Internal Derangements of the Knee Joint.

By Dr. Scott Lang

This title has been selected because it is comprehensive enough to include all the derangements to be referred to in this paper. "Heys' Internal Derangement of the Knee Joint" is the title commonly used and is only avoided because it is apt to mislead and to give the impression that there is only one particular form of internal derangement of the knee joint, whereas Heys himself used it in an indefinite and comprehensive sense.

Internal Derangements of the Knee Joint may be divided into several well marked varieties having different features both as regards their clinical aspect and their pathological anatomy.

Dislocations of the patella and loose bodies in the joint will not be here.
discussed, and the cases to be considered may at once be designated as luxations and subluxations of the semilunar fibro-cartilages of the knee joint.

The first allusion to these derangements is generally credited to Wm. Hey of Leeds and a somewhat lengthy reference is made to them from a clinical point of view in his "Practical Observations on Surgery" (1810) page 332. (3rd ed.)

This is followed up by Smith of Leeds who makes further reference to them and to Hey's writings in a clinical lecture published in the Lancet Sept. 16. 1831. -

Reference is also made to them by Vincent "Observations on Surgical Practice" (1847) page 75.
But these works, as well as the more modern and standard works on surgery, make no attempt to state the exact nature of the lesion or the various forms of lesion which may occur, and their differential diagnosis.

Consequently, their treatment in a rational manner has not been taught, and a field has been left for the notorious "bone-setter" to set himself in, which he has doubtless done with more or less success, at least from a pecuniary point of view.

These luxations may be classified as follows. They may be of the internal or of the external semilunar cartilage, and they may be complete or incomplete. This method gives us four
distinct varieties, and although, no doubt, obscure and complicated cases may arise, such are quite exceptional, and the writer has been unable to find any record of a case in which there was simultaneous luxation of both cartilages. — By complete luxation is meant a total escape of the semilunar fibro-cartilage from under its respective femoral condyle — the articulating part of the femoral condyle, so to speak, recedes altogether from the socket formed for it by the cartilage.

The clinical cases which the writer has had an opportunity of studying and watching have, — with one important exception, — been connected with the internal
cartilage, and this is quite in accordance with the usual statement found in writings on the subject—viz. "that the internal cartilage is nearly always the one affected." In fact, Vincent, in his work, alluded to above, states that in all the cases he had seen, the internal cartilage was the one affected.

Sir A. Cooper also states (Surgical Dictionary) "It is almost invariably the internal cartilage which is affected." It cannot be doubted, however, that there are cases in which the external cartilage alone is affected, although no reliable figures are obtainable regarding the relatively greater frequency of cases where the internal cartilage is the one concerned."
The internal cartilage will be first considered. Complete luxation of this cartilage would appear from its greater size to be almost an impossibility, without at the same time involving a serious rupture of the internal lateral ligament of the knee joint, and possibly also a dislocation of bone. The writer has been unable to find any clinical or pathological account of such an occurrence, but there is a doubtful case described by Sir W. Fergusson in his "Practical Surgery" 5th ed., page 323. It was observed in the dissecting room, and is described in the following words:

"One of these cartilages had been torn from its connexion with the tibia..."
"throughout its whole length
with the exception of its
extremities, so that, during
flexion and extension, it
must have occasionally
slipped behind the
articular surfaces."

Unfortunately, Sir W. Jervisson
does not state whether it was
the internal or the external
cartilage which was thus
affected, but it was
most probably the external
one. For the pathological
account here given corresponds
in a remarkable manner
with some clinical cases to
be afterwards alluded to.
Partial luxation of Internal Cartilage.

Of all these Internal Dislocations of the Knee Joint, this is the most common form, and the reason why it is the lesion most frequently met with will be afterwards considered. It is the lesion which has occurred to the writer in his own person, and several other well marked cases have come under his observation.

Most of these other cases occurred in students of medicine new practitioners, who could be thoroughly relied on for an accurate account of their cases. The lesion occurs at the anterior part of the cartilage, and the diagnosis of the condition is generally easy. There is a history
of violence. The violence, however, may be slight - an exact history of the nature of the violence and the direction in which it was applied will not be often obtainable. It may occur from prolonged kneeling and suddenly attempting to straighten the limb, or it may occur by striking the foot against a stone, when the toe is turned outwards.

The limb must always be more or less flexed. It cannot possibly occur when the limb is extended and rigid.

Symptoms:

The knee is kept in a semiflexed position, and there is inability to completely extend it. There will probably be pain on pressure over the superior margin of the inner tuberosity of the tibia, especially if improper attempts
have been made to extend the limb forcibly — On attempting to extend the limb, an irregular prominence will be felt to appear between the internal condyle and the head of the tibia, about one inch and a half internal to the inner border of the ligamentum patellae; attempts to extend the limb cause severe pain at this spot, and a painful sensation as if something were being jammed between the opposing bony surfaces. It feels as if a sort of wedge were being but under the internal condyle as it attempts to roll forward on the tibia in extension — the joint is not interfered with — The rounded margin of the semi-lunar cartilage can be felt to project unduly on the
inner aspect of the joint.

