THE DIAGNOSIS OF TRAUMATIC
AFFECTIONS OF THE KNEEJOINT

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Injuries to the knee are of such common occurrence that a brief review of some of their aspects may be of interest.

This joint is more frequently damaged than any other in the body; this liability is due to the fact that unlike most other joints it is almost entirely dependent for its stability on the powerful but vulnerable muscles and ligaments which surround it, rather than on the interlocking of bony surfaces. Furthermore its complicated movements and its weight supporting functions continually expose it to all manner of strains.

As a matter of fact, considering its anatomical structure, it is surprising that it is not even more subject to trauma.

To obtain a proper understanding of the mechanism of these injuries, it is necessary that we should be fully acquainted with the anatomy and functions of the joint. Such knowledge, I will presume that you all possess and will not deal with it now.

The importance of these injuries lies in the fact that their diagnosis is often very difficult and that their proper treatment is as a consequence frequently faulty. It is this neglect of treatment that has made the knee joint such a source of profit to the unqualified bonesetter and a discredit to our profession.

These traumatic affections are frequently embraced under the term "internal derangement of the knee joint." The question, therefore, arises what is really meant by an internal derangement? There is a prevailing impression that a sensation of slipping, weakness or giving away of the knee must of necessity be due to displacement or injury of the semilunar cartilages and it is not sufficiently realised that such symptoms may result from many other conditions affecting the joint. In a recent American text-book, I have noticed that the term internal derangement is actually being used as if synonymous with injury to the cartilage. This of course is far from being the case. Recent investigations, particularly by Timbrell Fisher, have shown that a great many other lesions of the joint can give rise to equal if not greater disability and should be included under this heading. Furthermore, as I hope to show you presently, these diverse lesions, although at first sight producing somewhat similar symptoms, can with care be differentiated and require definite and distinct treatment for their cure.

An internal derangement of the kneejoint may be defined as being the result of any alteration in the state of the joint which may interfere with the normal movements of the femoral condyles in the hollows formed by the semilunar cartilages and the articular depressions on the upper surface of the tibia. Such a definition implies that any lesion of the many structures, which compose the joint, may interfere with its functions and give rise to more or less disability. In order, therefore, to arrive at a diagnosis it is necessary to visualize each of these structures, such as the bones, the ligaments, the cartilages, the synovial membrane, fatty tissue, the periarticular bursae, the muscle, etc., and attempt to decide whether injury of any one or several in combination is the cause of the symptoms.

In a short article such as this it is naturally impossible to discuss each and every one of these lesions and I propose, therefore, to confine myself to a few of the commoner ones such as you will be likely to come across in practice. These are (1) Traumatic Synovitis, (2) Intra-articular adhesions, (3) Displacements and fractures of the semilunar cartilages, (4) Sprains and tears of the internal lateral ligament, (5) Stretching and rupture of the crucial ligaments, (6) Injuries to the infrapatellar pad of fat.

In examining your patient I again want to stress the importance of care and method in your investigation and would advise you to set about it in the following way. First. To obtain a clear history of the development of
the condition. As you will see presently the careful interpretation of the history in cases of semilunar cartilage injury often overshadows the physical signs. Secondly always have both knees exposed so that an accurate comparison of the injured with the normal can be made. Thirdly. Never neglect the valuable aid afforded by X-Ray examination of the joint in both anteoposterior and lateral planes. The late Sir Robert Jones stated that he was quite prepared, even with cases with classical symptoms, to find that his diagnosis had proved incorrect by such an examination Fourthly. Don't let the injury, however important it may appear, overshadow your vision. Make a general examination of your patient in order to discover whether there is some constitutional fault which may perpetuate the effects of the injury or some static fault such as flat feet, knock knee, etc., which may pre-dispose to the injury. An omission to make such an investigation has on occasions led me into quite gross errors in diagnosis and treatment, e.g. a patient consulted me some time ago for a swollen knee which he ascribed to an accident to that joint. A superficial examination appeared to suggest an ordinary straightforward traumatic synovitis and he was treated accordingly. After a week or more when the condition did not subside as one expected it to, his genital organs were examined and he was found to be suffering from a chronic gleet. It became quite clear then that it was the gonococcal infection and not the trauma that was the cause of the trouble. Again, some months ago I was attending a nurse at this hospital for a synovitis of the knee which undoubtedly was due to trauma. As it also did not clear up as it should have done, a general investigation was made for some possible source of focal infection. This investigation revealed a tooth with an infective apical granuloma and with its extraction the pain and swelling in the knee soon disappeared. Lastly. Your examination of the joint must be conducted with the utmost gentleness. Apart from the patient's distrust which mishandling may induce, the physiological spasm of the muscles, which always accompanies joint injury, may become so intensified as to disguise the true amount of movement present.

