MORBID CONDITIONS OF THE KNEE-JOINT IN EAST AFRICAN ASKARIS WITH PARTICULAR REFERENCE TO AETIOLOGY AND PATHOLOGY

BY


Late Royal Army Medical Corps

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DURING the period July 1943 to December 1946—nearly three and a half years—almost 300 trained men and some 33,000 days of service were lost amongst the Africans in the East Africa Force due to diseases and injuries in, and around the knee-joint.

The following general ideas on aetiology and pathology emerged following survey of available information on these cases.

INCIDENCE

The total of admissions for this type of lesion, investigated, was 1,029 and the comparable total of hospital admissions about 16,000, i.e. approximately 6.4 per cent.

In a very much smaller series of Europeans, the figure was 4 per cent. These, however, were not comparable—too many varying factors affected admission to hospital and exposure to injurious influences outside—thus the African tended to be admitted for certain minor conditions and investigations, which would have been dealt with as an out-patient in the European who, on the other hand, while in Africa, was seldom called upon to exert himself physically, to the same extent as the African.

In Somali patients the incidence was 3 per cent, no doubt due to the facts that he was primarily a foot soldier, and was little exposed to strain from heavy gear, etc., and that he was not addicted to football to the same extent as the Bantu askaris.

NATURE OF THE LESION

From a detailed analysis of all the lesions, the following main types stand out.

<table>
<thead>
<tr>
<th>Traumatic synovitis</th>
<th>Osteoarthritis</th>
<th>Tears of ligaments</th>
<th>Infective arthritis incl. V.D.</th>
<th>Wounds and abrasions</th>
<th>Hysteria</th>
<th>Various</th>
</tr>
</thead>
<tbody>
<tr>
<td>40%</td>
<td>15%</td>
<td>9%</td>
<td>6%</td>
<td>5%</td>
<td>3%</td>
<td>17%</td>
</tr>
</tbody>
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The synovitis group, the most important, was found to be composed of the following types: —
Morbid Conditions of the Knee-Joint in East African Askaris

<table>
<thead>
<tr>
<th>Type of synovitis</th>
<th>Traumatic Haemorrhagic</th>
<th>Non-Haemorrhagic</th>
<th>Non-traumatic</th>
<th>Traumatic Haemarthrosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild acute (10 days)</td>
<td>2</td>
<td>60</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>Acute (10-40 days)</td>
<td>7</td>
<td>89</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Recurrent (&gt;2 times)</td>
<td>1</td>
<td>62</td>
<td>4</td>
<td></td>
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<tr>
<td>Chronic (&gt;40 days)</td>
<td>5</td>
<td>62</td>
<td>31</td>
<td></td>
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</tbody>
</table>

and the osteo-arthritis group of

(a) Post-traumatic
(b) Non-traumatic
(c) Secondary
(d) Osteo-arthritis dissecans

ÆTIOLGY

The effect of various influences thought to have causal relationship are discussed below.

Anatomical.—Dissection of twenty knee-joints, in ten subjects, gave the impression that the cruciate ligaments were longer and finer than in the European, but otherwise similar. Observation in the living confirmed the known anthropological features that: The negro has a longer leg, in toto; the lower leg is relatively longer and the calcaneus is more projecting than in the European.

Lewis, in the Biology of the Negro states “that the ligaments of the African knee are longer and slimmer, and that the Negro has a greater movement and the White a greater stability.” He also opines that the cartilages of bone ends, e.g. femur, are of finer construction and more advanced.

Physiology.—The range of movement in the African knee, as observed in the normal subject, in the anaesthetized, and in the recently deceased, and compared with a series of Europeans, was found to be greater, and of the following order in the various directions.

<p>| | | | | |</p>
<table>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Antero-posterior</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>1/4 inch</td>
</tr>
<tr>
<td>Lateral deviation</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>5-7 degrees</td>
</tr>
<tr>
<td>Hyper-extension</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>7 degrees</td>
</tr>
<tr>
<td>Patellar mobility</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>very mobile</td>
</tr>
</tbody>
</table>

Heredity has thus provided the African with a knee-joint having certain characteristics.

