RECURRENT OSTEOCHONDRAL FRACTURE OF THE PATELLA

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Two cases which came under the author's care within three months of one another present interesting points in diagnosis and treatment which are new in relation to a comparatively rare fracture of the patella. The injury is undoubtedly more frequent than would be expected, and many loose bodies removed from the knee joint have originated from such fractures of the patella. It is important that the correct diagnosis should be made early, and that operative treatment should be undertaken promptly, in order to prevent further damage to the joint. The condition is to be suspected when there is haemarthrosis following trauma, and particularly when the patient states that "something slipped in the knee at the time of injury."

The earliest reference to this type of fracture was by Kroner (1905). The patella which had been dislocated laterally, was split in two frontal sections; the articular portion sheared off and remained displaced while the anterior portion reduced itself. Kleinberg (1923) reported the case of a boy, eighteen years of age, with three loose pieces of articular cartilage fractured from the back of the patella by an injury sustained while playing football. He suggested that a fall with the knee in semi-flexion had forced the patella downward against the femoral condyles, shearing off its articular surface. He was unable to find any reference to the fracture. Stewart (1925) reported a frontal fracture not involving the articular surface. He reasoned that the mechanism was a subluxation or dislocation of the patella catching on the lateral femoral condyle or in the intercondylar notch; the pull of the vastus medialis then produced a shearing force which fractured the patella. Krida (1924) also reported a frontal fracture of the patella. Meekison (1937) reported three cases of "a hitherto undescribed fracture of the patella." In each of these a circular piece of the articular surface of the patella, 1.5 to 2 cm. in diameter, was torn from its medial-inferior surface and was lying in the lateral pouch. He was unable to demonstrate the fracture by radiographic examination. One of the patients reported pushing the patella back in place, and another stated that he had to "push his knee back in place". The mechanism was thought to be "a glancing blow on the patella from the inner side and directed obliquely posteriorly. The inferior medial corner of the articular surface was knocked out, presumably by the lateral condyle of the femur." Chaklin (1939) briefly reported one case where a defect was present in the cartilage at the lateral border of the patella and a loose body was found in the joint two days after injury. Milgram (1943) reviewed the literature and reported six cases of tangential osteochondral fracture of the patella verified by operation. In three additional cases the diagnosis was strongly suspected but no operation was performed. His well-illustrated article clarifies the mechanism and pathology. Harmon (1945) recently added one case where a loose body was found, originating from the patella, after definite dislocation of the patella.

FIG. 1

Case 1. Osteochondral fracture of patella. Radiographs show thin flake of bone but do not disclose its origin.

MECHANISM OF INJURY

The injury is produced by the patella sliding laterally over the lateral femoral condyle and, in so doing, scoring the articular surface of both patella and condyle. The medial border of the dislocated patella is then caught by the edge of the lateral condyle. When the quadriceps contracts, considerable tangential force is applied, which shears off a portion of the articular cartilage of the patella, usually with a thin layer of underlying bone. In both the cases reported here, direct pressure had also been applied to replace the dislocated patella.

FIG. 2

FIG. 3

Case 1. Patella exposed through lateral incision (Fig. 2). The flake of bone was part of a large osteochondral loose body (A) which has arisen from a defect in the patella (arrow). Exposure of the lateral condyle (Fig. 3) shows that an area of articular cartilage has been scraped off by impact of the patella (arrow).

which the loose body could be fitted. (Fig. 2 shows the defect and the loose body.) On the anterior surface of the lateral femoral condyle a thin layer of articular cartilage had been scraped off an area as big as a ten-cent piece (Fig. 3). Several small pieces of shredded cartilage were washed from the joint. The margins of the patellar defect were shaved obliquely and shreds of cartilage were removed from the lateral condyle. There was no tearing of the capsule medial to the patella.

Pathological examination by A. J. Blanchard, M.D.—Microscopic examination of the loose body

Case Reports

Case 1. C. G. P., aged 37 years. Was "strap-hanging" on one of the fast-starting street-cars of the Toronto Transportation Commission. He was thrown off balance, internally rotating the left femur on the fixed tibia. He felt his patella slip laterally and stick in the displaced position. He applied pressure and it slipped back with a loud crack causing extreme pain. Next morning while bending his knee the patella again slipped over and had to be pushed back. He gave no history of previous dislocations of the patella.