I will now deal briefly with the abovementioned lesions.

(1) Traumatic Synovitis or as it popularly called "water on the knee" is probably the most frequently encountered of all these lesions and can occur occasionally quite independently of damage to any other important structure. It may follow a simple strain, blow or kick on the knee and needless to say is a constant complication of the more serious knee joint injuries. Pathologically the synovial membrane and capsule are slightly damaged by a tear or a bruise and a small amount of blood is effused into the joint cavity. The irritation of this effused blood leads to a hyperaemia of the membrane with out-pouring of synovial fluid and inflammatory lymph. It is the latter which is so liable to become organised and form disabling adhesions. Within a few hours the joint becomes uniformly distended with this fluid and the patella is pushed away from the femur with which it is normally in contact. At this stage the characteristic patellar tap can be elicited. The joint feels warm and painful and sometimes there is an area of tenderness over the site of the bruised synovial membrane. The history of the case will negative the presence of cartilage or ligamentous trouble, and X-Ray examination will exclude bone mischief. Passive movements of the joint, if carefully carried out, will show no marked limitations, and particularly that extension is full. Associated with the synovitis, and as a matter of fact with nearly all affections of the joint, there is a rapidly developing reflex weakness and wasting of the muscles especially of the quadriceps group. This wasting of the muscles is an important feature and one which is frequently neglected in the subsequent treatment. It will be readily appreciated that if these muscles are not restored to their normal strength, the loss of their support will leave the knee permanently weak, and liable to repeated strains, and a tendency to giving way or slipping.

(2) Intra-articular adhesions are a very frequent cause of disability following kneejoint injuries. As already mentioned, it is in these particular types of cases that our failure to recognise the disabling effects of adhesions, render them a prolific source of income to the unqualified practitioner. The latter either through lack of knowledge or fraudulently ascribes the disability to displacement of some imaginary small bone and proceeds by manipulation to replace it. Unfortunately for us he occasionally succeeds by one such single manipulation to break down the adhesions and immediately relieves the patient of a disability which previously long-continued treatment by the legitimate surgeon had failed to cure. It must be obvious in spite of popular
opinion to the contrary that these quacks are not endowed with superior knowledge nor gifted with a manipulative skill that we also are not able to acquire. If then they with their ignorance of the underlying pathological features can cure some of these conditions, there is no reason why we with our superior experience should not be equally if not more successful.

Intra-articular adhesions can often be prevented by suitable treatment but occasionally either as the result of the faulty application of treatment or on account of some severe and complicated injury or infection, which necessarily requires prolonged immobilization, their development is inevitable. Unfortunately their symptoms and signs are by no means clear cut, as they can simulate so many of the other internal derangements, their presence is frequently not recognised.

The following signs strongly suggest the presence of such adhesions:—

(a) Sensation of slipping or giving way of the knee rather than actual locking.

(b) A certain amount of painful limitation of particular movements which may be either flexion, extension, rotation or the final screw home movement, generally movement up to a certain point being free.

(c) Definite localised pain when the adhesion is stretched and possibly tenderness localized to the site of the adhesion.

(d) Recurrent effusions into the joint usually the result of quite minor and inadequate injuries.

