LATERAL INSTABILITY OF THE KNEE FOLLOWING POLYARTHRITIS AN EXPERIMENTAL STUDY*

BY

E. N. COOMES†

*From the Rheumatism Research Centre, University of Manchester,
and the Manchester Royal Infirmary*

Although joint instability frequently follows certain types of polyarthritis it has seldom been investigated in the past; the end results vary from the nuisance of the unstable wrist to the catastrophe of atlanto-axial dislocation. It is upon the ligaments that stability so often depends, yet few studies have been performed to assess their functional state and physical characteristics either in health or disease. The aim of this investigation has been to provide some data to clarify the situation.

Apart from the condition included in this study, joint instability is a feature of several diverse states. There are certain hereditary disorders of connective tissue in which there have been consistent reports of excessive joint mobility. Carter and Sweetnam (1958) described a family with very mobile joints complicated by recurrent dislocation of the patella—a condition recognized as “familial joint laxity” quite distinct from seemingly related conditions. McKusick (1960) and many others have reported similar mobile joints in osteogenesis imperfecta, Marfan’s syndrome, and Ehlers-Danlos syndrome, in addition to the other manifestations. In all of these conditions there is some primary abnormality of the connective tissue.

There are other conditions that produce instability because of their effect upon previously normal ligaments. Trauma is an important cause of this, and there have been numerous clinical reports, a good example of which is that of Ritchey (1960) who studied 28 cases of unstable knees following injury. Infection can produce an unstable joint—apart from gross destructive change—in some unknown way. After a naso-pharyngeal infection, the transverse ligament of the atlas can give way leading to atlanto-axial dislocation. This complication has been recorded by Bell (1830), Grisel (1930), and Watson-Jones (1932), but the ligaments were not examined histologically, nor were any attempts made to measure strength or elasticity, so that the mechanism of the dislocation remains obscure. Similar dislocations have been reported

during the course of acute rheumatic fever in childhood, Coutts (1934), but again no adequate explanation has been put forward. Ligamentous change has been incriminated as the cause of excessive joint mobility in “chronic rheumatic fever”; Jaccoud (1867) described a case of a young man who had had repeated attacks of acute rheumatic fever followed by dislocation of the small joints of the hands without gross destructive changes. Ravault, Maitrepierre, Léjeune, Normand, and Cretin-Maitenaz (1961), in reporting a series of such cases, stressed that the peripheral joints were mainly affected but that “laxity” did occur in other joints, for example, the knees. However, this condition is exceedingly rare and, although the ligaments have been incriminated, no full-scale studies have been undertaken.

In rheumatoid arthritis, joint subluxation is well known, but like the other conditions, little attention has been paid to the mechanisms. The most comprehensive experiments have been those on the cervical spine. Sharp and Purser (1961), in a clinical and radiological study of atlanto-axial dislocation in rheumatoid arthritis and ankylosing spondylitis, pointed out the importance of measuring the gap between the odontoid process and the arch of the atlas on the x ray of the flexed cervical spine. This assessed the state of the transverse ligament of the atlas—the wider the gap the slacker the ligament. Ball (1961) examined 38 rheumatoid spines *post mortem*, and found in some of his material subluxation at all levels. The primary abnormality was erosion of the disk substance and ligaments by pannus arising from the neurocentral joints.

Clinical studies have been undertaken on psoriatic arthritides, but no particular information has been collected regarding the state of the ligaments. However, joint subluxation has been noted. Sherman (1952) pointed out that it occurred at a relatively early stage of the disease before the occurrence of gross disorganization of the joint. Wright (1959) in his study pointed out that ulnar deviation of the fingers was more common in patients with uncomplicated rheumatoid arthritis than in those with indistinguishable psoriatic arthritis, but neither of

* Based on a thesis submitted to London University for the degree Doctor of Medicine.

† Present address: St. Thomas’s Hospital, London, S.E.1.

