and 7 (both 12-year old male soccer athletes, **Fig. 6**): regular and irregular calcifications (no corresponding stage and stage 2, respectively) were found in the right symptomatic knees of cases 6 and 7, respectively. There was tenderness at the inferior pole of the patella in the right knee. No radiographs were obtained of the two left asymptomatic knees.

Discussion

The purpose of this case study was to discuss the etiology of the syndrome based on our examination of radiographs of the inferior pole of the patella in the seven cases of SLJD. Among eight symptomatic knees, a regular or irregular calcification (the latter: stage 2) was found at the inferior pole of the patella in three knees; coalescence of the calcification (stage 3) was found in two knees; incorporation of the calcification into the patella to yield a normal radiographic configuration of the area (stage 4A) was found in two knees; and a small calcification separated from the patella was found in one knee. All of these findings varied and did not always correspond to the radiographic stages identified by Medlar.[3]

Even in asymptomatic knees, a regular calcification at the inferior pole of the patella, or incorporation of the calcification into the patella to yield a normal radiographic configuration of the area (corresponding to stage 4A) was found. This fact indicates that radiographic abnormalities at the inferior pole of the patella are not always associated with symptoms in juvenile athletes, which could possibly make the etiology of SLJD more complicated.

Injuries in which a differential diagnosis with SLJD is required are considered to be sleeve fracture, osteochondritis and stress fracture of the patella, and tendinitis of the patellar tendon. In particular, sleeve fracture, osteochondritis, and stress fracture are hardly distinguished based on the radiographic findings. Because orthopaedic treatment depends on the type of injuries (i.e., major trauma or over-use; bone and cartilage lesions or tendon lesion), the differential diagnosis of SLJD from other injuries is important. SLJD results from over-use, whereas a sleeve fracture is caused by a major trauma. Therefore the differential diagnosis between SLJD and sleeve fracture would appear to be easy from the onset of the symptom. On the other hand, the stress fracture is defined as a partial or complete fracture of bone that results from the repeated application of a stress lower than that required to fracture the bone in a single loading situation.[6] Osteochondritis is related to over-use, such as little leaguer elbow and shoulder, and is included in the definition of stress fracture. Thus, SLJD in the case 1 was not clearly distinguished from either osteochondritis or stress fracture. Rather, osteochondritis or stress fracture could possibly contribute to the etiology of SLJD. The strategy of orthopaedic treatment for over-use injuries including SLDJ, osteochondritis, and stress fracture might be consistent. Moreover, SLJD and tendinitis in terms of so called jumper's knee in adult athletes could be combined in some cases. Therefore, case 3 could be diagnosed as having both SLJD and tendinitis. Further studies using magnetic resonance images and pathological examination are needed to clarify the clear differences between SLDJ and osteochondritis, stress fracture, or tendinitis. Thus, the etiology of the syndrome seems not to be unified.

We have also experienced two cases of jumper's knee accompanied by ossification in adult baseball and basketball athletes (radiographs not shown). Pathological examination of the former athlete showed ossification inside the patellar tendon. However, these cases correspond to the adult variety of SLJD suggested by Smillie.[7]

The symptoms caused by SLJD would appear to be mild. Most of the cases in this report returned to their original sporting activities in 6-14 weeks except for the case that showed the similar symptom to tendinitis or needed a meniscectomy, suggesting the good prognosis of SLJD.

In conclusion, we examined radiographs of the inferior pole of the patella in seven juvenile athletes diagnosed as having SLJD and discussed the etiology of the syndrome. The radiographic abnormalities and consequently the etiology of the syndrome vary, and therefore there is a limitation to call the syndrome accompanied by abnormal findings of the inferior pole of the patella under the umbrella term of SLJD.

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