It is mobile, dependent for stability on muscles, their readiness for action, and the adequacy of that reaction—eminently suited for the regular, rhythmic strain of his usual life, e.g. work in the fields, travel by foot, tribal dances, etc., but too dependent on muscle protection to be suitable for the heavy, irregular unexpected strains of military life or sport.

There is longer leverage than the European, causing greater damaging force from a similar strain and, further, requiring greater protective reaction from muscles to control and counteract this force.
He has a leg which should have more fluid in the joint normally, and excess more often, because it has a greater range of movement, and this normal movement is the stimulus to the production of synovial fluid. Further, its greater dependence on muscles renders minor traumata more frequent, thus increasing the fluid and the readiness with which it is produced in response to any stimulus.

If it is more advanced developmentally, as suggested above, it will follow the usual rule—the more advanced, the more liable to derangement.

**TRAUMA**

This had an obvious relationship in many cases, and is of particular interest in the two commonest lesions. Thus:

In Synovitis.—*Degree of Trauma*: There was no definite relationship between the severity of the injury and the resultant synovitis, nor yet to the presence or absence of blood in the effusion. Nor was this discrepancy due to any underlying pathology, e.g. yaws, syphilis, or dysentery.

*Time*: This was usually from one hour to one year previously, but ranged up to fourteen years in one case, without demonstrable arthritis, or recent injury.

*Repetition of Trauma*: This was reported in only a minority of the cases, and recurrence was usually due to strain or exercise insufficient to reach consciousness.

*Nature*: 30 per cent football; 40 per cent a fall on the knee—training, playing games, P.T. or during transport; 18 per cent striking the knee—as at work or in a fracas, etc.; 12 per cent twisting the knee—as on a parade or training ground or during games. The common factor to all was a sudden strain, irregularly applied with the muscle caught unawares—the force itself usually being insufficient to cause damage to an "aware" joint.

*Occupation*: Incidence was directly proportional to the severity of the work or training performed, and varied from Infantry and Labour Corps on one hand to the Dental and Signal Corps on the other. The E.A.A.M.C. came unexpectedly high, due to playing football without adequate training, or lack of general hardiness.

*Period of Service*: Frequency was almost equal in those with one, two, and three years' service, by far the largest groups.

*Rank*: 91 per cent were privates, while above Serjeant such lesions were almost non-existent, i.e. they occurred in those directly exposed to the stresses and strains of Army life.

*Seasonal Incidence*: In the First World War in the Middle East such injuries were most frequent in summer, coincident with the period of "summer idleness." Curiously enough, the summer quarters in 1944 and 1945 showed the highest incidence. The hot season did not, however, correspond to our own summer, though in some parts activity or lack of it may have done so.

*Intelligence*: With its accompanying general awareness, and activity of protective reflexes could not be demonstrated as a factor of safety. We were, however, of the opinion that the African was not so much on his guard, against
unexpected strain, as those who had been brought up in constant awareness of the possibility of injury from many sources, as in industrial or town life. He often became injured, even the same way, twice.

In Osteo-Arthritis.—Trauma seemed to have a major causative role, 60 per cent of cases being clearly post-traumatic, while in the non-traumatic group, 50 per cent were in the main occupational classes affected (Infantry, Labour and Service Corps) suggesting that strain or over-use plays an important part.

A further influence was the "squatting" position adopted by the African so frequently, for such long periods, which may affect the joint in the following ways, predisposing to disease or modifying it.

Localization of pressure: In standing the largest area of joint surface is comfortably engaged, in sitting, pressure is minimal, whereas in squatting, the posterior aspect of the femoral condyle and menisco-tibial surface are involved making a greater pressure on a more limited area.

Vascular: The popliteal vessels must be kinked acutely, probably diminishing the blood supply to the joint through the geniculate arteries.

Ligamentous: The patellar ligament and capsule attached thereto, must be at full stretch for hours on end, leading to ultimate lengthening, and therefore relaxation, in the extended position, making the joint more dependent on muscular control for stability and allowing repeated minor traumata to occur. Further, the long anterior fibres of the medial collateral ligament acquire a greater antero-posterior glide than normal in flexion, and the frequency of the extreme position must stretch the attachment of the ligament to the medial meniscus, so that both ligament and cartilage are less fixed and dependent on one another in function and in trauma. Due to this, and to the general laxity of the ligaments, which allows bruising of the cartilage and strain of the coronary ligaments rather than tears of cartilage, meniscal lesions are very uncommon.

