Fe⁵⁹. Simultaneous counting over the thigh gives a count rate proportional to the intravascular component, which on subtraction from the knee count rate (after conversion to a common rate for Day 1) gives an 'accumulated knee' count—representing the intra-articular sequestration of iron—from which the daily sequestration of iron in the knee can be calculated.

The average accumulation of iron per day, per rheumatoid knee, was 1.25 mg. $\pm$ 2.38 (1 S.D.). Assuming this iron to be entirely derived from RBCs as a result of intra-articular bleeding, the average blood loss into a rheumatoid knee per day can be calculated to be 3.58 ml. $\pm$ 4.6 (1 S.D.).

Osteoarthrotic knees showed no significant accumulation of iron. There was no correlation between the degree of intra-articular iron deposition and the patient's haemoglobin, platelet count, or serum iron. It is concluded that synovial iron deposition in rheumatoid patients is unlikely to be a significant factor in the anaemia.

Discussion

DR. J. K. VAN DER KORST (*Holland*) Why do people with rheumatoid arthritis bleed in their knees?

DR. BENNETT We think the answer is due to a combination of increased vascularity of the synovium and the rough joint surface. When the joint surface is moved there is trauma to the synovium and bleeding occurs. I think we have shown very dramatically in one patient that bleeding occurred only when she was mobile.

DR. B. VERNON-ROBERTS (*London*) In one slide you showed iron being deposited in the subintimal synovial tissues, whereas in the late study there was good evidence of bleeding into the synovial cavity. In the patient that came to synovectomy, did you carry out autoradiography to determine the routes by which blood can pass from the synovial cavity into the deeper tissues?

DR. BENNETT We did, in fact, do this on several patients and obtained very convincing autoradiographs of iron in the subintimal layer of the synovium.

DR. J. A. MATHEWS (*London*) I never see blood in the fluid that I aspirate from the knee joints of patients that walk into the clinic. Can you explain this apparent discrepancy between my patients and your patient with a fistula?

DR. BENNETT I think it reflects remarkable powers of phagocytosis of the synovial membrane. Of course on microscopy, one can nearly always find blood in rheumatoid synovial fluids.

PROF. E. G. L. BYWATERS (*Taplow*) We have recently looked at some examples of pigmented villonodular synovitis where there is a very great accumulation of iron in the synovial membrane. In a number of these, on careful section of the whole synovial membrane, we have found evidence of localized haemangioma formation (Phillips, Ansell, Arden, and Bywaters 1971). I think that probably the presence of an increased number of blood vessels plus the ordinary trauma of walking accounts for this bleeding in pigmented villonodular synovitis and I think that this

could also account for bleeding of a lower degree in rheumatoid joints.

DR. P. FOWLER (*Macclesfield*) In some patients there was a very close correlation between the accumulation of iron in the right and left knees, whereas others showed wide differences. Could you correlate this in any way with clinical remission in the joints?

DR. BENNETT No, we could not. This was an interesting point; there was no correlation whatsoever between the clinical degree of inflammation and the amount of bleeding into the joint.

DR. J. WEBER (*Holland*) There is a controversy about whether iron and bleeding is harmful or an advantage for the joint. I would like to ask your opinion about this.

DR. BENNETT This is one of the unanswered questions that I put up at the end and I am really in no position to comment on it.

MR. A. R. TAYLOR (*Aylesbury*) I do a fair number of synovectomies and the fluid always appears remarkably clear to me. I think this explains why, in the shoulder joint, the fibrinous deposits are always bright yellow, whereas in the knee they have a brownish colour. This may be due to blood loss from the activity of the knee joint. In your case you have a persistent discharge after the removal of popliteal cysts and yet you have not undertaken synovectomy. Had you any conclusive proof that this was not an infected joint?

DR. BENNETT The interesting feature about this particular fistula was that the fluid was infected with *Staphylococcus aureus*, while the fluid from the joint cavity itself was completely sterile. This is in keeping with the concept of a one-way valvular mechanism between the joint cavity and Baker's cysts (Jayson and Dixon, 1970).

PROF. E. G. L. BYWATERS (*Taplow*) Regarding the relationship between bleeding into the joint and joint damage, very severe joint damage may occur in haemophilia and also, of course, in pigmented villonodular synovitis.

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Pain Threshold and Arthritis. By E. C. HUSKISSON and F. DUDLEY HART (*Westminster Hospital, London*)

Though there has been more speculation than experimentation, pain threshold has often been thought to influence the apparent severity of course of rheumatoid arthritis. It is of particular importance, that a high pain threshold could enable patients to carry on unsuitable work and therefore lead to destructive joint changes.