Examination—The knee joint was full of fluid, and movement was limited and painful. There was tenderness over the front of the external condyle. No knock-knee deformity was present. Radiographs (Fig. 1) showed a loose body lying in the joint. Several views were taken but the origin of the loose body was not discovered. After operation further radiographs showed the defect at the lower border of the patella.

Operation report—Seventeen days after injury the knee joint was opened through a short incision lateral to the patella. The joint was filled with blood-stained fluid and several clots were expressed. A large piece of articular cartilage measuring 2.5 cm. $\times$ 1.5 cm. $\times$.5 cm. was immediately seen in the antero-lateral compartment of the knee. A thin flake of bone was present on one surface. The incision was extended to give better exposure of the joint. A defect was found at the lower

medial aspect of the patella into

from the patella shows a large area of hyaline cartilage covered by synovial membrane and a small portion of cancellous bone. The majority of the cartilage cells appear to be still viable, but the appearance of the bone cells suggests that they are dead. Beneath the synovial membrane are areas of recent haemorrhage and in these situations there is proliferation of young osteogenic cells and chondroblasts. In the cancellous bone there is evidence of injury with large globules of fat surrounded by foreign body giant cells. There is also a considerable number of foam cells. The impression is gained that this lesion does not represent a true osteochondritis dissecans, but rather that it is the result of an injury with chip-like fracture and incomplete preservation of blood supply.

Convalescence was uneventful. He returned to work as a bank clerk in two months time with a full range of knee movement. He has no complaints eleven months after operation.

Case 2. B. J. B., aged 35 years. Admitted to hospital complaining of a painful swollen left knee. Two days previously, while pushing a car out of a snowdrift, the car suddenly moved a short distance causing sudden abduction of the knee joint. He gained the impression of something slipping and then "going back" in place. There was severe pain in the knee but he was able to walk on it. Ten months previously, while a prisoner-of-war in Germany, he had jumped backwards from a fence, alighting on his left leg and twisting it outwards as he landed. He had experienced extreme pain, so severe that he fainted, and when he came to he had thought that the knee was dislocated because it seemed to project on the inner side. He had struck the inner side of the knee with his hand and heard a loud click, accompanied by extreme pain. The knee had become swollen, but he carried on. After this he had occasional aching over the inner side of the knee, but no locking or giving way.

Examination of left knee—There was a large effusion. Coarse crepitus could be felt when the patella was moved on the femur. A loose body was palpated above and to the outer side of the patella. There was no ligamentous instability. There was tenderness along the medial border of the patella and over the joint line medially. Radiographs (Fig. 4) showed a loose body in the outer part of the suprapatellar region and irregularity at the inner distal border of the patella.

Operation note—Under spinal anaesthesia an incision was made, medial to the patella, four inches in length. The joint was full of blood-stained fluid. A fibro-cartilaginous loose body about as big as a ten-cent piece immediately presented. The articular surface of the lower medial quadrant of the patella was roughened and a segment was missing. There had been an attempt at repair of this segment with fibro-cartilaginous tissue. The loose body had obviously arisen from the centre of this area. Over the front of the external condyle there was an area from which the thin outer layer of the articular cartilage had been scraped. (The patella could be readily dislocated laterally.) In the outer wall of the suprapatellar pouch a loose body was embedded. It was shelled out and found to be composed of cartilage and bone. It was approximately the size of the defect in the patella. The patella was removed by subaponeurotic dissection. The synovial membrane was closed behind the defect left by the removal of the patella and the quadriceps tendon was sutured to the patellar tendon with a strip of fascia taken from the thigh. The suture line was reinforced with three No. 3 chromic cat-gut sutures. The synovial membrane was then closed medial to the patella and the capsule of the joint overlapped half an inch. Dermal sutures were used in the skin and a plaster-of-Paris cast applied to the leg.

