ACUTE SYNOVIAL RUPTURE

FURTHER OBSERVATIONS

BY

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This paper reports further observations on the clinical syndrome of acute synovial rupture of the knee (Dixon and Grant, 1964) in four instances of rheumatoid arthritis and one of osteo-arthritis with effusion.

Patients

Case 1, a man aged 54, had first developed generalized rheumatoid arthritis at the age of 40, but this had healed, leaving nothing except minor residual changes in the hands and feet. In January, 1964, he had a further attack for which he was examined in hospital. The hands and feet were again affected but the knees at that time were normal. The erythrocyte sedimentation rate was 15 mm./1 hr (Westergren) and the differential sheep cell and latex agglutination tests for rheumatoid factor were positive. Radiographs of the hands and feet showed typical rheumatoid erosions. His condition continued to deteriorate and 3 months later he noticed effusions in both knees; 2 weeks after this, when getting up from a chair, he experienced sudden pain behind the right knee spreading to the calf. On examination shortly afterwards the diameter of the right calf was found to be 5 cm. greater than that of the left and the skin showed pitting oedema, tender induration, and slight *peau d'orange* over the calf. Homan's sign was negative at this stage, and no thrombosed veins could be palpated. Aspiration of the calf found a narrow tissue plane from which a few drops of viscous fluid could be obtained. The calf swelling subsided with rest in bed, but reappeared with increasing use of the joint. Coincidentally there was a further deterioration of the rheumatoid arthritis in the other joints. With this relapse the left knee became tensely swollen, but the right knee showed only moderate swelling, possibly because it was able to discharge its synovial contents into the calf. The calf by this time was so hard and tender that surgical decompression was considered because of the danger of ischaemic necrosis of muscle, but this proved unnecessary as the swelling decompressed itself by prolonged drainage through a needle puncture wound made in an attempt to find a further collection of fluid to aspirate. Homan's sign was by this time strongly positive. An arthrogram

was performed using 20 ml. 65 per cent. Hypaque* injected into the right knee (Fig. 1).

Fig. 1.—Case 1. 20 ml. contrast material injected into the knee has spread to the calf through a posterior rupture of the capsule.

Subsequent progress was slow owing to a general increase in the activity of his disease, in which the right

* 5g. sodium 3·5-diacetamido-2,4,6-triiodobenzoate and 10 g. N-methylglucamine-3·5-diacetamido 2,4,6-triiodobenzoate.

knee shared. General and local corticosteroids, rest in bed, and a plaster of paris splint were needed for 3 weeks before he could be mobilized without further pain and swelling in the calf.

Case 2, a woman aged 50, had first developed rheumatoid arthritis in 1958 (titre for rheumatoid factor 1:128; radiographs of hands and feet showing typical rheumatoid erosions). The arthritis was severe and permanent deformities developed in the hands and feet. The shoulders, elbows, and other joints were progressively affected, despite a variety of treatments including corticosteroids. In November, 1959, she developed her first episode of swelling of the lower leg associated with pain below the knee and difficulty in walking. Examination at that time revealed a swollen left calf with local tenderness and oedema up to the level of the knee. Homan's sign was positive. A diagnosis of deep vein thrombosis was made and the patient was put to bed. Anticoagulant therapy was given. The swelling in the leg improved with rest in bed in the following 3 weeks but it was noted that as the calf circumference decreased, an effusion appeared in the left knee. Following this, the left knee was the site of recurrent effusions, and these were treated by occasional injections of hydrocortisone with temporary relief. The right knee had been free of pain until May, 1964, when she noticed increasing swelling. One morning she awoke with pain in the right calf and in the course of the following 2 weeks the pain persisted and the lower leg began to swell. Pain came on only during walking and was felt in the mid-calf region. The effusion in the right knee disappeared. When it was examined 2 weeks later, the calf was still swollen and tender, particularly on the medial aspect. No fluid was demonstrable clinically in the right knee. The circumference of the right calf was greater than that of the left. Homan's sign was positive on the right. Acute rupture of the knee was diagnosed and an arthrogram of the knee confirmed this (Fig. 2, opposite). The patient was treated with rest in bed and passive exercises for 10 days after which she was mobilized; 2 weeks later effusions had recurred in both knees, but there was no further swelling of the calf. In retrospect the previous episode in the left knee and calf seemed to have been similar to that in the right knee; although that had been diagnosed at the time as deep vein thrombosis; it was probably an episode of synovial rupture.

