SYNOVIAL CHONDROMATOSIS

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We reviewed 53 cases of synovial chondromatosis and compared their clinical, radiological and pathological features. A radiological diagnosis is possible with increasing frequency as the disease progresses; in the early phase arthrography is helpful. Radiologically the disease may be classified as either extra-articular, or intra-articular; the intra-articular variety may be localised or generalised.

Recurrence after operation was seen in 11.5% and was much the same after either synovectomy or simple removal of loose bodies. A protocol for treatment is proposed.

Synovial chondromatosis is a rare condition in which foci of cartilage develop in the synovial membrane of joints, bursae or tendon sheaths as a result of metaplasia of the sub-synovial connective tissue (Sim, Dahlin and Ivins 1977). Secondary calcification and ossification commonly occur, and multiple cartilaginous loose bodies are seen when the metaplastic foci become pedunculated and detached.

Previous reports have discussed the histology. Jaffe (1958) considered that the diagnosis should only be made when there was cartilage metaplasia in the sub-synovial tissue. Milgram (1977) and Schajowicz (1981) have extended Jaffe's criteria and also include patients with four or more osteocartilaginous loose bodies in a joint in the absence of synovial metaplasia, when no other cause can be found. Milgram (1977) suggested that cartilage metaplasia merely indicated active intrasyonal disease, which is self-limiting. Cartilage bodies in a joint may remain when the synovium becomes quiescent and may enlarge by continued surface proliferation.

Milgram (1977) classified synovial chondromatosis into three phases: early, with active intrasyonal disease but no loose bodies; transitional, with active disease and loose bodies; and late, with multiple loose bodies but no intrasyonal disease. Confirmation of the disease is by histology, but a pre-operative diagnosis can often be made from characteristic radiographic features; in the earlier phase of the disease double-contrast arthrography may be useful (Prager and Mall 1976). The principle radiographic features have been reported (Zimmerman and Sayegh 1960; Murphy, Dahlin and Sullivan 1962; Sim et al. 1977), but we are aware of no classification of these with reference to the planning of treatment.

There is some controversy about the surgical treatment of synovial chondromatosis: removal of loose bodies with synovectomy is advocated by many authors (Jaffe 1958; Murphy et al. 1962), but Jeffreys (1967) concluded that removal of the loose bodies alone was just as successful. Milgram (1977) recommended synovectomy with removal of loose bodies for the early and transitional phases when active intrasyonal disease is present, but removal of loose bodies alone in the late phase, and he questions the need for synovectomy for all cases in the transitional phase.

We have reviewed all the cases of synovial chondromatosis which have been referred to the Bristol Bone Tumour Registry (BTR), with particular reference to pre-operative diagnosis, classification and management.

PATIENTS AND METHODS

In all, 52 patients had been classified as having synovial chondromatosis in the Bristol Bone Tumour Registry. Their clinical records and radiographs were re-examined and the 43 patients with full documentation were studied. Histological slides were re-assessed (Figs 1 and 2) and patients were classified into Milgram's three phases. Follow-up information as to outcome was obtained from the hospital case notes, and by personal review (HM) in a special clinic or by a questionnaire. We
also reviewed an additional 10 patients with typical clinical and radiographic features, who have not yet required operation.

RESULTS

Clinical features. The mean age at presentation was 47.7 years, with a range of 17 to 79 years (Fig. 3). The sex incidence was female 1.4 to male 1.0. All 43 patients had presented with local pain, associated with diffuse swelling in 25 (58%) and in five with a more discrete painful mass. Mechanical symptoms of locking or clicking occurred in 14 patients (32.6%), but only in the knee or elbow. The average duration of symptoms before operation was 4.5 years.

Radiology. A radiological diagnosis was made when multiple juxta-articular radio-dense shadows were seen to have the discrete stippled appearance of cartilaginous lesions (Fig. 4). When the opacities were larger, peripheral linear densities with radiolucent centres developed, and bony trabeculation was seen in mature areas of the nodules.

Radio-opaque bodies were visible in 79% of all cases (54% of phase 1, 88% of phase 2 and 100% of phase 3). The nodules were usually less than 2 or 3 cm in diameter but in one case, a single one measured 4 by 5 cm (Fig. 5). Of those with intra-articular disease, 88% had radio-

Figure 4 – Multiple osteocartilaginous bodies are seen, including a few in the swollen suprapatellar pouch. This is generalised intra-articular disease. Figure 5 – There is a solitary osteocartilaginous body behind the knee. This is localised intra-articular disease.
Multiple cartilaginous bodies are present in a Baker's cyst. There is gross patellofemoral degeneration disease with osteophytes but there is preservation of the tibiofemoral joint space.

Fig. 6a  Fig. 6b

Pressure erosion of the anterior femur due to thickened synovium. There is marked patellofemoral degeneration with an essentially normal tibiofemoral joint.

