Popliteal and calf cysts in rheumatoid arthritis

Treatment by anterior synovectomy

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Popliteal or calf cysts are frequently found in association with rheumatoid arthritis of the knee. The conclusions drawn from a study of the physiology of the knee joint (Jayson and Dixon, 1970b) suggested that, in treating these cysts, attention should be directed primarily to the knee. We report here seven patients who developed cysts in the calf or in the popliteal space behind the knee which were relieved by synovectomy from the front of the knee.

Patients and methods

Measurements were performed upon nine knees of seven patients with definite or classical rheumatoid arthritis (Ropes, Bennett, Cobb, Jacox, and Jessar, 1959). Associated with each of these knees was a popliteal or calf cyst producing symptoms sufficient to warrant treatment. In each knee the following assessments were made:

- (i) Clinical examination.
- (ii) X ray contrast studies. Arthrograms were performed by aspirating any effusion and replacing it with 20 ml. 60 per cent. meglumine iohalamate (Conroy 280), x rays being obtained before and after exercising the joint. When possible these were supplemented by cystograms obtained by injecting the same dye directly into the cyst.
- (iii) Measurements of pressure within the knee and within the cyst by the technique described by Jayson and Dixon (1970b).

Synovectomy was performed by one of us (AK or IP) under tourniquet and with general anaesthesia, and as much as possible of the inflamed synovium was removed through an anterior approach to the joint. No attempt was made to reach the back of the joint through the intercondylar notch, to find the connection between the knee and the popliteal cyst, or to close any such opening. At varying intervals after synovectomy assessments were repeated.

Case reports

Patient 1, a man aged 62 years, had had rheumatoid arthritis for 12 years with involvement of both knees for 5 months.

LEFT KNEE

The knee contained a small effusion but posteriorly there was a large tense and very painful cyst. The arthrogram (Fig. 1) showed that dye passed from the knee directly into the cyst. The resting pressure was 8 mm. Hg in the knee and 87 mm. Hg in the cyst. After anterior synovectomy, the symptoms improved. In one month the knee effusion

FIG. 1 *Patient 1. Left knee. Preoperative arthrogram. Numbers refer to the intra-articular and intracystic pressures in mm. Hg, in all diagrams*

was smaller and the cyst not palpable. On arthrography the dye no longer passed into a cyst (Fig. 2). The assessments were repeated at 10 and 23 months and on neither occasion could the cyst be detected.

FIG. 2 Patient 1. Left knee. 1 month postoperative arthrogram

RIGHT KNEE

The knee was similar with a small effusion and a large tense and tender popliteal cyst (Fig. 3). The pressure in the knee was 17 mm. Hg and in the cyst 88 mm. Hg. 2 months after anterior synovectomy a small effusion was still present in the joint, but the cyst though palpable was soft and painless. The pressure in the knee had fallen to 7 mm. Hg and that in the cyst to 8 mm. Hg. Contrast injected into the joint no longer passed into the cyst even though the shadow of the cyst could be discerned, and 10 months later the findings were unchanged (Fig. 4). A cystogram (Fig. 5) showed a large cystic space with multiple filling defects, suggesting that the contents of the cyst consisted of fibrinous lumps. 23 months after anterior synovectomy there was only a very small knee effusion and the cyst was difficult to palpate. Dye failed to pass from the knee to the

FIG. 3 Patient 1. Right knee. Preoperative arthrogram

FIG. 4 Patient 1. Right knee. 10 months postoperative arthrogram

FIG. 5 Patient 1. Right knee. 10 months postoperative cystogram

FIG. 6 Patient 1. Right knee. 23 months postoperative cystogram

cyst, and contrast injected into the cyst at this time showed that it was still present but much smaller (Fig. 6). The knee and cyst pressures were 4 and 10 mm. Hg respectively.

In this knee production of effusion was reduced by the operation and the cyst no longer filled from the knee. The entrance to the cyst closed but, because of the large masses of fibrin, the cyst itself was slow to disappear.

Patient 2, a man aged 57 years, had had rheumatoid arthritis for 22 years.

The left knee contained a small effusion but there was a large tense cyst in the left calf which showed cross-fluctuation with a small popliteal cyst. The pressure in the knee was 14 mm. Hg, and that in the calf cyst 109 mm. Hg.