It is of course essential to differentiate between adhesions due to infection and those due to trauma, as the treatment for each is totally different. It is due to this inability to make a differential diagnosis that the unqualified bonesetter sometimes comes to grief. The manipulative procedures, which are often so necessary for post-traumatic adhesion, are strongly contra-indicated in the post-arthritis variety as they are liable to reactivate the infective process and may either cause the death of the patient or at the best a loss of the limb.

(3) Displacement and fractures, the semilunar cartilages. Undue mobility, displacement or actual fracture are the lesions which these cartilages may sustain and they affect the internal semilunar about nine times as frequently as the external.

These injuries are most commonly met with in those who engage in athletics and games. They also occur very frequently among those who follow occupations such as underground mining which entail working in a squatting or kneeling position for long periods. Some people seem to be more liable to them than others: for instance, one individual may severely twist the knee and yet no displacement occurs, whilst in another some comparatively trivial action such as a slip whilst dancing or going down stairs suffices to produce a displacement. Such individual predisposition may be accounted for, by the variable attachments of the cartilage.

There are also certain pathological conditions which may predispose to displacement. Thus in cases of longstanding knock-knee, the inner part of the capsule and the internal lateral ligament become stretched and lax, or again when a joint has been subjected to recurrent synovial effusions from any cause similar stretching of the ligaments gradually ensues. In both cases the attachments of the cartilages become loosened and render them unduly liable to displacement. In some cases weakness of the supporting muscles may cause similar instability which may lead to displacement.

The actual mechanism by which the cartilage becomes injured is generally the same in all these cases. The combined flexion and abduction of the knee opens the inner compartment of the joint and the internal cartilage either gets sucked in towards the centre by atmospheric pressure, or in its movement backward during flexion slips under the femoral condyle and gets jammed between the femur and tibia when the knee is suddenly extended. The character of the lesion to the cartilage shows considerable variation and seems to depend to some extent on whether the attachment of the cartilage to the internal lateral ligament remains intact and whether there has been a superadded rotation of the femur on the tibia. The commoner lesions are either simple displacements of the anterior or posterior horns, or more usually, fracture of the cartilage. Various types of fracture have been described, but the ones most frequently met with are either transverse or longitudinal. In the latter type the split in the cartilage separates the inner portion in the form of a loop, from the outer, constituting the well known "bucket handle" variety. Occasionally a fracture of both cartilages in the same knee is met. As a result of these fractures the displaced portion becomes lodged between the condyle and the tibia and prevents extension, thereby giving rise to the
characteristic "locking" of the joint, in which the patient lies helpless, in great pain and is unable to straighten out the leg completely. The sudden stretching to which the joint structures are subjected, leads to a synovitis which is soon followed by an effusion of fluid into the cavity of the joint and results in a swollen knee. These symptoms will differ somewhat in original and recurring displacements but mainly in degree.

The characteristic in both cases being the history of true locking, the acute manifestations will naturally be of lesser intensity in recurring cases and may sometimes even be comparatively painless. In fact, not uncommonly the patient who has had frequent displacements learns to reduce the cartilage himself by some simple knack. In rare instances when displacement of the posterior horn has occurred, extension may be full whereas flexion is limited. I would remind you here that in obtaining your history from the patient do not mistake "locking" for "slipping" of the joint. Many patients will tell you that there was locking when actually there was only a difficulty in straightening the knee. True locking implies a mechanical block and is only convincing when the abrupt unlocking was accompanied by a snap and was associated with both relief and disentanglement. In examining the joint in the quiescent intervals between the attacks of locking, tender spots may often be discovered either at a point midway between the internal lateral ligament and the ligamentum patellae, or over the internal lateral ligament at the site of its attachment to the cartilage. A joint that habitually clicks or snaps on flexion or extension is the seat of a lesion of the external cartilage.

(4) Sprains and tears of the lateral ligaments. Of the two ligaments the internal is far more frequently damaged than the external and I will therefore confine my remarks to it. This ligament is either damaged by the same abnormal rotatory movement which displaces the semilunar cartilage, or more commonly at football by another player falling against the outer side of the patient's thigh or leg while the foot is fixed firmly on the ground. The gravity of the lesion depends largely on the violence of the force and varies from a mere stretching of the ligamentous fibres to a complete rupture of the ligament. In some cases instead of the ligament itself tearing, it becomes torn off at its femoral or tibial attachments and detaches a small sliver of bone, giving rise to what is known as a sprain fracture. The upper end of this ligament is damaged seven times as commonly as the lower.