Venereal Diseases.—These were commonly supposed to be a frequent cause of pathology in the knee-joint but, in this series, the relationship could be shown in only 3 per cent of lesions (gonococcal 1 per cent, syphilitic 1.8 per cent). As far as could be ascertained in V.D. centres the incidence of knee-joint complications seemed to be of the order of—gonococcal \( \frac{1}{2} \) to 1 per cent and syphilitic 1 to 2 per cent.

The usual range, given for Europeans, is 2 to 5 per cent suggesting a greater immunity and a lower grade of infection in the African. The criteria used in assessing the origin as venereal, vary. For the purpose of diagnosis, it was thought: In suspected gonorrhoeal cases, the only finally reliable test was the finding of a positive genito-ureinary lesion. The gonococcal complement-fixation test, the use of presumptive lesions, presence of pus in the prostatic smear, etc., were, for various reasons, regarded as unsatisfactory and conditions diagnosed on these criteria frequently failed to respond to the therapeutic test. In suspected syphilitic cases, one of the combinations listed was required—either a confirmed past, or definite recent history of syphilis, now having a Kahn test \((+++)\) or greater; or a Kahn test \((++++)\) or greater, and no sign of yaws; or the
demonstration of spirochaetes in any associated lesion, e.g. ulcers, etc.; and the
definite local characteristic of painlessness (except in arthralgic cases which
seldom came to the surgeon).

**Psychogenic Causes.**—Almost 3 per cent were classified thus:

1. Hysteria—sensory (pain, paraesthesia) ... ... 1.4 per cent
2. Post-traumatic neurasthenia (pain, loss of function,
following definite trauma) ... ... ... ... 1 per cent
3. Hysteria—motor (gross limp, paralysis, spasticity
etc.) ... ... ... ... ... ... ... ... ... 1 per cent

In addition definite hysterical exaggeration, or prolongation of symptoms
was present in about 10 per cent of cases.

To summarize: 75 per cent of morbid lesions in the African knee were
directly due to trauma, and many others influenced by it.

In 70 per cent of cases this occurred during the inevitable strain of military
labour, transportation, training, and manoeuvres.

The remaining 30 per cent were due to football or allied games, and as such
could have been completely eliminated, in theory, by banning these games, but
impracticable in practice, as the value of football was so great in many other
ways.

**Pathology**

Three factors were of greater significance than in the European.

*The Production of "Internal" Keloid.*—The African was liable to keloid
formation following injury or division of fibrous tissue, even in minor ulcers,
abrasions, bruises or after injections. Similar excess fibrous tissue reaction
probably occurred in such conditions as torn lateral ligaments, capsular tears,
nipping of synovial membrane and infrapatellar pad of fat, in diseases like
villous and osteo-arthritis and, of course, in the formation of adhesions. Thus,
for example, following the not uncommon tear of the internal lateral ligament
excess fibrous tissue causes formation of adhesion from ligament to capsule,
resistant to manipulative treatment, and a mass which involves medial genicu-
late nerve, causing pain.

The frequency of nipping of the infrapatellar pad of fat as a probable pri-
mary pathology in many joint lesions, especially traumatic synovitis. Such
nipping being due to a momentary delay of the quadriceps muscle (relaxed by
much squatting, by hysterical inhibition due to some minor bruise or capsular
tear, or just responding sluggishly from "unawareness") in pulling the pad out
of the way, when the need for movement arose suddenly.

This would account for strains, twists, stumbles and falls being the most
frequent cause, not severe blows; and also for the lack of direct relation between
degree of trauma and the reaction produced.

In favour of this primary lesion are the facts that most of the patients, once
the general symptoms had subsided, complained of an ache below the patella,
accompanied by definite tenderness on either side, and at a varying distance from it—all exaggerated on extension. If actual thickening accompanied this picture, the condition was classified as a bruise of the pad.