An arthrogram (Fig. 7) confirmed these findings and a cystogram (Fig. 8, overleaf) delineated the cysts and confirmed that dye would not pass readily from the cysts into the joint space. 1 month after anterior synovectomy a small calf cyst could still be detected by an arthrogram but not by palpation (Fig. 9, overleaf).

3 months after synovectomy a small effusion was present in the knee but the cysts were neither palpable nor demonstrable on arthrography (Fig. 10, overleaf). The

FIG. 7 Patient 2. Left knee. Preoperative arthrogram

FIG. 8 Patient 2. Left knee. Preoperative cystogram

FIG. 9 Patient 2. Left knee. 1 month postoperative arthrogram

FIG. 10 Patient 2. Left knee. 3 months postoperative arthrogram

intra-articular pressure was 8 mm. Hg. Final assessment 10 months after the operation showed no effusion and no detectable cyst.

Patient 3, a woman aged 48 years, had had rheumatoid arthritis for 6 years which had involved the right knee for 1 year. For 6 months there had been a large painful popliteal cyst. The pressure in the knee was 11 mm. Hg, and in the cyst 67 mm. Hg. Contrast injected into the knee passed into a large multiloculated cyst with a number of filling defects (Fig. 11) but did not pass from the cyst to the knee (Fig. 12). 1 month after anterior synovectomy there was a small effusion in the knee and the cyst was smaller (Fig. 13) and much softer. The pressure in the knee was 6 mm. Hg, and that in the cyst had fallen to 20 mm. Hg.

Patient 4, a man aged 56 years, had had rheumatoid arthritis for 3 years.

LEFT KNEE

This knee had been affected for about 5 months and a very painful multiloculated popliteal cyst had developed (Fig. 14). The pressure in the knee was 5 mm. Hg, and that in the cyst 220 mm. Hg. 1 month after anterior synovectomy the cyst was painless and no longer palpable, and there was only a small posterior synovial protrusion on arthrography (Fig. 15, overleaf). 13 months after operation there was a mild relapse of arthritis in the knee but the cyst did not recur.

FIG. 11 Patient 3. Right knee. Preoperative arthrogram

FIG. 13 Patient 3. Right knee. 1 month postoperative arthrogram

FIG. 12 Patient 3. Right knee. Preoperative cystogram

FIG. 14 Patient 4. Left knee. Preoperative arthrogram

FIG. 15 *Patient 4. Left knee. 1 month postoperative arthrogram*

RIGHT KNEE

This knee had also been painful for about 3 years and a posterior cyst had been present for 1 year, but the latter was becoming less tense and was no longer causing severe symptoms. The knee pressure was 11 mm. Hg, and the cyst pressure 18 mm. Hg; an arthrogram showed virtually no contrast entering the cyst from the joint. 2 months after anterior synovectomy the intra-articular pressure had fallen to 4 mm. Hg, and the cyst was no longer palpable nor demonstrable. 14 months after the operation the cyst could not be palpated. This joint was improving spontaneously, but anterior synovectomy may well have hastened resolution of the cyst.

Patient 5, a woman aged 44 years, had had rheumatoid arthritis for 8 years which had involved the left knee for 9 months. No effusion could be detected in the knee, but a painful popliteal cyst was present and the pressure in this cyst was 40 mm. Hg. Contrast passed from the knee to the

cyst *via* a tortuous passage. 8 months after anterior synovectomy the cyst was no longer palpable or demonstrable and the knee was pain-free.

Patient 6, a woman aged 67 years, had had rheumatoid arthritis for 4 years which had involved the left knee and given rise to a large tense painful cyst in the left calf. 3 months after anterior synovectomy the cyst was palpably smaller and considerably less tense, and no longer filled from the joint on arthrography. After 6 months the cyst was no longer demonstrable clinically or on arthrography.

Patient 7, a woman aged 56 years, had had rheumatoid arthritis involving the right knee for 3 years with a small effusion. There were tense popliteal and calf cysts which showed cross-fluctuation and filled from the joint, the calf cyst being joined to the popliteal cyst by a narrow neck and filling less easily. 2 months after anterior synovectomy there was no knee effusion and neither of the cysts was palpable or demonstrable.