(even in a perfectly sound knee, the rounded margin of the internal semilunar cartilage can be felt on the head of the tibia, and it can be distinctly felt to recede when the knee is flexed, and to come forward in extension—on the anterior internal aspect of the joint).

Although the authors already ventured to make no attempt to differentiate these internal derangements of the knee joint, they had evidently met with cases similar to the one above described. For they write, op. cit., page 332 of vol. "The patient himself cannot freely bend. He cannot perfectly extend the limb in walking," and Smith in Lancet Sept. 20, 1851, writes still more pointedly, "In consequence of some slight fall, slip or strain, the mechanism
"of the Knee joint becomes so far deranged that the full extension of the limb is rendered impossible."

Sir A. Cooper also writes (Surgical Dictionary) "The patient becomes incapable of perfectly extending the leg. There may be no pain at the instant the accident occurs so long as no attempt is made at complete extension."

He refers to luxations of both the internal and external cartilages, and had met with cases of each variety, but the two latter quotations evidently point to a luxation of the anterior part of the internal semilunar cartilage.

In Lancet 1855 vol. 1 page 448 Mr. Syme describes a case and confirms Mr. Syme's observations but he does not say whether the internal or external cartilage was the one
affected. Again in Lancet 1856, vol. 1, page 11, Mr. W. J. White describes a case which was evidently a subluxation of the internal semilunar cartilage for it corresponds closely with the description of a typical case already given—both as to causation and symptoms.

It is unnecessary therefore to multiply clinical cases, which all closely resemble each other when the "arrangement" is of that particular variety now under consideration.
It has been stated that this Partial Luxation of the Internal Semilunar Cartilage is the most common form of Internal Displacement of the Knee Joint, and it has also been stated incidentally that the lesion occurs at the anterior part of the cartilage. The explanation of these two circumstances is to be found in the anatomy and mechanism of the parts involved, and it will be convenient to consider both the Semilunar cartilages at the same time.

In descriptions of the Anatomy of the Knee Joint, it will sometimes be found here stated that the Semilunar cartilages are fixed on the top of the tibia, but we find in Goodson "Anatomical Memoirs" Vol II p. 227, "The external Semilunar..."
"cartilage must be viewed as an appendage to the external condyle of the femur, with which it moves backwards in flexion forwards in extension . . . . . The internal semilunar fibro-cartilage again must be regarded as an appendage to the internal condyle of the tibia . . . It resembles a curved yielding, but elastic railway on the upper surface of the inner condyle of the tibia, along which the corresponding condyle of the femur rolls backwards and forwards."

Both the cartilages are, however, fixed firmly to the tibia by their coronal and might be regarded as altering their shapes and positions to receive the condyles of the femur somewhat in the manner in which an ellipse is formed by fixing a piece of cord or an elastic band sag at the points 2 and 6, leaving it slack enough
to form the figure X.

It may however, although still fixed by its cornua, alter its position to describe the figure y or the figure z.

Regarding above as the left internal semilunar cartilage, the figure z is formed when the knee is flexed - the figure y when the joint is extended. The nearer the points of attachment, the greater will be the range of movement. And Goodair states p 327 that the movements of the external cartilage are facilitated by its "circular form and the approximation
of its horns."

The corina of the Internal cartilage are more widely separated, and its range of movement consequently less.

Both the semilunar cartilages are maintained in position by the coronary ligaments, and these ligaments are more or less elastic and also slack to allow greater range of movement. The capsular ligament itself follows these movements to some extent, for the coronary ligaments are neither very long nor very elastic, and the most superficial examination of the knee joint, in life, shows us that the anterior portion of the capsular ligament falls back in flexion and comes forward in extension of the joint, following the movement of the rim of the semilunar cartilage. The coronary ligament of the external cartilage
has a break in it where it is pierced by the tendon of the publians muscle. This is a weak spot, and probably accounts for the predisposition to luxation of the external semilunar cartilage to be afterwards described.

When the knee is flexed, the surfaces of the femoral condyles in contact with the tibia are portions of arcs of smaller circles than the anterior portions of the condyles which are in contact with the tibia in extension. In extension then the larger bony arcs more completely fill up and fit into the pockets formed by the semilunar cartilages, and so increase the strength and rigidity of the limb.

