HABITUAL DISLOCATION OF THE PATELLA IN FLEXION

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Thirty-five patients with habitual dislocation of the patella in flexion were reviewed; eight were bilaterally affected. Each had undergone quadricepsplasty with an average follow-up of 6 years 9 months. Bands or contractures, most commonly in vastus lateralis, the iliotibial tract and rectus femoris were seen in each. Redislocation was seen in 12 knees. At review, 79% of the knees were normal.

Quadriceps lengthening is an essential part of treatment and must be performed proximally. Causes for failure include reformation of contractures and failure to correct the initial abnormality fully.

Habitual dislocation of the patella in flexion implies that dislocation occurs every time the knee is flexed. The displacement is painless, in marked contrast to recurrent dislocation which occurs as isolated episodes, often in response to trauma and is accompanied by pain and followed by swelling. Congenital dislocation refers to an irreducible dislocation present since birth and associated with a lateral position of the entire quadriceps mechanism. The distinction between these groups is important as the surgical treatment for each is quite different. Operations for recurrent dislocation usually involve procedures distal to the patella. Habitual dislocation of the patella always requires releases proximal to the patella.

Hněvkovský (1961) described quadriceps fibrosis, but it was Gunn (1964) who not only described the association of fibrosis with intramuscular injections to the thighs, but also put forward the idea that quadriceps contracture may sometimes give rise to dislocation of the patella. He reported 22 cases of quadriceps contracture. In 20% of these, dislocation of the patella laterally permitted full and painless flexion. In 1963 Jeffreys described an abnormal attachment of the iliotibial tract to the patella, producing habitual dislocation in flexion. Williams' (1968) series of quadriceps contractures contained a group with habitual dislocation of the patella in flexion; and Alvarez et al. (1980) reported 17 patients

with quadriceps fibrosis, five of whom had habitual dislocation of the patella.

This paper describes our clinical experience with habitual dislocation of the patella in flexion, and presents the results of surgical treatment.

MATERIALS AND METHODS

All patients treated at the Royal Children's Hospital for habitual dislocation of the patella in flexion since 1961 were identified. All underwent a quadricepsplasty and were followed at least until recovery from the extensor lag. Thirty-five patients, with 43 affected knees, were included. There was even distribution of the sexes with 18 males and 17 females. The average age at presentation was 9 years with a range from 3 to 15 years. The average follow-up was 6 years 9 months with a range from 3 months to 19 years 10 months.

In eight patients there was a documented past history of multiple intramuscular injections during the neonatal period. The most common were the antibiotics chloramphenicol, penicillin and streptomycin. One patient had a quadriceps fibrosis of the opposite side without patellar dislocation. In 10 patients there was a family history of dislocation. There were associated anomalies in seven patients (Table I). There were eight patients with bilateral dislocations, with a family history in four and other anomalies present in three.

A number of untreated affected parents were examined and these all had a significant disability consisting of a flexion deformity of the knee, marked patellofemoral arthritis with pain and instability. In some, the patella had become fixed on the outer side of the knee and was barely reducible manually. These observations provide ample reasons for advising repair

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of the anomaly in the young child even when asymptomatic.

Clinical presentation. It is remarkable how little trouble an habitually dislocating patella produces in young children. Fifteen were detected when the mother reported an odd-looking knee (Fig. 1). The dislocating patella was found at routine examination in seven patients. A history of unrelated trauma to the knee prompting examination was obtained in seven patients. Pain was the presenting symptom in only four, and an inability to run because of instability was seen in two. This condition is never obvious in the young, fat-covered knee and may be missed unless actively sought.

Examination. The cardinal physical sign is lateral dislocation of the patella each time the knee is flexed (Fig. 2). With the patella held firmly in the femoral groove, the average flexion possible was 35° but may be as much as 70° (Fig. 3). When the patella is allowed to dislocate, full flexion is possible (Fig. 4). Palpable bands attaching to the lateral border of the patella were noted in six knees. Lateral insertion of the patellar tendon was clinically detectable in two knees.