Aim of this Investigation

Before considering abnormal mobility or instability, normality would have to be defined and ligament extensibility assessed by the examination of a series of normal individuals of different ages. When this has been completed, similar studies could be undertaken upon joints affected by the types of polyarthritis under study, *viz.* rheumatoid arthritis, ankylosing spondylitis, and psoriatic arthritis. An attempt could then be made to correlate the measurements with the clinical, laboratory, and radiographic findings, and if possible to draw conclusions as to the causes of the joint instability.

There was a relatively large initial deflection followed by a gradual increase or "creep" over 5 to 6 minutes which levelled off. These deflections could be due either to slack or to stretch in the ligament, to compression of cartilage or a combination. Fig. 1 shows the forces applied in this system; provided the knee is extended three ligaments are stretched, the two cruciates and the medial ligament, while the articular cartilage of the lateral

femoral condyle and tibial plateau is compressed. Although the cartilage is represented as a point source, it has in reality an area of about 2 sq. cm. However, the point of maximum pressure corresponds with the mid-point of the lateral condyle.

and this was taken as the fulcrum (F) for purposes of assessing the stresses of the joint. The problem of assessing the relative contribution of ligament and cartilage towards the deflection was resolved by excising the lateral femoral condyle and the lateral half of the tibial plateau and replacing them with a piece of metal machined to fit the gap. On repeating the experiment the result showed that the initial deflection of the tibia was the same as with the cartilage *in situ*, but that the slow component or "creep" had disappeared. The conclusion reached was that the initial deflection was of ligamentous origin and the "creep" of cartilaginous origin.

Method of Examination

Some means had to be devised that would enable similar measurements to be performed *in vivo*. At first each knee was examined separately, but owing to the difficulty in securing the thigh this had to be abandoned—the artefact was far larger than the projected measurements. To overcome this, both knees were examined at the same time using a specially-made apparatus consisting of a tubular steel framework 5 ft. $\times$ 3 ft. $\times$ 3 ft. riveted to a wooden base 6 ft. $\times$ 3½ ft. The apparatus was light and could be lifted on to an examining couch.

The subject lay flat on the back with the calves suspended in canvas slings 9 in. wide (Fig. 2). The thighs were secured together with padded aluminium shells shaped to fit the thighs, and the knees were kept extended by a padded aluminium bar just above them (Fig. 3). (This was important because any flexion led to an increase in the artefact.)

Fig. 3.—Padded bar pressing down on the thighs to maintain extension of the knee.

Fig. 2.—Canvas slings supporting the calves to allow extension of the knee.

copyright.

Weights were applied to shackles placed above each ankle, the centre of which was always $2\frac{1}{2}$ in. above the medial malleolus. The resulting separation of the malleoli was measured with calipers (Fig. 4).

The same weights were used as in the *post mortem* experiments. 5 lb. proved to be about the minimum weight that would overcome the inertia of the apparatus and take up any "slack" in the knees. 15 lb. was the maximum weight that anyone would tolerate in comfort, heavier weights than this being quite painful. When 5 lb. was applied to the normal adult there was seldom more than a few millimetres of deflection, but if the weights were left on for 5 to 6 minutes there was a slow increase which gradually levelled off; this was identical with the finding in the *post mortem* experiment. When the weights were removed the malleoli did not at once return to the exact point from which they started, but they did so over a minute or so; this phenomenon was attributed to cartilage compression.

The findings were reproducible to a good degree

of accuracy; this is illustrated in Fig. 5 (overleaf). Since the initial deflections concerned the response of the ligaments and it was these structures that were under investigation, only the initial deflections were recorded.

Measurements taken from Each Leg to Assess the Stresses on the Knee

(a) *Femoral Bicondylar Distance*.—This was measured with a small pair of calipers gripping the femoral condyles, the thickness of the skin and subcutaneous tissues being estimated by taking a pinch of tissue from the inner side of the knee; as this consisted of two layers of skin and subcutaneous tissue, subtraction of this figure from the gross reading gave an estimate of the bony distance. The results were comparable to the direct measurements of the femur by Martin (1959). As the fulcrum lay at approximately the centre of the lateral femoral condyle, the leverage was only a proportion

Fig. 4.—Measurement of malleolar separation with calipers.

