

clinical case study

Acute fracture bipartite patella: case report and literature review

MARY LLOYD IRELAND and JONATHAN L. CHANG

*Kentucky Sports Medicine Clinic,
Lexington, KY 40517; and
Orthopaedic Surgery and Sports Medical Group,
Monterey Park, CA 91754*

ABSTRACT

IRELAND, M. L. and, J. L. CHANG, Acute fracture bipartite patella: case report and literature review. *Med. Sci. Sports Exerc.*, Vol. 27, No. 3, pp. 299–302, 1995. Disorders of the patella are the most common cause of anterior knee pain. The etiologies of anterior knee pain are reviewed. A case report of an acute displaced patella fracture in a bipartite union is presented. Bipartite patellar development, incidence, radiographic findings, and clinical symptoms follow. Treatment of excision of displaced fragment provides an excellent result.

ANTERIOR KNEE PAIN, PATELLA FRACTURE, PATELLA ANATOMY AND DEVELOPMENT, PARTIAL PATELLECTOMY

Anterior knee pain is a common complaint in the athletic population. The differential diagnosis of anterior knee pain includes osteochondral fracture or chondromalacia of the patella or trochlear groove, cartilaginous loose bodies, bipartite patella fracture or nonunion, stress fracture, lateral patellar subluxation or dislocation, and quadriceps rupture (Table 1). As a subcutaneous sesamoid bone, the patella is most commonly injured by a direct blow. Eccentric quadriceps contraction can cause anterior knee pain with a fibrous union of a bipartite patella.

A bipartite patella is usually asymptomatic (2,4,5,9). With severe anterior knee pain and swelling, a bipartite patella fracture should be considered. A case of an acute displaced fracture of a bipartite patella and a review of the literature follows.

CASE REPORT

A 47-yr-old white male accountant felt acute pain and a pop in his left knee while playing basketball in a noncontact mechanism. The patient had no previous history of knee injury and was an avid tennis player. Written informed consent from the patient was obtained.

Physical examination of the left knee demonstrated an acute hemarthrosis with tenderness localized to superolateral aspect of the patella. Active range of motion was 15°–90° with active extension present but painful.

Plain radiographs of anteroposterior, lateral, and patellar views revealed a displaced fracture of the superolateral aspect of the patella (Fig. 1). The mechanism of injury and orientation of the fracture was consistent with a previously asymptomatic bipartite patella. The opposite knee radiographs were normal.

The patient underwent diagnostic arthroscopy, which demonstrated the mobility but smooth edges of the su-

TABLE 1. Differential diagnosis of anterior knee pain.

Mechanical	Inflammatory	Other
Patella	Bursitis	Reflex sympathetic dystrophy
Subluxation	Prepatellar	Tumor
Dislocation	Retropatellar	
Fracture	Semimembranosus	
Stress	Tendinitis	
Acute horizontal	Patellar	
Bipartite	Pes anserinus	
Fibrous nonunion	Semimembranosus	
Acute fracture	Synovitis	
Quadriceps rupture	Arthritis	
Patella tendon rupture		
Inferior avulsion		
Interstitial		
Patellofemoral stress syndrome		
Pathologic plica		
Osteochondral fracture		
Trochlear groove		
Patella		
Loose bodies		
Osteochondritis dissecans		