The next patient demonstrates a possible hazard of misdiagnosing acute synovial rupture of the knee as deep vein thrombosis in the calf.

Case 3, a woman aged 60, had been followed at St. Stephen's Hospital since 1949 for rheumatoid arthritis of gradually increasing severity. By 1957 there were typical deformities in the hands and feet and the Rose test for rheumatoid factor was positive. Subsequent radiographs showed rheumatoid erosions of the small joints of the hands and feet. In August, 1963, a painful effusion into the left knee developed and this was treated by aspiration and intra-articular hydrocortisone with

temporary relief on two occasions. In October, 1963, she suddenly developed pain in the left calf which made it difficult for her to walk. Examination at that time showed a fluctuant swelling in the posterior aspect of the knee and diffuse swelling of the left calf, the circumference of which was greater than that of the right. Aspiration of the swelling was attempted without success; 2 days later the swelling in the calf became more severe and painful, pain being felt in the lower leg posteriorly and medially with pitting oedema of the foot and calf and local tenderness. Homan's sign was positive. Synovial rupture was considered but it was felt safer to treat the patient for deep vein thrombosis and the patient was accordingly admitted to hospital for anticoagulant therapy. However, the calf swelling did not subside and subsequent aspiration produced 150 ml. heavily blood-stained fluid from the calf and also from the joint. Aspiration was necessary on two further occasions, bloodstained fluid being obtained each time. The diagnosis was changed to acute rupture of the knee and the patient was treated with a plaster splint for 2 weeks followed by gradual mobilization which was impeded by the development of a contracture in the calf muscles. No arthrogram was done at the time, but a follow-up arthrogram 8 months after the initial episode showed that the communication between the synovial cavity and the calf had closed.

Case 4, a man aged 57, had been followed in the outpatient clinic for rheumatoid arthritis with typical deformities which had begun in 1938. The Rose and latex tests for rheumatoid factor were positive, and radiographs showed typical rheumatoid erosions of the joints. The patient also showed the dry mouth and eyes of Sjögren's syndrome. In November, 1963, he complained of increasing pain behind the left knee. A Baker's cyst was present at this time and clear yellow fluid was obtained on aspiration. In January, 1964, he developed an effusion into the left knee joint; this was also aspirated, obtaining similar fluid. In April, 1964, he first complained of pain in the left calf with intermittent swelling of the left lower leg. This had come on suddenly and he distinctly remembered that the swelling of the knee joint had disappeared at the same time, the knee itself having since been free of pain. Examination showed a tender mass in the mid-calf region and a small effusion in the left knee. Aspiration of the knee produced clear yellow fluid, and aspiration of the calf obtained blood-stained fluid. Hydrocortisone was injected into the knee and the calf was strapped. The patient was not put to bed and he continued at his work. When he was seen 3 weeks later there was only minimal swelling of the leg and no pain.

The next patient illustrates rupture of a Baker's cyst in osteo-arthritis of the knee.

Case 5, a mechanic aged 55, had suffered football injuries to the right knee when younger and was thought to have sustained a torn medial meniscus. He subsequently developed osteo-arthritis in several joints for which he

Fig. 2.—Case 2, showing acute rupture of the knee. The feathery appearance of contrast material extravasated between the muscle bundles is again evident. The main pool of extravasated fluid is in the upper medial part of the calf.

attended hospital in 1961. The erythrocyte sedimentation rate was normal and tests for rheumatoid factor were negative. A painful spot near the right medial ligament was injected with hydrocortisone with relief. A Baker's cyst was present behind the knee, and fluid aspirated from this was clear and viscous. A small effusion was present in the knee. In May, 1964, when he was rising from the stooping position, the knee locked painfully in the flexed position. He forced it straight but developed a sudden pain behind the knee spreading into the calf. The whole leg swelled, from ankle to thigh, and he was unable to work. Examination later in the outpatients department confirmed that the circumference of the calf was increased by 2 cm. by painful oedema but that the Baker's cyst had disappeared. After a further 2 weeks, the leg swelling gradually subsided and the Baker's cyst reformed. An arthrogram at this stage showed only the normal knee cavity communicating with a Baker's cyst of moderate size.

