LONG LEG ARTHROPATHY*

BY

A. ST. J. DIXON AND S. CAMPBELL-SMITH

Bath

There are now abundant examples of the way in which mechanical factors concerned with the use of a limb influence the pattern and severity of subsequent joint disease irrespective of diagnosis, both in inflammatory arthritis and non-inflammatory arthrosis. For example, Jacqueline (1953) noted that, in hemiplegic patients who subsequently developed rheumatoid arthritis, the paralysed side did not develop the clinical or radiological changes of rheumatoid arthritis, although biopsy (Thompson and Bywaters, 1963) showed the synovium to be affected. Similarly, disuse of a limb because of a lower motor neurone lesion such as poliomyelitis will also protect against the subsequent development of rheumatoid arthritis (Secondo, Barboso, and Mellini, 1967). Kamermann (1966) showed that disuse due to previous trauma will have the same effect. Courtright and Kuzell (1965) confirmed this sparing effect of disuse in another patient and also in experimental adjuvant arthritis in rats. Conversely, increased use of a joint increases the frequency and severity of arthrosis. Thus, by using careful grading systems, Rotés Querol and Roig-Escotet (1968) showed that there is usually a more severe arthritis in the joints of the right than of the left hand. Van Dam (1964) and Soila (1963) published similar findings with regard to radiological erosions of articular bone in rheumatoid arthritis. Castillo, El Sallab, and Scott (1965) noted that manual workers developed larger, more “cystic” erosions compared with non-manual workers affected by rheumatoid arthritis. We have observed that, when patients develop ulnar deviation of the fingers, it more frequently affects the right hand before the left. Lindsay (1913) found involvement of the small joints of the hand to be more frequent on the right than on the left side in gout.

In arthrosis similar observations have been made.

Thus Coste and Forestier (1935) showed that hemiplegia protected against the development of Heberden’s nodes and Glyn, Sutherland, Walker, and Young (1966) that the joints of the paralysed limb in poliomyelitis had less tendency to arthrosis than the non-paralysed joints. Similarly over-use of a joint with arthrosis increases the size of osteophytic outgrowths.

This paper describes a common mechanical alteration in the use of the knee which predisposes this joint to more severe disease. This disordered gait occurs when a patient walks for a number of years with an uncorrected inequality of leg length and results in selective damage to the knee of the longer leg. We have observed this whether the inequality of leg length is apparent (due to hip contracture) or real (due to a true reduction in leg length) and whether it is due to damage to one hip from previous infection, arthritis, congenital dysplasia, or trauma. Whatever the predisposing cause, the knee in the seemingly longer leg is then used abnormally. This brings about more severe arthritis of the knee if the patient is affected by rheumatoid arthritis, or more precocious arthrosis of the knee if the patient is affected by osteoarthrosis. We refer to this as “long leg arthropathy”.

Case Reports

Brief case histories illustrate the association:

1) A 45-year-old woman developed tuberculosis of the left hip when she was 14 years old. This healed, but she thereafter walked without correction of the short left leg. At the age of 40 she noted a painful right knee. Fig. 1 (overleaf) shows the problem. There is about 5 cm. of difference in leg length. The right knee shows destruction of the lateral tibial compartment characteristic of long leg arthropathy. Clinically the knee was slightly swollen and laterally hypermobile and showed some valgus and flexion deformity.

Clinical and cinematographic studies have shown that such patients walk with the “longer” leg flexed

and externally rotated at the hip and flexed at the knee. During walking a strain is thrown on the knee so that it tries to bend into a valgus position. This repeated valgus strain may be the cause of the damage we are describing.

Four further patients show illustrative cases of varied aetiology.

(2) A 69-year-old woman has bilateral coxarthrosis. A Smith-Peterson cup arthroplasty had been inserted on the left without correction of 4-5 cm. inequality of leg length. She has arthrosis in both knees, but the left knee does not trouble her while the right knee is painful and shows more severe changes in the lateral compartment (Fig. 2, opposite).

(3) A 60-year-old woman gave a 10-year history of rheumatoid arthritis with symmetrical involvement of the knees until there was destruction of the right hip with protrusio acetabuli and shortening of the right leg by 4 cm. This has been associated with the subsequent development of valgus instability and increased radiological change in the left knee, which is now much more painful than the right (Fig. 3, overleaf).