Pathology at operation. All cases were submitted to operation. In each knee, well-defined bands, or muscular contractures within the quadriceps, could be detected. Figure 5 depicts the incidence of the main contractures seen at operation. Some cases had an obvious main contracture with minor (secondary) involvement of one or more other structures. Vastus lateralis was involved in 31 knees (72%). This generally comprised a dense, fibrous band running along its lower border (Fig. 6). An abnormal attachment of the iliotibial tract to the patella was seen in 25 knees (58%). This band has a rolled anterior border and sweeps forward to the patella rather than having its main attachment to the tibia (Fig. 7). Contractures were present in rectus femoris in 18 knees (42%), and vastus intermedius in seven (16%). Vastus medialis was felt to be tight in only one knee.

Other abnormalities found at operation were a flat,

or shallow, femoral groove (often associated with a flat, patellar undersurface), a hypoplastic lateral femoral condyle, lateral insertion of the patellar tendon, a double rectus femoris tendon (one) and an absent vastus intermedius (one).

Operative procedures. The technique of operation has already been described (Williams 1968). In principle, the tight lateral bands are released from the patella and the incision continued proximally, lateral to the rectus femoris tendon, thus fully releasing vastus lateralis (Fig. 8). Vastus intermedius is inspected and divided if tight. When necessary, rectus femoris is lengthened by extending the medial release proximally, medial to the rectus femoris tendon and dividing rectus femoris at its musculotendinous junction. The knee is then flexed, lengthening rectus femoris. Vastus lateralis and vastus medialis are sewn to each other and to the rectus femoris tendon in its lengthened position. If lateral dislocation is still not controlled, a medial advancement of vastus medialis, medial plication, patellar tendon transfer or sartorius to patella transfer is added. Closed suction drainage is used.

As well as division of bands, rectus femoris lengthening was needed in 16 (37%), medial plication in

Fig. 1

Presentation in 35 patients. An unusual appearance is the most common presentation. Unrelated trauma to the knee often prompted the initial examination.

Fig. 2

Figure 2 – Dislocation occurs each time the knee is flexed. Figure 3 – When the patella is held in the midline the knee will not bend more than 70°. Figure 4 – With the patella dislocated a full range of knee movement is obtainable.

Fig. 3

Fig. 4

Fig. 5

Operative findings. Bands or contractures are seen in all components of the quadriceps, but most commonly in vastus lateralis and the iliotibial tract.

7 (16%) and advancement of vastus medialis in 19 (44%). Patellar tendon transfer was required in six cases to achieve stability. This was performed using a soft-tissue technique, thus avoiding the disastrous effects of premature anterior growth-plate arrest of the tibial tubercle. Sartorius was transferred anteriorly to the patella in two knees.

Rehabilitation. The knee is immobilised in a plaster cast at 90° of flexion for six weeks. After removal of the cast an extensor lag is always present initially whenever rectus femoris has been lengthened. The average duration of the extensor lag was 12 months, ranging from 1 to 33 months; it resolved in each case without treatment but even when present did not appear to cause any disability.

Fig. 6

Fig. 7

Figure 6 - The insertion of vastus lateralis has a strong contracted band running along the posterior border of the muscle and inserted into the patella. Figure 7 - A band sweeps forward from the iliotibial tract (B) and is inserted into the lateral border of the patella (P). Vastus lateralis (VL) is seen.

Fig. 8

Quadriceps lengthening is performed sequentially. First the lateral structures are released, then the medial, and then rectus femoris is lengthened at the musculotendinous junction.

Operative complications. Significant complications occurred in four knees during the early postoperative period. There was one wound haematoma associated with a lateral popliteal nerve palsy and two wound dehiscences.

Redislocation. Patellar redislocation was seen in 12 knees (28%). Ten underwent a repeat quadricepsplasty and all of these were successful. The remaining two were in children with Down's syndrome who had ligamentous laxity and valgus knees; further attempts were not considered justifiable. The average time to redislocation was 35 months, but ranged from 2 months to 10 years.

At re-operation, reformation of vastus lateralis or iliotibial contractures was seen in six knees, two of which also required lengthening of rectus femoris. Rectus femoris alone was lengthened in two knees and in one of these a sartorius transfer was added. One knee was

stabilised by patellar tendon transfer alone, and another by vastus medialis laterally.

RESULTS

At follow-up, after an average period of 6 years 9 months, 34 knees (79%) were considered to have normal function. Of the remaining nine knees (21%) six had a history of occasional giving way and this group included the two knees in children with Down's syndrome where redislocation was accepted. Three had a complaint of pain in the patellofemoral compartment. An ugly scar was noted in nine knees (28%).