Fig. 5.—Results of experiments on two separate occasions.

of the bicondylar distance. This was estimated from measurements on twelve *x* rays of knees, both male and female, and the mean ratio was found to be 0.85.

(b) *Tibial Length*.—This was ascertained by measuring the distance from the medial malleolus to the joint line. If Fig. 1 is considered, it is possible to estimate the forces acting on the knee. If the values *L*, *l*, and *W* are known, taking moments about the point *F*,

$$T \times l = W \times L$$

$$T = \frac{W \times L}{l}$$

T represents the tension in the ligaments; similarly *C* represents the compression of cartilage which could be calculated by taking the fulcrum at *F*¹, which would be its position after the initial deflection had ceased.

Because of the variation of the size of the leg, for purposes of comparison all the readings had to be standardized so that *L/l* = 4. However, in many cases the ratio between the two measurements was in fact 4 or very nearly so, and little arithmetic was necessary.

The degree of stress exerted upon individual ligaments, three from each knee, was relatively small. If it is assumed that the stress is equally distributed to all the ligaments in the experiment (which is not strictly true) then the order of the stress on each would never be more than 20 lb. In a separate experiment measuring the extension of ligament directly, this weight did not produce full

extension, and it was considered that the weights employed in the main experiment were quite adequate for the measurement of ligament elasticity.

Artefact in the Method

In any study of this nature a comprehensive investigation of artefact has to be made, as the measurements are small and the possible artefacts large. The artefacts come from two sources:

- (a) The aluminium thigh clamps;
- (b) Flexion deformity of the knees.

The first was not of great importance as all the readings were affected by it. The second was of importance on two counts: first, in a normal knee the degree of lateral movement is slightly greater in flexion than extension, and secondly, and of far greater importance, a flexion deformity of the knees will allow the hips to rotate internally as the weights are applied to the ankles.

The first source of artefact was estimated by performing the full experiment on twelve subjects, taking *x* rays of the knees during the experiment, and assessing the separation of the femoral condyles with the effect produced on the malleoli. This is represented by the shaded area in Figs 6, 7, and 8 (see below), the mean artefact is shown by the continuous line close to which the majority of readings fell.

The second source of artefact was minimized in three ways:

- (i) No patient with severe permanent flexion

deformity of the knees was included in the study.

- (ii) The padded aluminium bar that was pressed down on the thighs corrected minor flexion deformities simply through the presence of fluid in the joint and not through contracture (a knee with any sizeable effusion is held slightly flexed).
- (iii) If the hips rotated internally it was quite evident, since the feet instead of being parallel were forced into an angle to each other; this could be eliminated by instructing the subject to rotate the hips externally until the feet were parallel again. However, there were few cases of this sort, and it was seldom necessary to perform the manoeuvre.

Results

In any study of this nature the range of normality must be defined first. This was estimated by examining 59 normal persons selected from different age groups ranging from the 2nd to the 8th decade. One feature that soon became clear was that adolescents had more mobile joints than adults; with each weight there was always a larger deflection of the malleoli. The normal subjects were therefore separated into two groups: 23 "under 20 yrs" and 36 "over 20 yrs". This age was taken as the dividing line because there was little difference in reaction between a man of 23 yrs and one of 70 yrs, whereas those under 20 yrs became progressively more mobile. There was no difference between the sexes.