Pathological report by A. J. Blanchard, M.D.—The specimen consists of a patella and two loose bodies (Fig. 5) from the knee joint. The medial half of the patella shows an eroded area measuring 2.5×2 cm. At the margins of this area there is an obvious tear in the surface cartilage, and beneath this there is recent blood clot. Medial to this point there is an irregular area which appears to represent a healed fracture. The two loose bodies measure respectively $1.5 \times 1.5 \times .5$ cm. and $2 \times 1.5 \times .5$ cm. The former of these shows a layer of fibrous tissue on one surface, and smooth glistening opposing surface. The second piece shows what appears to be bone on one surface and cartilage on the other.

Microscopic examination of a section through the old eroded area of the patella shows loss of the surface hyaline cartilage, and in this area the bone is covered by fairly dense fibrous connective tissue containing an increased number of capillary blood vessels. Section through the recently injured area reveals a recent tear in the surface cartilage with masses of blood clot. There appears to be no under-

FIG. 4

Case 2. Old and recent osteochondral fractures of the patella. There is a loose body in the outer suprapatellar region and irregularity of the inner border of the patella.

lying pathological condition in the patella. Section through the larger loose body shows hyaline cartilage undergoing resorption. There is proliferation of connective tissue, and osteoclasts are present. Section of the other loose body shows mostly hyaline cartilage and masses of quite dense fibrous tissue. A few spicules of dead bone are present.

Convalescence was prolonged by thrombophlebitis which developed three weeks after operation. Mobilisation of the knee joint and muscle re-development was consequently delayed. Eight months after operation his only complaint was of some aching in the knee after sitting. He still had one inch wasting of the thigh with knee movement from 180 to 70 degrees.

FIG. 5
Case 2. Old and recent osteochondral fractures of the patella. The patella was removed. Note the defect in the medial distal quadrant with fibrillation of articular surface, and two loose bodies, one from the old fracture and one from the recent injury.

DISCUSSION

The history of both these cases, and the operative findings, leave no doubt as to the mechanism of injury. Most reported cases have been children or adolescents, but these two were adult males with no knock-knee deformity. The defects in the patella could be demonstrated radiographically but lateral, oblique, and "sky-line" views were necessary to catch the right projection. A pneumo-arthrogram was tried in Case 2, but it did not make the defect any more clear; it would, however, be of value in revealing a defect which involved only the articular cartilage of the patella. Of particular interest in both cases was the history of recurrent injury. In the first case the two injuries were on succeeding days, two and a half weeks before operation. In the second case there was an interval of ten months between the two injuries, the second injury occurring one week before operation. The finding in this knee joint of two loose bodies, and the evidence of recent and old damage to the medial surface of the patella, confirmed the history. This was, in effect, a case of recurrent osteochondral fracture of the patella. The second injury scraped off part of the fibro-cartilage which had partly repaired the original defect in the patella (Fig. 5). The possibility of recurrence of this injury has not previously been recorded, and it is an important consideration in determining treatment. In Case 2 the joint was approached through a median patellar incision and in the course of closing the wound the capsule was overlapped. Plication of the

capsule should be sufficient to prevent recurrent injury in cases without knock-knee deformity such as may be found in recurrent dislocation of the patella. The patella was removed in Case 2 because extensive involvement of the articular surface had been causing symptoms since the original injury, and would undoubtedly have led to patello-femoral arthritis.

Later note. Since submission of this article the author has treated three additional cases of osteochondral fracture of the patella. Two were confirmed by operation. In each there was a typical history of dislocation of the patella with large effusion into the joint.

FIG. 6

Osteochondral fracture due to dislocation of the patella. The detached fragment of articular cartilage had a pedicle of synovial membrane.

Both had previously been diagnosed as tears of the medial meniscus. Fig. 6 shows the detached fragment of articular cartilage of the patella in Case 3; there was a pedicle of synovial membrane. Operation in Case 4 showed scoring of the articular surface of the patella and lateral femoral condyle with a small area of cartilage scraped off the condyle. The fifth case showed characteristic radiographic findings with a defect on the posterior-medial border of the patella.

CONCLUSIONS

Osteochondral fractures of the patella should be recognised early, loose bodies removed, and defects in the articular surfaces smoothed off, or the patella removed if it is extensively involved. Plication of the capsule on the medial side is recommended in order to prevent recurrence of the injury and to prevent dislocation of the quadriceps tendon in cases where the patella is removed.

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