Using Keele's algometer (Keele, 1954), pain threshold was measured in three groups, patients with rheumatoid arthritis (106) or ankylosing spondylitis (50) and normal controls (50). The distribution of pain threshold was similar in normal subjects and patients with rheumatoid

arthritis, but a high pain threshold was significantly more common in those with ankylosing spondylitis and this was not due to the different age and sex of the group.

Patients with rheumatoid arthritis and a low pain threshold had more severe pain which was present for a greater part of the day; they took larger numbers of analgesics and tended to lose more time from work. There was no evidence that pain threshold influenced the course of the disease in any way and the presence and size of radiological articular erosions and cysts was not related to pain threshold.

In patients with ankylosing spondylitis, there was no relationship with pain severity but a significant relationship with disease severity, the more severely affected patients with greater disability having a higher pain threshold.

Discussion

DR. W. H. D. DE HAAS (*Holland*) I have made a similar study of about a hundred patients and my results agreed with yours. There were some points about which I would like your opinion: The second assessment of pain threshold was nearly always lower than the first (McCarty, Gatter, and Phelps, 1965). Again, the proximal interphalangeal joints had higher thresholds than the distal interphalangeal joints and the right hand always had a higher threshold than the left except in left-handed people, when the reverse was true.

DR. HUSKISSON These are very interesting points. I would make a distinction between the results of dolorimetry and measurement of pain threshold. Our measurement was made well away from any joint, whereas dolorimetry strictly measures joint tenderness. I think that it is true with most methods, that with repeated measurements the results tend to fall slightly. Presumably the difference between proximal and distal interphalangeal measurements was related to disease activity. There is some evidence that the non-dominant side of the body is less capable of discriminating pain than the dominant side (Wolff and Jarvik, 1964), but we were unable to confirm these findings using modifications of the method described by Hollander (1939).

DR. M. I. V. JAYSON (*Bristol and Bath*) Pain threshold has been found to be very constant in any one individual, but such studies were of normal people tested with acute pain induced by injections. Is this the same thing as saying that patients with chronic disease and chronic pain over many years will maintain the same pain threshold? Do you think that the pain threshold can increase in patients who have chronic rheumatoid arthritis for many years?

DR. HUSKISSON There is some evidence that in people with painful conditions, pain threshold tends to rise and that it falls when the pain is relieved (Hazouri and Mueller 1950). Our evidence shows that patients with ankylosing spondylitis had a high pain threshold, and it seems more likely that this is the result of the disease than that patients with a high pain threshold are more likely to have ankylosing spondylitis. We found that the pain threshold tended to remain pretty constant when measurements were repeated up to a period of 18 months and it did not consistently rise in patients with reumatoid arthritis

after a period of in patient therapy when their pain was considerably reduced, but not, of course, abolished.

PROF. E. G. L. BYWATERS (*Taplow*) This is a very useful and detailed study of a neglected and important subject, and it would obviously be worthwhile looking at your material in detail as you have presented us an enormous amount of data which is difficult to appreciate fully in this time. Beecher (1959) commented that there is a very great difference between the experimental or physiological pain which you have been measuring, and the real daily life pain due to painful situations, as, for example, after an operation; the latter is much more complex, as it includes psychological factors. You are dissecting the pain phenomenon and there is obviously much more to be done in the characterization of the pain felt by those with rheumatoid arthritis.

DR. J. A. COSH (*Bath*) You hinted that, if the patient was encouraged to talk about his wounds or painful experiences, he would manifest a different pain threshold. Was this a higher pain threshold? Secondly, we have heard about the difference in pain threshold between the two halves of the body; I take it that your measurements were made in the centre of the forehead?

DR. HUSKISSON Yes, you can influence the pain threshold in all sorts of ways. When we started we had six people sitting round in a room and, of course, the pain threshold went up in order because there was an element of competition. In a large study of coalminers, the subjects apparently recounted tales of their indifference to pain and were not surprisingly found to have high pain thresholds (Sherman, 1943). It is very easy to raise the threshold in this way. In answer to your second question, it is an advantage of Keele's method (Keele, 1954) that the measurement is carried out in the centre of the forehead and there is no problem of dominant and non-dominant sides of the body.

DR. R. GRAHAME (*London*) Did you look for any correlation between pain threshold and the psychological status of the patients?

DR. HUSKISSON No, we did not, although this has been done in the past and showed that patients with neurotic and 'functional' illnesses have a lower pain threshold.

DR. M. I. V. JAYSON (*Bristol and Bath*) This approach may perhaps be much more relevant to osteoarthritis of the hip or lumbar spondylosis than inflammatory arthritis. A high pain threshold might allow excessive trauma to joints and predispose to degenerative joint disease. Have you considered looking at these conditions?

DR. HUSKISSON It may also be relevant to study the relationship of pain threshold and loss of time from work in minor conditions such as these. I agree that this is a very interesting area which we haven't yet studied.

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