In order to compare the two groups, mean values have been calculated, the results of which are shown in Table I. In the adult group the deflection with 5 lb. could virtually be ascribed to artefact, whereas in the young, the deflection was much larger and resulted from a more mobile joint. The two larger weights of 10 lb. and 15 lb. allowed measurement of the true stretch of the ligament by subtraction

of the reading at 5 lb. These findings are shown graphically in curves of weight plotted against mean deflection (Fig. 6). The differences in deflection with 5-10 lb. and 10-15 lb. are illustrated by the dark columns. They are very similar in magnitude, reflecting the slopes of the two graphs. The extensibility of these two groups of ligaments appears to be the same, but the differences in behaviour of the two groups with 5 lb. (joint mobility) is statistically significant ($P < .001$); the differences 5-10 lb. and 10-15 lb. (ligament stretch) showed no statistical significance.

Fig. 6.—Curves of mean deflection plotted against weight from the two groups of normal subjects. (Shaded areas represent artefact.)

Rheumatoid Arthritis

With the range of normality defined it was now possible to examine cases of rheumatoid arthritis; 57 patients were examined and it was soon clear on clinical grounds that the severely affected patients had the more unstable joints. The patients were separated into two groups according as the knees were "obviously affected" or only "mildly affected",

TABLE I
MEAN MALLEOLAR SEPARATION (mm.) IN NORMAL SUBJECTS

Normal Subjects		Weight (lb.) $\pm$ S.E.				
No. of Cases	Age (yrs)	5	10	15	5-10	10-15
23	Under 20	7.8 $\pm$ 1.2	18.7 $\pm$ 1.3	29.9 $\pm$ 1.3	11.0 $\pm$ 0.7	11.2 $\pm$ 0.4
36	Over 20	2.8 $\pm$ 0.3	12.2 $\pm$ 0.8	23.0 $\pm$ 1.0	9.4 $\pm$ 0.7	10.8 $\pm$ 0.5
Probability of Difference . . .		< .001	< .0001	< .0001	Not significant	Not significant

S.E. = Standard error of the mean.

judging by synovial thickening, fluid, pain and, decreased range of movement. There were 37 patients in the first group and twenty in the second. Age differences were of minor importance as only three of the patients were under 20 years old. The means were estimated for the two groups of patients. There were much larger deflections for all the weight values in the obviously affected patients than in the other group (Table II). The mildly affected patients gave readings almost halfway between those of normal adolescents and adults. In contrast, the obviously affected patients yielded readings that were far in excess of any of the other groups. The deflection with 5 lb. was about four or five times larger than in the normal adult, denoting a considerable decrease in joint stability. Graphs prepared from Table II (Fig. 7) illustrate this enormous difference in behaviour. The deflection with 5 lb. represents joint instability or, in other words, the slackness of the ligaments in the fully-extended knee. The differences 5-10 lb. and 10-15 lb. represent the

stretch of the ligaments. These values are illustrated by the black and white columns to the right of the graph, which in turn reflect the slopes. Statistically the difference between the readings of the obviously affected patients and those from normal adults is highly significant, and so to a less extent is that between the slopes. This is due to the larger value of the difference 10-15 lb. in the obviously affected group (13.2 as opposed to 10.8 mm.). Now this could result from one of three causes:

- (1) Increased extensibility of the more severely affected rheumatoid ligament.
- (2) Increased compressibility of rheumatoid cartilage.
- (3) Artefact caused by minor flexion deformities of the knee.

In a separate experiment, there was no detectable difference when rheumatoid and normal ligaments were suspended and the extensibility measured directly. It was also demonstrated in a further *post mortem* experiment on a knee, that a "spongy fulcrum" could give rise to a larger deflection—a situation that could arise in rheumatoid arthritis if there were much pannus over the articular cartilage. In a modified knee (the one with the lateral condyle and tibial plateau removed and replaced with metal) this was mimicked; the metal was moved from hard cortical bone to soft medullary bone and when the experiment was repeated the metal sank into the soft bone with the heavier weights giving rise to larger tibial deflections. Either this, or flexion of the knee, could account for the differences in the slope of the graphs, and the truth probably lies somewhere in between the two.