Fig. 7

A 99 mm Tc-HMDP bone scan shows increased activity in the synovium, while the radiograph reveals multiple cartilaginous bodies in the same distribution as the increased activity.

Fig. 8a  Fig. 8b

opacities throughout the affected joint, indicating generalised intra-articular disease, and 12% had localised opacities.

In the knee degenerative change was seen in 41.2% of all with intra-articular involvement, but this was frequently in the patellofemoral joint only and was characterised by osteophyte formation rather than loss of joint space (Fig. 6). Pressure erosion of bone, caused by the bulky synovium (seen in 11%), most commonly occurred on the anterior aspect of the lower femur (Fig. 7).

Other radiological investigations were occasionally used. In one case an isotope bone scan with 99 mTc-HMDP demonstrated increased activity in the synovial distribution of the affected joint (Fig. 8), and in another the CT scan helped to establish the anatomy (Fig. 9).

Including the 10 cases which have not yet had an operation, the synovial involvement was intra-articular
in 42 (79%) and arose in a synovial cyst or tendon sheath in 11. The sites of disease are shown in Figure 10.

Operative findings. Active synovial disease, recognised when cartilaginous nodules were budding within the synovium, was seen in 38 patients (88%). In 25 of these, loose bodies were also present. Five patients had loose bodies alone. The operations undertaken are shown in Table I.

Recurrence. Full follow-up information was available for 37 patients (86%) at a mean time of seven years. Recurrence after operation (Table II) was seen in five patients (12%). In one case this followed incomplete excision of localised intra-articular disease. The other four patients had generalised phase 2 intra-articular disease: two recurred after synovectomy and two after removal of loose bodies alone.

DISCUSSION

Extra-articular synovial chondromatosis is said to be rare (Wilner 1982), but we found a 21% incidence: however, this may reflect selection of material submitted to the Bristol Bone Tumour Registry. A radiological diagnosis was possible in 79% of our cases, but this may not always be disease-specific since similar appearances may be produced by pigmented villonodular synovitis, psoriatic arthropathy and in the early stages of an infective or inflammatory arthritis, including gout. Most of these other diagnoses can be excluded by clinical and biochemical data. In cases of doubt, double-contrast arthrography can demonstrate both synovial nodularity and intra-articular loose bodies (Fig. 11), though similar appearances may be seen in cases of pigmented villonodular synovitis, rheumatoid arthritis and synovial haemangioma (Prager and Mall 1976). Lipoma arborescans can be excluded by the characteristic radiolucency of fatty tissue on the plain film. Radionuclide imaging was valuable in one case and may be a means of assessing synovial activity in phases 1 and 2.

In cases of localised intra-articular disease, synovial metaplasia is confined to one area of the joint, and complete excision of the abnormal synovium appears to be curative. Total synovectomy is probably unnecessary in these patients. In extra-articular disease complete excision is usually possible and seems to be curative.

In our series, apart from one case with incomplete excision of localised disease, recurrence was limited to patients with generalised intra-articular disease and an active synovium. Recurrence after synovectomy may be due to remaining active synovium, since it is accepted that total removal of synovium is virtually impossible. Alternatively, recurrence in such cases could be due to persistence of the unknown stimulus which has caused the metaplasia. Recurrence following removal of loose bodies is likely to be due to persisting synovial activity. Since recurrence may occur following either operation, we believe that operations for generalised intra-articular

<table>
<thead>
<tr>
<th>Phase</th>
<th>Number of cases</th>
<th>Synovectomy</th>
<th>Removal of loose bodies</th>
<th>Local excision</th>
<th>Biopsy</th>
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<tbody>
<tr>
<td>1</td>
<td>13</td>
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<td>3</td>
<td>5</td>
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Table II. Recurrences following operation

<table>
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<th>Classification</th>
<th>Phase</th>
<th>Operation</th>
<th>Number of cases</th>
<th>Time in years</th>
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<tbody>
<tr>
<td>Localised</td>
<td>1 intra-articular</td>
<td>Incomplete excision</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Generalised</td>
<td>2 intra-articular</td>
<td>Removal of loose bodies</td>
<td>2</td>
<td>0.5 and 5</td>
</tr>
<tr>
<td>Generalised</td>
<td>3 intra-articular</td>
<td>Synovectomy</td>
<td>2</td>
<td>3 and 4</td>
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Table III. Proposed management for synovial chondromatosis

<table>
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<tr>
<th>Site</th>
<th>Treatment</th>
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<tr>
<td>Intra-articular</td>
<td>Localised</td>
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<tr>
<td></td>
<td>Generalised</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td>Extra-articular</td>
<td>Complete excision</td>
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</table>

Diagram showing the sites of synovial chondromatosis in 53 cases.
unilateral synovial chondromatosis, sequential radiographs of both knees showed similar degenerative changes, suggesting that the knee with synovial chondromatosis was not adversely affected. It seems that synovial chondromatosis may not necessarily lead to severe osteoarthritis.

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REFERENCES