Arthrography in Acute Rupture

The technique of contrast arthrograms which we have followed is to aspirate some of the joint fluid and inject 20 ml. of 65 per cent. "Hypaque" into the knee cavity. The patient is then allowed to take a few steps and radiographs taken. It is important to get the patient to walk as the injection of this amount of fluid into the knee may not of itself generate sufficient pressure to trace the path of the extravasated joint fluid through the rupture of the capsule of the joint. It is equally important not to overdistend the joint. An amount of fluid of 40 ml. or more and strong contraction of the thigh muscles may of itself rupture a normal knee (Dixon and Grant, 1964). Follow-up radiographs of arthrograms in rheumatoid arthritis have shown that the contrast material is removed from the rheumatoid joint in about 2 hours (and may outline the lymphatics draining the area). There are few after-effects—these include some increased stiffness on the following day, which can be minimized by the injection of 25 mg. hydrocortisone acetate into the joint at the same time. Strict asepsis must, of course, be observed.

The path of the extravasated fluid seen in the arthrogram accords well with clinical observations and dissections of autopsy material. The rupture occurs at the back of the knee between the insertions of the semi-membranous and semi-tendinous muscles medially and the medial head of the quadriceps laterally. Some fluid may extravasate into the superficial fascia, but most of it tracks beneath the deep fascia downwards and medially, eventually dispersing amongst the muscle bundles of the calf giving the typical feathery appearance.

Discussion

These further observations confirm the clinical syndrome of acute rupture of the knee in rheumatoid arthritis (Dixon and Grant, 1964). In the typical case an effusion in a knee or Baker's cyst disappears coincidentally with the appearance of a painful swelling in the calf. In the severe cases the swelling and tenderness has been maximal in the medical aspect of the calf at the junction of upper and middle thirds. This is confirmed by the arthrogram showing the spread of contrast medium to this region. Homan's sign for deep vein thrombosis usually gives a spurious positive result. It is possible that this may be because of joint fluid which has infiltrated into the muscle bundles in the calf, causing increased pressure and pain when the foot is dorsiflexed. It is, however, important to differentiate this syndrome from that of deep vein thrombosis; in our opinion all acute swellings of the calf in patients with known effusions of the knee should be considered as cases of acute rupture in the first place. The possible dangers of selecting the incorrect of two possible diagnoses is illustrated by Case 3 in which haemorrhage into the calf was followed by a prolonged and difficult convalescence due to muscle contracture. Good (1964), in a discussion of rheumatoid arthritis, Baker's cysts, and "thrombophlebitis", noted one case (his Case 4), in which a patient with rheumatoid arthritis developed painful swelling in the left calf, and was treated for deep vein thrombosis, but in which surgical exploration subsequently showed a cystic haematoma.

Since the publication of the first paper (Dixon and Grant, 1964) on this topic, and in addition to the patients quoted here, we have seen, and others have reported to us, a number of instances of probable acute rupture of the knee with less severe symptoms, often clearing up in a few days. It is our impression that the condition is by no means rare. The clinical severity probably depends on a number of factors, of which the rate of production of fluid in the joint, the patient's ability to go on using the joint despite pain, and the strength of the thigh muscles are the most important. Mechanically, the situation is "valvular", in the sense that the high but intermittent pressure generated into the joint pumps fluid into the tissue spaces, whence it cannot return even if the knee is relaxed. Up to the present we have not observed acute rupture developing into chronic rupture, *i.e.* rheumatoid calf cyst formation (although, no doubt, this can occur), but two of the patients reported in this paper showed acute rupture complicating a pre-existing Baker's cyst.

Once the rupture has been diagnosed, the most important point in the management is to reduce the

production of synovial fluid. This is most effectively done by resting the patient and splinting the knee and also by the intra-articular injection of hydrocortisone or a similar locally-acting steroid. These measures may need to be continued for several weeks depending on the severity of the underlying disease process.

Summary

Four further cases of acute rupture of the knee in rheumatoid arthritis and one in osteo-arthritis are described, with the arthrographic appearances in two. The condition needs to be differentiated from acute deep vein thrombosis in the calf, which it may closely resemble.

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Rupture synoviale aiguë. Observations additionnelles

RÉSUMÉ

On décrit quatre autres cas de rupture aiguë du genou dans l'arthrite rhumatismale et un cas dans l'osteo-arthrite, ainsi que l'apparence arthrographique dans deux de ces cas. Cette condition doit être différenciée de la thrombose veineuse profonde aiguë de la jambe, à laquelle elle ressemble beaucoup.

Rotura sinovial aguda. Observaciones adicionales

SUMARIO

Se describen cuatro casos de rotura aguda de la rodilla en la artritis reumatoide y un caso en la osteoartritis, así como la apariencia artrográfica en dos casos. Esta condición debe diferenciarse de la trombosis venosa profunda aguda de la pantorrilla, a la que se parece muchísimo.