DISCUSSION

Quadriceps fibrosis involving the rectus femoris and vastus intermedius alone will result in an elevated and hypoplastic patella. When the vastus lateralis and the iliotibial tract are involved there is a greater tendency for habitual dislocation of the patella to occur on flexion of the knee. It is not true to say, however, that in all cases in which vastus lateralis and the iliotibial tract are contracted, habitual dislocation will occur (Williams 1968). Whether or not habitual dislocation occurs may depend on factors extrinsic to the quadriceps such as femoral torsion, dysplasia of the lateral femoral condyles, genu valgum, a laterally placed patellar tendon insertion and ligamentous laxity.

In our series of dislocating patellae, contractures were seen in all components of the quadriceps, but the vastus medialis was felt to be tight in only one case. There is no single cause of quadriceps contractures. Initially, it was believed to be due to a congenital myelodysplasia (Hněvkovský 1961; Jeffreys 1963; Karlen 1964). Similarities to club foot and Sprengel's shoulder have been noted (Gammie, Taylor and Ulrich 1963). An association of vastus intermedius contracture with birth trauma and a resemblance to contracture of the sternomastoid muscle has been noted (Fairbank and Barrett 1961). Gunn first reported the clear association of quadriceps fibrosis with intramuscular injections and "subcutaneous" infusions. This has since been confirmed by others (Lloyd-Roberts and Thomas 1964; Williams 1968; Alvarez et al. 1980). Local trauma of the injection itself can produce muscle necrosis and fibrosis. Introduction of large volumes of liquid can produce raised pressure within the muscle bundles resulting in capillary obstruction, oedema and muscle ischaemia (Groves and Goldner 1974). The irritant quality of the solution varies with its composition, pH and osmotic pressure.

The histological studies in this condition have consistently shown degeneration of striated muscle and replacement with varying amounts of fibrous and adipose tissue (Hněvkovský 1961; Gammie et al. 1963; Lloyd-Roberts and Thomas 1964; Alvarez et al. 1980).

The characteristic clinical features of habitual

Table I. Associated anomalies

Bilateral congenital talipes equinovarus	1
Undescended testes	3
Idiopathic infantile scoliosis	1
Congenital scoliosis	1
Bilateral absent fibula and kyphotic tibia	1
Hirschprung's disease	1
Discoid lateral meniscus	1
Congenital short stature	1
Down's syndrome	2
Hypoplastic thumb	1

dislocation of the patella in flexion are restricted flexion of the knee with the patella held reduced and painless lateral dislocation of the patella on flexion. With long-standing habitual dislocation, the patella may become irreducible as seen in two patients in this series. The pathological features of these cases were similar to the others so they are considered to be true habitual dislocations.

A clear appreciation of the type of dislocation present is necessary at the time of operation. Distal procedures alone are certain to fail, and if the procedure involves distal advancement of the tibial tendon the condition will actually be made worse. In other words, it is essential to lengthen the quadriceps above the patella rather than to shorten it below the patella. A quadriceps-plasty is performed and, depending on the pathology seen, medial plication, advancement of vastus medialis across the anterior surface of the patella, patellar tendon transfer or transfer of sartorius to the patella is added (Williams 1968). The extensor lag often present at six weeks is not a problem. It resolves over 12 months without physiotherapy.

Redislocation was seen in 12 knees. In one-third of these, rectus femoris lengthening should have been performed at the initial operation. Failure to realign distally, when a lateral patellar tendon insertion was detectable clinically, was responsible for another failure. The reformation of the contractures was seen in six cases at re-operation.

Pain related to degenerative changes in the patello-femoral joint was seen at follow-up in 12%. A flat patellar undersurface and flat femoral groove were commonly seen at review but did not prevent a successful outcome. In view of the significant disability observed in untreated adults, the authors considered that reparative surgery is indicated in childhood; except in Down's syndrome, an acceptable result can be anticipated in practically every case.

Conclusions. Habitual dislocation of the patella in flexion is due to contracture of one or more elements of the

quadriceps muscle although the vastus medialis is rarely affected. Most cases present between the ages of 5 and 12 years when the femur is growing disproportionately to the quadriceps. Operative correction involves a quadricepsplasty in all cases. Additional procedures are required in individual situations. An extensor lag, when present, generally resolves over 12 months. If re-dislocation occurs, it is due to reformation of contractures or failure to achieve full correction at the previous quadricepsplasty. Good results in terms of patellofemoral pain and function can be expected.

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