In two cases in which it was doubtful if the cartilage was damaged, at operation, no meniscal abnormality was found but there was recent haemorrhage into the infrapatellar pad.

In the post-mortem examination of ten subjects, three were found to have bilateral tags originating from this pad of fat, varying in size, from $\frac{1}{2}$ to $\frac{3}{4}$ inch, in number, from 2 to 4, and in consistency from hard avascular to soft haemorrhagic, yet there had been no history of significant knee lesion.

The sequence in both traumatic and non-traumatic synovitis cases was probably—mild nipping—effusion—further laxity of ligaments—greater liability to nipping, etc.

The presence of a direct or accessory psychomatic element, in many cases—mainly an inhibition, accompanied by limp, disuse, and later atrophy of quadriceps; this sometimes followed upon very minor lesions, perhaps not even connected with the leg—thus the African sought refuge in a limp in such conditions as inguinal adenitis, epididymo-orchitis, lumbar fibrositis, etc. Organic causes for similar atrophy occurred and required exclusion, e.g. old poliomyelitis, progressive muscular atrophy, chronic pyomyositis and that following such injections as quinine.

Other pathological conditions which may be mentioned for interest were as follows:

**Meniscal lesions** — for their rarity (as mentioned above)
- Pellegrini Stieda's disease
- Osgood Schlatter's sprain — for their frequency, each about 1 per cent.
- Osteo-arthritis dissecans.

Chronic villous hypertrophy (synovitis or arthritis) for presenting as an apparent entity, which though without pathological basis appeared clinically as follows: Diffuse thickening, limited to the synovia; gross, hard crepitus, suggesting articular involvement; yet, normal X-ray or the appearance of intra-articular soft tissue and negative findings in various specific tests.

No evidence could be found that these cases were the precursors of tuberculosis, the products of syphilis, nor yet the lipomatous stage of osteo-arthritis. Twenty-two cases were put into this category. A number of these were almost certainly examples of chondromalacia patellae—a degeneration of the knee-joint in young people, the description of which has been so thoroughly presented recently—Gray (B.M.J., March 1948) and of which we were inadequately conscious, to make the diagnosis, prior to this.

**Guinea-worm infestation** for being the explanation behind a number of puzzling cases.

Other individual examples of pathology due to these various causes were seen—yaws, dysentery, filariasis, septic foci, nervous diseases, diaphyseal aclasia, pyomyositis, bilharzia (associated), mycosis, cysticercosis, exostosis, chondroma, chondrosarcoma, peri-articular fibrosis, Sudeck's atrophy and thrombophlebitis.
Henry B. Young

TREATMENT

Almost 25 per cent of native soldiers, with disability of the knee, had to be boarded, while most Europeans could return to their duties. Further, using uncomplicated traumatic synovitis to compare the duration of treatment, it was found that the average stay in hospital of an African was twenty-two days, that of a European fifteen—tending to confirm the impression that treatment was less successful in the African. There was, however, less difference than the above suggests as the degree of function required in the African was greater, in view of the physical needs of his service, compared with those demanded in the semi-supervisory capacity of the European.

Treatment in each case was along orthodox lines, seldom operative, and rehabilitation facilities were satisfactory, so the difference must have lain in other spheres and indeed was much influenced by the psychological elements in his environment as indicated below.

The key to maintenance, or restoration, of stability, function, protection, and freedom from symptoms, in this joint—particularly in the three main causes of disability—lay in the correct action of the quadriceps' group of muscles. The prophylactic and therapeutic handling of this muscle, demanded a very considerable effort of will, and co-operation on the part of the patient. Diminution or collapse of this exercise of will-power and concentration was readily brought about by numerous influences and ideas, some seeming nebulous or even fatuous, yet, if the African mind was disturbed by even one of these, delay or failure of restoration of muscle balance and compensation tended to result.

These factors were either:

In his attendants.—Failure to understand the African due to the "white sahib" attitude; to laziness or lack of interest. Failure to grasp the vital need for rehabilitation, introducing that element of doubt in the air which allowed the African to slip back into passive lethargy. Failure to regard the African worth all the sustained effort required—he seemed such a poor economic and even military unit, so easily replaceable, so easy of disposal—into the bush.