In addition to these measurements, clinical, laboratory, and radiological data were collected in an attempt to correlate them with the joint instability. The positive findings were that joint instability was related to the length of time the joint had been affected and to the radiological changes. Of the

Fig. 7.—Curves of mean deflection plotted against weight from the two groups of rheumatoid arthritis. (Shaded area represents artefact.)

TABLE II
MEAN MALLEOLAR SEPARATION (mm.) IN RHEUMATOID ARTHRITIS

Rheumatoid Arthritis		Weight (lb.) ± S.E.				
No. of Cases	Affected	5	10	15	5-10	10-15
20	Mildly	4.2 ± 0.7	15.3 ± 1.0	25.3 ± 1.3	11.1 ± 0.8	10.0 ± 0.5
37	Obviously	16.5 ± 1.3	29.6 ± 1.4	42.7 ± 1.6	12.9 ± 0.7	13.2 ± 0.7
Probability of Difference . .		< .081	< .081	< .081	Not significant	< .041

S.E. = Standard error of the mean.

37 patients in the obviously affected group, twenty (55 per cent.) had had symptoms for more than a year, whereas in the mildly affected group of twenty patients only five (25 per cent.) had had trouble for this length of time. Similarly, in the obviously affected group, radiological changes were more pronounced; erosive change was present in seventeen (46 per cent.) of the obviously affected patients and in one (5 per cent.) of the mildly affected group. As regards joint narrowing, thirteen (35 per cent.) of the obviously affected and two (10 per cent.) of the mildly affected patients were involved. Osteoporosis was about equal in the two groups. Although x-ray changes were more pronounced in the obviously affected and unstable joints, about one-third of this group had normal films by any standards. These findings are summarized in Table III. There was no correlation in the degree of instability with the total length of time the patient had had rheumatoid arthritis, the level of the erythrocyte sedimentation rate, and the titre of rheumatoid factor in the serum.

TABLE III
RADIOLOGICAL FINDINGS IN RHEUMATOID ARTHRITIS

Radiological Findings	Arthritics Affected			
	Mildly		Obviously	
	No.	Per cent.	No.	Per cent.
Erosions	1	5	17	46
Narrowing	2	10	13	35
Osteoporosis	4	20	11	30

Ankylosing Spondylitis

Nine patients were examined, all of whom had obvious symmetrical involvement of the knees, none of which showed any degree of abnormal mobility or abnormal ligamentous extensibility. The mean readings are shown in Table IV, and Fig. 8 shows a curve almost identical with that from normal

TABLE IV
MEAN MALLEOLAR SEPARATION (mm.) IN ANKYLOSING SPONDYLITIS COMPARED WITH THAT IN NORMAL SUBJECTS

Series	Weight (lb.) $\pm$ S.E.				
	5	10	15	5-10	10-15
Spondylitis	2.8 $\pm$ 0.8	11.9 $\pm$ 1.4	22.6 $\pm$ 1.7	9.1 $\pm$ 0.7	10.6 $\pm$ 0.5
Normal Subjects over 20 yrs of age	2.8 $\pm$ 0.3	12.2 $\pm$ 0.8	23.0 $\pm$ 1.0	9.4 $\pm$ 0.7	10.8 $\pm$ 0.5
Difference from Normal	0	0.3	0.4	0.3	0.2

S.E. = Standard error of the mean.

Fig. 8.—Curve of mean deflection plotted against weight from the group of spondylitis. (Shaded area represents artefact.)

adults. Only one patient had mild erosive change and joint narrowings. Osteoporosis was not a particular feature in any of the films examined.

Psoriatics

Only three of these patients were examined, all of whom had obvious bilateral disease. Two had stable knees and the results were compatible with those from normal adults; the third gave results comparable with those from a case of "obvious" rheumatoid arthritis. Two of these patients had erosive change with joint narrowing; the patient with the worse radiological changes was the one with unstable joints.