Both the cornua of the external fibro-cartilage are firmly fixed into the head of the tibia.
and the posterior corner also sends an extra slip of attachment to the posterior cruciate ligament. The internal fibro-cartilage has also two horns firmly fixed into the head of the tibia, but its anterior horn is very variable. It is sometimes found that a considerable portion of the substance of the anterior part of the Internal Cartilage is directly continuous with the Transverse Ligament, and that the portion of it fixed into the tibia is small, thus

![Diagram]

Left Internal cartilage.

Works on descriptive anatomy state that the transverse ligament is very variable in size and strength (Gray, Heath), and in proportion as it may vary in
size and strength, 20 will the anterior corn of the Internal Semicircular cartilage vary inversely.

The outer end of the transverse ligament has only a weak and ill-defined attachment to the capsule of the joint and covers the ligament of the opposite side.

The so-called alar ligaments are much more important than might be supposed from the usual anatomical descriptions.

They are, as is usually stated, in the position of fringes to the ligamentum mucosum, but in many cases, they will be found to be distinctly hard and cartilaginous, and, although variable in size and consistency, they will always be found to be introduced between the femoral condyles and the anterior portion of the semi-

lunar fibro cartilages in complete
extension of the joint in a sound knee. This can be readily seen upon opening the joint by cutting along the inferior margin of the patella, throwing forward the capsular ligament, and noting the positions assumed by the alar ligaments when the joint is flexed and extended. It can also be more completely demonstrated by making an oblique vertical section through the internal condyle when the joint is completely extended. The appearance then presented is roughly shown by following diagram.

Two opened knee joints are submitted herewith—one of which shows both the alar
pads well marked, but the internal one is the larger—

The other preparation shows the internal semilunar cartilage somewhat deficient at its anterior part, and this deficiency is evidently compensated for by a large cartilage pad—

The word “pad” is here used as that would seem more correctly to indicate the function of these structures.

The internal also had so larger than the external (the latter being frequently absent) and, in complete extension, the joint, is found to be introduced to the extent of about half an inch between the internal condyle of the femur and the corresponding portion of the internal semilunar cartilage.

This is a point in the mechanism which seems to have
escaped observation, and, although apparently trivial, it must add considerably to the complexity and delicacy of the movements necessary to completely extend the limb.

This variability of the size and strength of the transverse ligament, the alar pads, and even the internal fibro-cartilage itself will probably account for the fact that a luxation or subluxation at this point is more readily produced in some knees than in others, for it cannot be doubted that although a small amount of violence may produce a permanently recurring subluxation in one knee, the same violence in nature and amount might have no marked effect on another knee. In short, that natural variations regulate predisposition.
and such variations must always interfere with the absolute exactness of surgery.

From the researches made by himself and some German anatomists into the mechanism of the Knee Joint, Goodier concluded that its movements were like those of a "double-threaded conical screw"—the spine of the tibia R. being the cone (the tap) and the lower end of the femur being the hollow receiver (comparable to a candle-stripper but much shallower or flatter) the nut or die. The great rigidity of the limb in complete extension is attained by the conical tap being screwed home into the receiver or nut with a simultaneous tightening of all the ligaments.
In completing extension, the left tibia performs the movement of a right-hand screw, and the right tibia that of a lefthanded screw. In order to initiate flexion, the opposite rotary movement is necessary in each case.

But, supposing the leg and foot to be held fixed, then, in order to complete extension, a rotary movement of the femur inward will be observed to take place and this rotary movement takes place, in the words of the late Professor Jodrak

"...round the oblique curvature of the posterior third of the internal femoral condyle."

The passage is as follows:

Anatomical Memoirs Vol. II pp. 221-2

"...in the first third of flexion and in the latter third of extension, the movements of the femur and tibia take place round the
"Oblique curvature or anterior third of the internal femoral condyle, and involve, in addition to the completion of extension and commencement of flexion, a movement of rotation of the tibia and consequently of the leg and foot inwards in flexion and outwards in extension. These remarkable movements of rotation inwards and outwards inseparable from the commencement of flexion and the completion of extension take place round the axis of an ideal cone, which axis is directed at an angle of 45° downwards, outwards and backwards in front of the shin of the tibia — the oblique axis of the knee joint.

Besides the anatomical points already referred to, there will be noticed at the anterior extremity of the external femoral
condyle a flattening or depression frequently very distinct which receives the external cartilaginous surface of the spine of the tibia and the external condyle of the femur partly slides inwards partly rotates as on a pivot while the internal condyle is passing through the movement of rotation upon an oblique axis inseparable from complete extension of the joint. This movement is well seen by sawing into the intercondyloid fossa from above the external condyle, and after having removed the rest of the femur observing the movements of the external condyle on completing extension while the leg and foot are held fixed.