The Symptoms. At the moment of occurrence, severe pain is felt on the inner aspect of the joint but there is no locking unless there is an associated displacement of the internal semilunar cartilage. The pain is followed by a boggy swelling, due to extravasated blood over the site of the ligament and later by a generalized synovial effusion into the joint. The latter may not occur until the following day.

There is also a distinct limitation of movement, but this is entirely due to reflex muscular spasm and not to any mechanical block. On examination tenderness is found to be present over one or other of the attachments of the ligament, but not in the joint line and distinguishes it from a lesion of the semilunar cartilage. The pain is made worse by passive abduction of the knee (i.e. valgoid strain) and if there is a complete tear of the ligament, there may be hypermobility in this direction. Recurrences are frequent, particularly when the original injury has not received adequate treatment. In such cases, a minor twist or turn is sufficient to cause a sudden giving way of the joint.

(5) Stretching and rupture of the crucial ligaments. The crucial ligaments are injured much less frequently than the lateral ligaments, and the anterior crucial is the one more commonly affected. The anterior crucial ligament, you will remember, is rendered taut by hyperextension of the knee and by forced internal rotation of the femur on the tibia during flexion. Any exaggeration of either of these movements, will therefore tend to stretch or tear the ligament. The latter of these movements also injures the internal semilunar cartilage and the internal lateral ligament at the same time. Sometimes, instead of the crucial ligament giving way, the spine of the tibia, to which it is attached, becomes avulsed. In such a case extension of the joint may be prevented by the impingement of the bone fragment on the infra-patellar pad of fat.

It will be observed that the injury which causes damage to the anterior crucial ligament is generally a very severe one. The characteristic signs of injury to this ligament, apart from the associated synovial effusion and other features of severe joint trouble, are
hyperextension of the leg, with abnormal antero-posterior mobility and abnormal power of rotation either of the femur inwards or the tibia outwards. I would remind you not to be misled by minor degrees of hyperextension because this is often a normal feature in an otherwise normal individual.

The posterior cruciate ligament is injured by violent flexion of the knee combined with displacement of the tibia backwards. It rarely occurs alone. Its characteristic sign is undue mobility of the tibia backwards when the knee is bent.

(6) Injury to the infra-patellar pad of fat.

This injury is far more common than is usually thought. Personally I think it is one of the commonest of knee joint injuries and the only reason why it is not more frequently diagnosed is because its very definite signs and symptoms are not properly appreciated.

This pad of fat, as you will remember, is wedge-shaped, and is placed below the patella and behind the patellar ligament, being covered on its posterior aspect by synovial membrane.

It frequently becomes enlarged in stout middle-aged people and is then, owing to its bulk, very liable to be nipped between the bones during sudden extension of the knee. This liability to become nipped will be particularly great when there is associated wasting of the quadriceps. Some of the fibres of the vastus medialis are inserted into the pad and their function is to withdraw the pad from between the bones during extension; it follows, therefore, that this function will be inefficient when the muscle is weak. As a result of such nipping, haemorrhage occurs into the pad; this is followed by further thickening and hypertrophy and still greater tendency to injury.

Sometimes this pad of fat is injured in younger people by the screw home movement of the femur at the end of extension and may therefore, be damaged by a similar injury to that which produces displacement of the semilunar cartilage. The symptoms are discomfort and pain in the knee, with recurrent attacks of synovial effusion. There is also a complaint of weakness and unreliability of the joint and a sensation of "giving way" but true locking is absent. On examination the enlarged pad will be indicated by a bulging or swelling on either side of the ligamentum patellae, with tenderness over these projections. The most characteristic sign, however, is pain at the same site on full extension of the knee.

These then are briefly, the common traumatic affections of the knee-joint. I shall deal with their treatment on some subsequent occasion.

In the field of observation the chance comes only to the prepared mind.—Pasteur.