Discussion

The results show that with low stresses the knees of persons under 20 yrs of age showed more lateral mobility than those of adults. This has been interpreted as a difference in tautness of the ligaments. The question arises whether differences in elasticity could account for these results. The deflection with low loads measures elasticity, and the stresses employed in this experiment were certainly low—the maximum stress on one ligament was approximately 20 lb., a weight that did not fully extend normal or rheumatoid ligament in a separate experiment when it was directly suspended and stretched, and, furthermore, the slopes of the curves of ligament extensibility (Fig. 6) were virtually identical.

This is evidence against a difference in extensibility but, as the measurements were comparatively coarse and the system complex, it may be that, with a more accurate technique and with even lower loads, a difference might be demonstrable.

The results from the rheumatoid arthritics are quite compatible with lengthening of the ligaments. The mobility of the knee with 5 lb. was much greater than in any of the other experiments and cannot be interpreted in terms of changes in elasticity alone. As soon as this slack had been taken up, the ligaments behaved closely to normal, and the differences in slope of the two graphs (Fig. 7) could be interpreted in terms of fulcrum change (soft cartilage) or artefact.

The presence of more severe radiological changes in the obviously affected unstable knee is not surprising, and the higher incidence of erosive change suggests that more rheumatoid granulation tissue was present in these knees. Ball's findings on the cervical spine may well have a parallel at this site; granulation tissue could invade and erode the attachments of the ligaments thus weakening them. When a rheumatoid ligament was suspended and stretched the posterior fibres tore away from the bone when a normal one was unaffected, a fact which would support this contention.

Joint narrowing alone cannot account for these findings, for only about a third of the patients showed any such evidence from their films. The patients who had normal knee *x* rays and unstable joints present another problem; the ligaments may have been loosened by granulation tissue as postulated in the other cases, or some other factor as yet unknown may account for the change. In any case it is not possible to draw any further conclusions on the data available from these experiments.

The spondylitics showed no instability and it did not seem to matter how long they had had the disease in the joint—one patient in this series had had trouble for at least 20 years and the joints were still stable. These knees had large effusions and synovial thickening suggesting the presence of granulation tissue, but the ligaments did not seem to be affected in the same manner as in patients with rheumatoid arthritis.

The psoriatics seemed to fall somewhere between the rheumatoid arthritics and the spondylitics, but since only three were examined, no firm conclusions could be drawn; however, of the two patients with radiological change (erosion and joint narrowing), the one with the worse changes had the unstable knees, and this instability might be attributed to the same erosive changes as occur in rheumatoid arthritis.

Summary

A method has been designed to assess the lateral mobility of the knee joint and to measure the extensibility of the ligaments. 59 normal subjects were examined; adolescents proved to have more mobile joints than adults and after 20 years of age this differential mobility disappeared.

57 patients with rheumatoid arthritis were examined in the same manner. Twenty of these had only mild local disease and their knees were stable, and the other 37 had more severe local disease and their knees were unstable. These latter patients had had symptoms in the knees for longer than the others and they had more severe radiographic changes, but only one-third of them had quite normal films and one-third showed evidence of joint narrowing. In some way the ligaments in these cases have lengthened and the reasons for this are discussed.

Nine patients with obvious clinical involvement of the knees with ankylosing spondylitis were examined and all had quite stable joints.

Three patients with psoriatic arthritis seemed to lie somewhere between the stable spondylitics and the unstable rheumatoid arthritics.

I should like to thank Prof. J. H. Kellgren, Dr. J. Sharp, Dr. J. Ball, and Dr. R. Harris for their help and constructive criticism in the preparation of this paper, and Miss F. Bier for the statistical assessment of the results.