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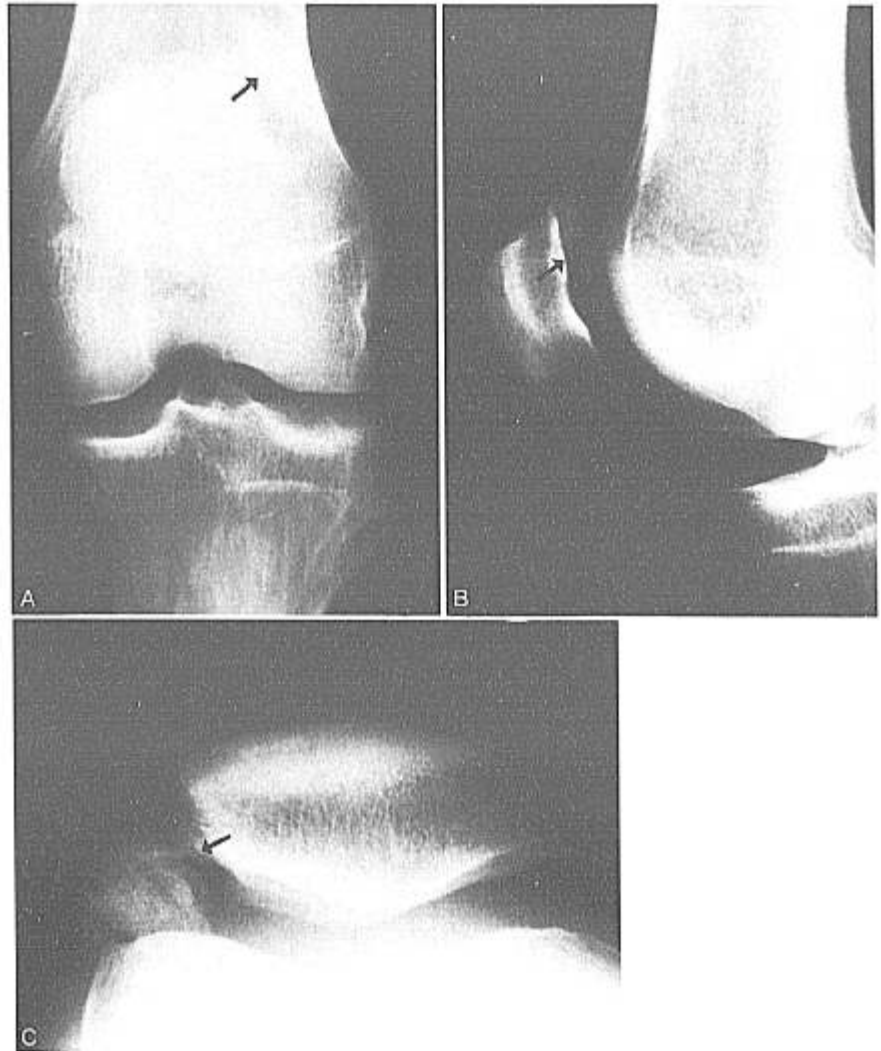


Figure 1—Radiographs of AP (A), lateral (B), and patellar (C) views show a displaced fracture superolateral patella. *Solid arrow* points to the unstable painful fragment. This is consistent with an underlying asymptomatic bipartite patella, Saupé Type III.

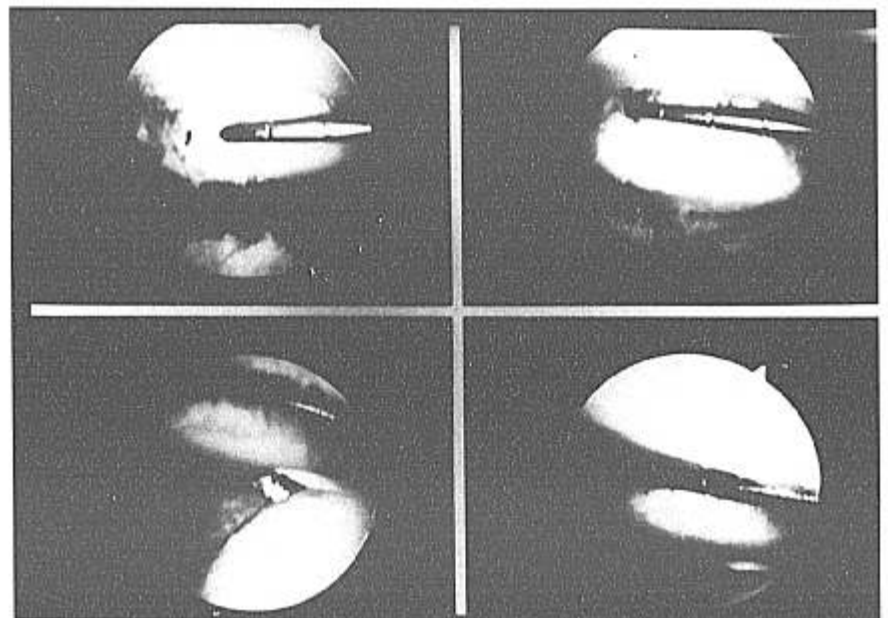


Figure 2—Arthroscopic view of the displaced superolateral fracture fragment. Probe is pointing to the level of the fracture. Notice the thick articular surface, rounded edges, and mobility of the fracture fragment.