(4) A 62-year-old woman with congenital dislocation of the hips, developed generalized osteoarthrosis at the age of 40 and shortening of the left hip at the age of 52 years. She now complains of more pain in the right (contralateral) knee which has become subject to repeated effusions. This knee already shows increased lateral mobility compared with the left. Fig. 4 (overleaf) contrasts the radiological appearance of the lateral tibiofemoral compartments of the two knees.

(5) A 67-year-old woman had osteoarthrosis of the left hip with an abduction deformity causing an apparent left leg lengthening of 4.5 cm. In this instance it was the ipsilateral knee of the longer left leg which became painful and swollen and showed the radiological changes of osteoarthrosis.

Merely to select certain patterns of joint disease does not prove their significance. Therefore two further studies have been done to discover whether the association is true or due to selection.

We have argued if there were no association of knee arthropathy with the longer leg, patients who have primary shortening of one leg and who subsequently developed knee pain should do so with...
equal frequency in either knee. This proposition was tested in two separate surveys.

I. The first survey was done at the Winford Orthopaedic Hospital. 224 case histories of patients known to have unilateral hip disease in childhood and now over the age of 20 years were found in the hospital records and nineteen other patients were seen in an appliance clinic attending for raised shoes. From amongst these, by means of a questionnaire, we found 33 patients who fulfilled the following criteria:

(i) They had real or apparent leg inequality of leg length of 2.5 cm. or more.
(ii) They had subsequently walked with this uncorrected inequality of leg length for at least a year.
(iii) They had subsequently developed symptoms (pain, swelling, stiffness) in the knees.

Of these 33, eighteen accepted re-examination and fifteen refused or lived too far away. Of the eighteen re-examined, one complained of pain in both knees and had minor bilateral patello-femoral osteoarthrosis. Eight complained of pain in the knee of the shorter leg, so casting doubt on the validity of our thesis. However, on examination, these knees were all clinically normal and the pain was anterior thigh pain referred from the damaged hip. One of these eight patients had had two episodes of locking in the ipsilateral knee. Nine of the eighteen patients complained of pain in the contralateral knee and only three of these knees were clinically normal, six showing painful valgus deformity with or without instability and three of these six knees showed radiological damage. In two of these this was confined to the lateral tibio-femoral compartment. None of these patients had rheumatoid arthritis.

To summarize this first survey, in patients who had shortening of 2.5 cm. of leg length or more and who subsequently developed pain in the knees, objective changes were almost always confined to the knee of the longer leg.

II. The next survey was a 6-month period-of-time study of all consecutive in-patients and out-
patients at the Royal National Hospital for Rheumatic Diseases, Bath, and all patients of certain orthopaedic and geriatric wards in neighbouring hospitals. Altogether 1,431 patients were screened and, of these, 37 were found to have:

(i) Real or apparent shortening of one leg of 2.5 cm. or more
(ii) A subsequent history of walking on such legs for at least a year
(iii) A clear history of no previous knee symptoms.

In this survey, patients had to be excluded who suffered from both hip and knee disease and in whom it was impossible to discover retrospectively (e.g. from hospital records) whether knees or hips had been affected first. Both arthritis and arthrosis were represented in this second survey.

Of the 37 who answered the criteria, no less than in 24 was the contralateral knee the “worst” knee. In only one was there complaint of more pain in the ipsilateral knee, and in twelve the knees were either unaffected or equally affected.
LONG LEG ARTHROPATHY

The sequence of events clinically would seem to be as follows: First, there is increased lateral movement and limitation of normal movement; secondly, there is destruction of the lateral tibio-femoral compartment of the knee with valgus deformity leading to crushing of the lateral tibial table. Pain may supervene at any stage. Secondary osteoarthrosis of the rest of the joint may develop later.

A sixth case history exemplifies the possible clinical importance of these observations.

(6) A 65-year-old woman with rheumatoid arthritis and destructive change in the right hip was very successfully treated by arthroplasty (Fig. 5). Inequality of leg length was not corrected after the operation and she subsequently walked freely but then developed a painful effusion of the left knee. For this she was submitted to synovectomy of the knee, which did badly, pain and swelling soon recurring. We believe that the surgeon’s attention was drawn away from the underlying problem, namely inequality of leg length rather than active rheumatoid arthritis of the left knee.

In several patients there has been reduction in pain in the knee after correction of the inequality of leg length and instruction in a proper gait.

In conclusion, we believe that there are a number of other recurring patterns of joint involvement in rheumatoid arthritis and in osteoarthrosis, which may well have a mechanical explanation due to disorders of gait or posture. These patterns of joint involvement are of obvious importance in the understanding of our treatment of these conditions and of the prevention of deterioration.