REFERENCES

- Ball, J. (1961). "Atti del X Congresso della Lega Internazionale contro il Reumatismo, Roma", vol. 2, p. 1058.
- Bell, C. (1830). "The Nervous System of the Human Body", 1st ed., Appendix, p. cxxvii, No. LXIV. Longmans, London.
- Carter, C., and Sweetnam, R. (1958). *J. Bone Jt Surg.*, **40B**, 664.
- Coutts, M. B. (1934). *Arch. Surg.*, **29**, 297.
- Grisel, P. (1930). *Presse méd.*, **38**, 50.
- Jaccoud, S. (1867). "Leçons de clinique médicale faites à l'Hôpital de la Charité", 1st ed. Delahaye, Paris.
- McKusick, V. A. (1960). "Heritable Disorders of Connective Tissue", 2nd ed. Mosby, St. Louis.
- Martin, R. (1959). "Lehrbuch der Anthropologie", 3rd ed. Fischer, Stuttgart.
- Ravault, P. P., Maîtreperre, J., Léjeune, E., Normand, J., and Cretin-Maitenaz, R. (1961). *J. Méd. Lyon*, **42**, 101.
- Ritchey, S. J. (1960). *U.S. armed Forces med. J.*, **11**, 167.
- Sharp, J., and Purser, D. W. (1961). *Ann. rheum. Dis.*, **20**, 47.
- Sherman, M. S. (1952). *J. Bone Jt Surg.*, **34A**, 831.
- Watson-Jones, R. (1932). *Proc. roy. Soc. Med.*, **25**, 586.
- Wright, V. (1959). *Amer. J. Med.*, **27**, 454.

Instabilité latérale du genou à la suite de la polyarthrite**Etude expérimentale****RÉSUMÉ**

On a développé une méthode pour déterminer la mobilité latérale de l'articulation du genou et mesurer l'extensibilité des ligaments. On a examiné 59 sujets normaux; les adolescents avaient des articulations plus mobiles que les adultes, mais après l'âge de 20 ans cette mobilité différentielle disparaissait.

On a examiné de la même manière 57 malades atteints d'arthrite rhumatoïdale. Chez 20 d'entre eux l'atteinte locale était légère et leurs genoux étaient stables, et chez les autres 37 l'atteinte locale était plus grave et leurs genoux étaient instables. La durée des symptômes aux genoux de ces derniers malades était plus longue que celle des autres et leurs signes radiographiques étaient plus graves, mais pour un tiers d'entre eux seulement les clichés étaient tout à fait normaux et chez un autre tiers ils montraient un pincement articulaire. De façon ou d'autre les ligaments dans ces cas se sont allongés; on en discute les raisons.

On a examiné 9 malades présentant des signes évidents d'atteinte des genoux par la spondylarthrite ankylosante et leurs articulations étaient tout à fait stables.

Trois malades atteints d'arthrite psoriasique semblaient se placer entre les stables spondylarthritiques et les instables rhumatisants arthritiques.

Instabilidad lateral de la rodilla a consecuencia de poliartritis**Estudio experimental****SUMARIO**

Se desarrolló un método para determinar la movilidad lateral de la articulación de la rodilla y medir la extensibilidad de los ligamentos. Se examinaron 59 sujetos normales; los adolescentes tuvieron articulaciones más móviles que los adultos, pero después de la edad de 20 años esta movilidad diferencial desaparecía.

Se examinaron de la misma manera 57 casos de artritis reumatoide. En 20 de ellos la lesión local fué ligera y sus rodillas fueron firmes; en los demás 37 la afección local fué más grave y sus rodillas fueron instables. Los últimos pacientes habían presentado los síntomas en las rodillas por más tiempo que los demás y sus signos radiológicos fueron más graves, sin embargo sólo en una tercera parte de ellos los clisés fueron enteramente normales y en una tercera parte hubo signos de estrechamiento articular. De algún modo los ligamentos en estos casos se alargaron; se discuten las razones de este hecho.

Se examinaron 9 enfermos con signos evidentes de espondilartritis anquilosante en la rodilla, encontrándose las articulaciones perfectamente firmes.

Tres enfermos con artritis psoriásica parecían colocarse entre los firmes espondilartríticos y los instables artríticos reumatoides.