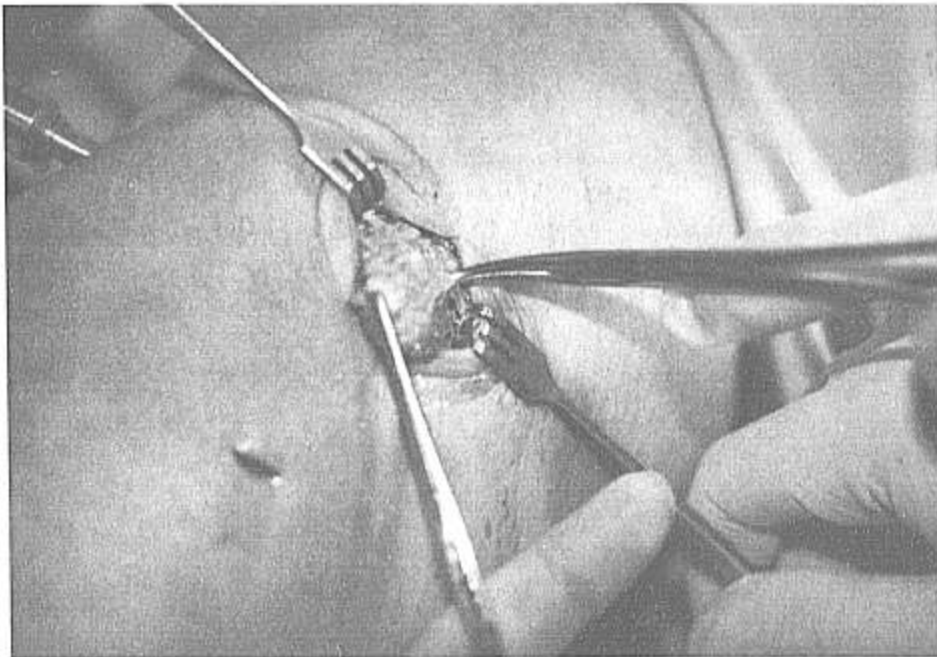


Figure 3—Mini-arthrotomy at the time of surgical excision bipartite patellar fracture fragment. Arthroscopic portal is at lower left and the loose fragment is being removed.

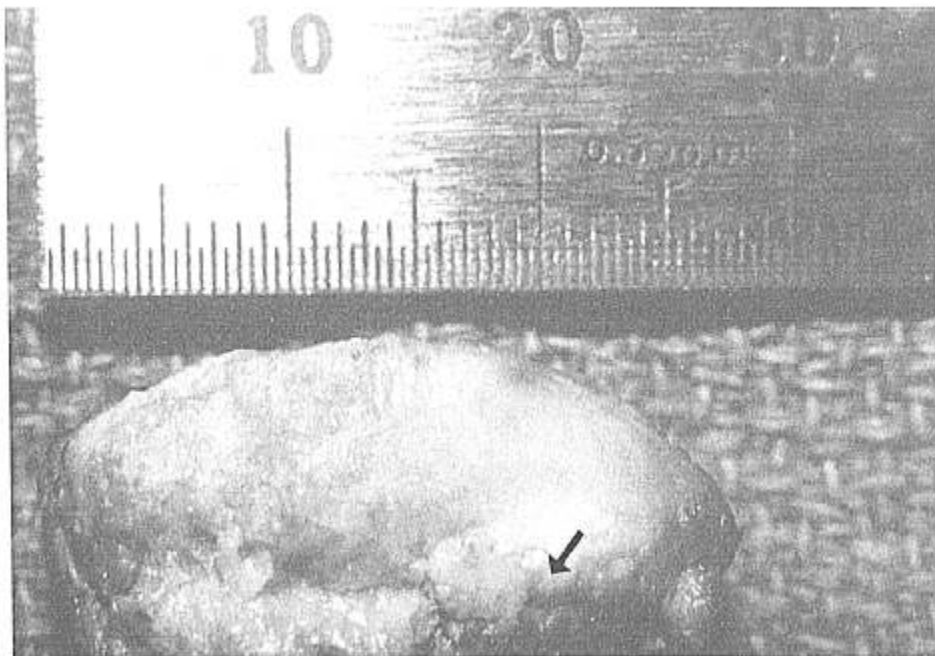


Figure 4—Excised fragment that measures 2.8×1.5 cm. The superior portion of this is all articular surface with the lower aspect of the fragment being cancellous bone. Arrow demonstrates the smooth edge of the junction between articular cartilage above and cancellous bone below.

perolateral patellar fragment (Fig. 2). An open mini-arthrotomy to excise the superolateral patellar fragment was done (Fig. 3). The excised fragment measured $2.5 \times 2 \times 2$ cm. (Fig. 4). The patellar articular cartilage is the thickest in the body. The smooth central edges of the fragment confirm the fibrous union, previous bipartite nature of the specimen.