In the African himself—mainly in his mental perspective. Thus, the fact that he was not supported by the European's grasp of and concurrence in the need for war or service in the forces (despite the best endeavour); the fact that the injuries occurred in association with unusual agents, e.g. tanks, guns, organized games, etc., made him feel that they must be worse than those he knew at home, causing the injured leg to become an object of detached interest to him and the muscles to be so completely flaccid, that only the most strenuous efforts could obtain even the tiniest flicker of their fibres; the difficulties of language and his incapacity to grasp semi-abstract thoughts or instructions; his feeling that a "native" doctor could really "get at the roots" of the trouble; his naturally easy-going temperament combined with the reduction of the usual fatigues, in hospital; his fear of ultimate social and economic inadequacy, and often worry due to loss of contact with his own home when away from his own unit; and, finally, his firm belief that he should
not exercise his leg to improve it, but that when it "felt good" he would walk on it easily.

All combined to render him most resistant to attempts to enlist his cooperation in the necessary physical regime. Each of these difficulties and doubts must be vigorously and consciously countered, by explanation and appropriate action and the highest psychological "boost" maintained at all stages of treatment, by all grades of his attendants.

Certain points of interest emerged from the actual details of treatment, e.g. damaged cartilages were best accepted as an indication for boarding—operation seldom returned them to satisfactory duty.

In refractory effusions, before the final decision to board, it was worth trying either, reduction of the fluid intake to below 12 oz. daily for three to four days, as sometimes if the body needed fluid, it would take it from the knee, or a period of three weeks' ambulation, following the aspiration of the fluid and application of a firm pressure bandage, and plaster of Paris in the almost completely extended position. On removal of the plaster, no recurrence was then found in about 30 per cent of cases.

Intra- or extra-capsular loose or foreign bodies, including those of osteoarthritis dissecans were worth removing—giving relief from symptoms, with a surprising freedom from post-operative psychogenic disability.

The only other noteworthy cause of delay in instituting treatment was the African's willingness to wait up to fourteen days, before reporting sick with the various swellings and infections in the joint region, if not accompanied by severe pain.

Study of the various causes, effects, and difficulties in treatment of such knee-joint conditions, suggests the following measures, which, if stressed more than formerly, might reduce the morbidity therefrom.

Prophylactic.—Insistence on great care in the driving of personnel trucks, and instruction in safe methods of en- and de-trucking.

Insistence on preliminary training before organized games, heavy physical training, or field exercises, and the acquisition of controlled skill in them rather than the random efforts of blind enthusiasm, so commonly exhibited by the African.

Therapeutic.—Organizational—mainly to see that personnel in wards and centres for these cases have sufficient vigour, knowledge, and understanding of the African, to be able to focus his attention on the requirements of the moment, and to dispel the clouds of doubt and distraction which so often inhibit action on his part.

Clinical—the avoidance of any passive or mechanical treatment, unless strongly indicated, for the African just delights in watching the "magic" machine doing the work, and once so habituated to ways so suited to his taste, strong and even harsh methods were needed to regain psychological "tone."
SUMMARY.

Considerable loss of trained man-power occurred among the native troops, of the East Africa Force, due to lesions in and around the knee-joint—particularly traumatic synovitis, osteo-arthritis, and partial tears of the collateral ligaments. Detailed analysis of over a thousand cases revealed that Aetiology was overwhelmingly traumatic, but that degeneration played a part; that other accessory influences (mainly anatomical, habitual, and psychological) were also at work: that the causative rôle of syphilis, and gonorrhœa was much less significant than usually supposed.

Pathology was noteworthy for the prominence of three elements as compared with the European: The formation of "internal" keloid; the frequent occurrence of nipping of the infrapatellar pad of fat, as a primary lesion; the incidence of marked psychosomatic reactions.

Treatment could be made to influence the morbidity further from two aspects—the prophylactic, by all means to avoid or minimize the various forms of reducible trauma cited above; and the therapeutic—by all measures to maintain and improve quadriceps muscle, volume, tone, co-ordination, and "awareness" particularly in the psychological and personality spheres.

REFERENCES