Summary

“Long leg arthropathy” refers to a pattern of joint damage seen in patients who walk for some time with uncorrected inequality of leg length. The knee of the “longer” leg is liable to earlier and more severe damage. This is exemplified by cases of varied aetiology, including arthritis and arthrosis. It is supported by two large-scale surveys of patients attending rheumatism and orthopaedic hospitals.
This “long leg arthropathy” is a pattern of joint involvement of obvious importance in the understanding of our treatment of joint diseases and the prevention of deterioration.

We are indebted to Mr. A. L. Eyre-Brook at Winford Hospital and to our colleagues in the Bath Group Hospitals for permission to survey the patients under their care.

DISCUSSION

DR. D. A. BREWERTON (London): The term “long leg arthropathy” makes it appear that the disparity between the lengths of the legs is responsible for the clinical picture, whereas the gait shown in the film suggests that the primary problem is deformity of the hip or hips. Patients attending Leg Equalization Clinics with long or short legs due to other diseases do not walk in this way and it is not known whether they develop similar degenerative changes. It would not be difficult to find out in a Leg Equalization Clinic whether there is an altered incidence of degenerative joint disease. Without this information I do not think we are justified in calling this “long leg arthropathy”.

DR. CAMPBELL-SMITH: Yes, I think that this is a valid criticism of our title.

DR. W. R. M. ALEXANDER (Edinburgh): I was unclear of the incidence of this symptom complex, because in your first survey you had 33 people with shortening of one leg, chosen because they had 2 cm. of shortening or more and pain in the knees. This means you would automatically select the ones with the symptom complex.

DR. CAMPBELL-SMITH: We did not select them in that sense. They complained of pain in either of the knees or both, and we did think we were going to go against the thesis until we found that those with pain in the “shorter” knee were nearly all patients who had classical referred pain.

DR. W. R. M. ALEXANDER: I meant there must be people who have one leg longer than the other but who do not have pain in the knee. I just wondered what the incidence of the long leg arthropathy was amongst people who had one leg longer than the other.

DR. CAMPBELL-SMITH: That figure was not mentioned. Speaking from memory, there were forty or fifty patients in the Winford survey who had the required leg length inequality but complained of no symptoms.

REFERENCES


RÉSUMÉ

"L’arthropathie causée par une longue jambe" se réfère à un ensemble de dommages aux articulations chez les malades qui marchent pendant un certain temps avec des jambes de longueurs différentes sans aucune correction faite au préalable. Le genou de la jambe plus longue est exposé de meilleure heure à des dommages plus sévères. Ceux-ci sont démontrés par les cas d’étiologie variée, tels que l’arthrite et l’arthrose. Il est corroboré par deux relevés de grande envergure des malades soignés aux hôpitaux orthopédiques et rhumatismaux.

Cette “arthropathie causée par une longue jambe” est un ensemble d’affection articulaire d’importance manifeste dans la compréhension de notre traitement des maladies articulaires et des mesures préventives.

SUMARIO

La “artropatía de pierna larga” se refiere a un tipo de lesiones de articulación visto en pacientes que caminan durante cierto tiempo con desigualdad incorrecta de largo de pierna. La rodilla de la pierna “más larga” está expuesta a daños prematuros y más severos. Esto ocurre en casos de etiología variada, entre ellos la artritis y la artrosis. Esto está apoyado por dos estudios, en gran escala, de pacientes que asistían a hospitales para reumáticos y hospitales ortopédicos. Esta “artropatía de pierna larga” es un patrón de afeccción articular de evidente importancia para comprender nuestro tratamiento de enfermedades de las articulaciones y de la prevención del empeoramiento.
Long leg arthropathy.

A S Dixon and S Campbell-Smith

doi: 10.1136/ard.28.4.359

Updated information and services can be found at:
[http://ard.bmj.com/content/28/4/359.citation](http://ard.bmj.com/content/28/4/359.citation)

**Email alerting service**

Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

**Notes**

To request permissions go to:
[http://group.bmj.com/group/rights-licensing/permissions](http://group.bmj.com/group/rights-licensing/permissions)

To order reprints go to:
[http://journals.bmj.com/cgi/reprintform](http://journals.bmj.com/cgi/reprintform)

To subscribe to BMJ go to:
[http://group.bmj.com/subscribe/](http://group.bmj.com/subscribe/)