Postoperatively, the patient was maintained in a knee immobilizer for 3 wk. He was placed on a vigorous rehabilitation program of quadriceps strengthening,

avoidance of eccentric loads, and patellar mobilization and was able to return to full activity by 4 months. It is now 2 yr after surgery and the patient reports no limitations in activities or knee pain. He has resumed full recreational sports activities.

DISCUSSION

The patella is the largest sesamoid bone in the body. Ossification of cartilaginous anlage occurs between ages

2 and 6 (2,5). In 77% of children, the patella ossifies from one center. In the remaining 23%, it ossifies from two or three centers (4). The secondary centers of ossification are located at the superolateral pole and occur around age 12. Most of these secondary ossification centers fuse with the main patella during adolescence, but approximately 2% do not (2,3). Review of knee radiographs over 1 yr showed six patellar ossification defects of 2,286 cases (8). Three of these were excised. Atypical muscular stress from the vastus lateralis insertion was proposed as a cause of the multipartite patella.

Saupe had investigated bipartite patellae and proposed a classification scheme that is most frequently utilized today (6) (Fig. 5). This patient's patella would be classified as a Type III. Superolateral Type III bipartite patellae constitute 75% of the total, 20% are found to be direct lateral or vertical, and 5% are in the inferior area.

Occurring in 2%–3% of the population, a bipartite patella is symptomatic in only 2% (9). The reported ratio male to female of bipartite patellas is 9:1 (7). Unilateral occurrence is 57% and bilateral 43% (4).

Radiographically, several features help to distinguish a bipartite patella from an acute fracture: 1) the bipartite patella is frequently bilateral; 2) usually consists of a large main bone and a small bone usually situated at the upper outer quadrant of the patella; 3) the radiolucent line of demarcation is wide and runs downward and lateral; and 4) the opposing bony margins are smooth, dense, and can be seen to be composed of bony cortices (1).

A bipartite patella can be fractured by repetitive stresses or single event. A stress fracture and fibrous nonunion should be considered in a patient with direct tenderness over the superolateral patella. Technetium bone scan may be helpful to confirm the diagnosis in unclear or complicated cases. With persistent pain from a patellar nonunion, surgical treatment of arthroscopy and surgical excision of the unstable fragment will provide pain relief and excellent results (2,4,5,9). In patients with

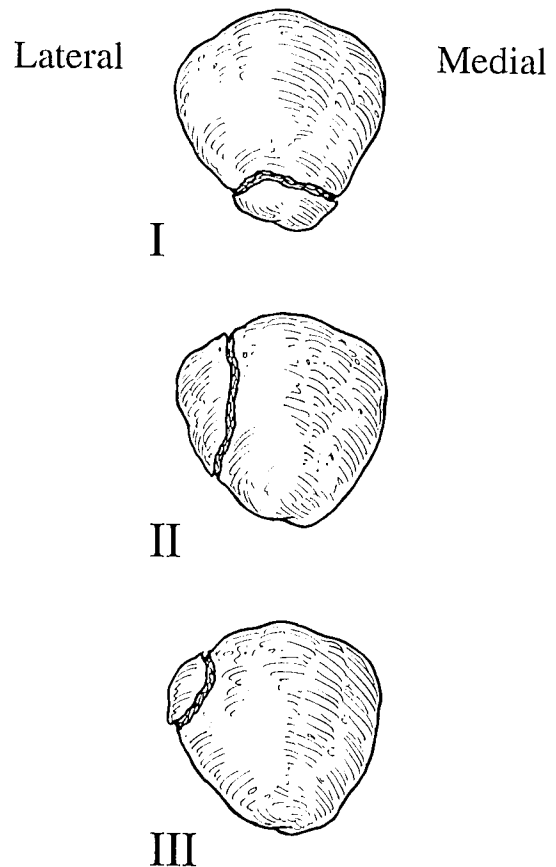


Figure 5—Saupe classification of bipartite patella. The most common is Type III of a superolateral quadrant (75%); then Type II, direct lateral or vertical (20%); and then Type I, inferior (5%).

acutely displaced fractures of the bipartite patella, diagnosis is evident by clinical exam and plain radiographs. Diagnostic arthroscopy and open mini-arthrotomy to excise the displaced fragment will predictably result in successful outcome.

Address for correspondence: Mary Lloyd Ireland, Kentucky Sports Medicine, 601 Perimeter Drive, Lexington, KY 40517.

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