Discussion

The pressure in the cavity of the normal knee, when the joint is extended and empty or nearly so, is near to the atmospheric pressure, but when the subject is walking the pressure varies, falling to as low as 30 mm. Hg below atmospheric pressure at certain phases of the gait. In the pressure of an effusion, natural or simulated, this sub-atmospheric pressure is abolished and replaced by strong positive pressures. The magnitude of this pressure is related to the volume of fluid and to the distensibility of the joint capsule. In the presence of rheumatoid arthritis even higher pressures are developed because of scarring of the capsule (Dixon, 1966; Jayson and Dixon, 1970a). These pressures may be sufficient to burst the joint capsule and produce the syndrome of acute joint rupture (Dixon and Grant, 1964; Jayson, Swannell, Kirk, and Dixon, 1969), or to disrupt the articular cortex and produce rheumatoid geodes (Jayson, Rubenstein, and Dixon, 1970).

Popliteal and calf cysts are often found in association with rheumatoid arthritis of the knee and we have previously shown that these cysts are connected to the joint *via* valvular channels. The effusion is able to pass from the knee to the cyst but not in the reverse direction. This has the effect of reducing the volume and pressure in the knee whereas the cyst becomes progressively distended (Jayson and Dixon, 1970b). This is readily confirmed by clinical observation and manometry as in the present series. Resting the knee leads to a fall in the pressure within the cyst; after exercise and at the end of a day spent walking or standing, the cysts are usually tense, swollen, and painful. Reduction in the volume of the knee effusion limits the pressure increase on quadriceps contraction and protects the knee against further joint damage. If a surgeon removes one of these cysts fluid is prevented from leaving the knee, the effusion

accumulates, high pressures develop when the joint is used, and the patient is no better off. The cyst may then recur, as in the following example.

Patient 8, a man aged 65 years, had had rheumatoid arthritis for 8 years. 2 years previously a large popliteal and calf cyst behind the left knee was excised, and after the operation he suffered recurrent effusions in the knee with eventual recurrence of a large tense popliteal cyst. A month after anterior synovectomy the cyst was much smaller and less tense and 2 months postoperatively it could no longer be detected.

Many surgeons believe that anterior synovectomy of the knee is of long-term value in preventing some of the mechanical and functional complications of chronic synovitis arising from rheumatoid arthritis. While this has yet to be conclusively proved in a controlled clinical trial, there is no doubt that anterior synovectomy often has a short-term beneficial effect on the knee which has been operated upon. In the present series of patients it was clearly seen that anterior synovectomy was followed by a considerable and usually rapid decrease in the size of the posterior cysts. In six of the nine studies the cysts could no longer be demonstrated and in the remainder they became very much smaller and ceased to be painful and to interfere with function. Arthrography confirmed these findings. In Patient 1 a small cyst was still present behind the right knee 23 months after synovectomy, but it no longer communicated with the knee joint. This long persistence was probably due to the cyst cavity being filled with solid fibrin debris which was slow to reabsorb.

Is it possible that some or all of these cysts would have disappeared spontaneously? We have observed

such a sequence of events in a few patients in whom rheumatoid arthritis improved of its own accord or after medical treatment. Grahame, Ramsey, and Scott (1970), for example, noted that popliteal cysts improved after an injection of therapeutic amounts of radioactive colloidal gold. In our patients the improvement was closely related to the time of surgery and occurred in all those in whom this particular study was undertaken. Thus, in rheumatoid arthritis which has failed to respond to medical measures, the presence of a tense posterior cyst in connection with an involved knee joint is an additional indication for anterior synovectomy and may well, at the present state of knowledge, be the most valid indication for this operation.

Summary

Anterior synovectomy was undertaken in nine knees of seven patients with rheumatoid arthritis associated with popliteal or calf cysts. Changes in the knees and cysts were followed clinically, manometrically, and by contrast radiography. In all instances the cysts became softer, smaller, and painless, and in six cases they disappeared and did not recur in up to 23 months. It is suggested that anterior synovectomy is the correct operation for posterior cysts associated with rheumatoid arthritis of the knee.

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