The unlocking (rotation inwards of the tibia) which is necessary to initiate flexion is arranged for by the peculiar mode of insertion of the semi-tendinosus
gracilis and popliteus muscles, as pointed out by Goodair and other anatomists. It seems probable that the popliteus muscle may act on the external condyle of the femur in a similar manner to produce this unlocking and initiate flexion in the event of the tibia being held fixed - for the tendon of the popliteus is tense and ready for action only when the joint is fully extended, and thus is in a position to unlock the joint by pulling upon the external condyle and rotating the femur outwards.

Goodair further points out that a movement the reverse of this rotation takes place towards the completion of flexion in which the hip and foot rotate inwards and further off cit p 242. "The movements round the anterior combination are more extensive and important than those round
the posterior and, in the ordinary "use of the joint are alone employed."

A remarkable clue is here furnished to explain the great liability of the Knee Joint to this particular derangement — of which the most prominent clinical feature is that there is "inability to completely extend the limb" — and the surgeons who first pointed this out wrote before the researches of Goodair were published, and probably without any knowledge of the delicate and complicated mechanism involved in the movement of complete extension.

It was about the year 1855 that Goodair first made public an account of his investigations by which he shewed that in completing extension, the tibia performed a movement of rotating round an oblique axis, and
was "screwed home" into the femur which receives it as a nut or she receives a conical tap.

Besides the well-known oblique portion at the anterior part of the Internal Condyle of the femur, the other structures concerned in completing extension in relation to it are, the anterior part of the Intercondylar Spine of the tibia — the anterior attachment of the anterior cruciate ligament — the internal alas pad — and the anterior portion of the Internal Semilunar Cartilage held in its place by the tibian ligament and transverse ligament when present.

Here then, merely from a consideration of the anatomy, the mechanism, and the "ordinary use of the joint," explanation is furnished as to why "Internal Derangement" occurs most frequently in connection with the internal
cartilage and also why it occurs at its anterior end. –

Before proceeding to investigate the immediate cause and exact pathology of these deformities, exception must be taken to the statement in a popular work upon Surgery which says, in endeavouring to account for them, that the attachments of the "semilunar cartilages must have been previously stretched by inflammation of the joint, and their own substance enlarged so as to increase their prominence." (Ibid.) This statement is mere conjecture, quite unsupported by evidence and numerous cases go to disprove it. There is no reason why the accident should not take place in a perfectly healthy joint, but the natural variations met with
in the ligaments &c, already alluded to, will increase or lessen the liability to the disorder.

In most of the works already quoted, it will be found stated that Internal Derangement of the Knee Joint "occurs when the foot is everted," but this is quite incorrect. It ought to be that Luxation or Subluxation of the Internal Semilunar Cartilage may occur when the leg is rotated outwards.

When Luxations of the External fibro-cartilage come under consideration it will be found that they occur only when the leg is rotated inwards.

The proof of these statements is very strong, in fact complete, and it hence becomes of the greatest importance to distinguish between derangements of the Internal and those of the External cartilage.
when considering either their
Causes, treatment or prevention.
The erroneous statement
above quoted has doubtless
arisen (1) because derangements of
the internal cartilage are by far
the most common, and (2) by
using the expression "everted"
instead of "rotated outwardly".

Of course, before any rotation
can occur, the knee must
be somewhat flexed.

The rotation here referred to
is a rotation of the tibia upon
a prolongation of its own axis and
must be carefully distinguished
from the rotation upon an oblique
axis which takes place when
the joint is "screwed home".

Rotation outward is
performed chiefly by the biceps
muscle — consequently, when this
movement is taking, or has
taken place, the superior surface
of the tibia will be found to
be held closely opposed to the external condyle of the femur, and the external semilunar cartilage is thus held firmly in its place between the two bones. But the gap between the internal condyle and the head of the tibia will be found to be increased, and the internal semilunar cartilage is movable and, consequently, is apt to slip too far in between the internal condyle and the corresponding portion of the head of the tibia.

The opposite state of affairs results when the tibia is rotated inwards. For, then, the internal semilunar cartilage is held firmly between its respective condyle and the head of the tibia, the parts holding it being the muscles used to rotate inwards, viz., the Semitendinosus, gracilis, sartorius and also the anterior crucial ligament which is then tense.
This must be distinguished from the rotation on the reousms "inseparable from complete extension of the limb." The latter is effected by the quadriceps extensor chiefly through the "gastrocnemial expansion" of fascia connected chiefly with fibres of the muscle externus. See Pound of cit also Williams "Journal of Anatomy and Physiology" Vol XII, page 181.
whilst the gap between the external femoral condyle and the head of the tibia is increased in extent.

When the knee is flexed, the anterior part of the semilunar cartilage glides backwards on the head of the tibia; if the leg be then rotated outwards, the internal semilunar cartilage will be drawn in between the internal condyle and the head of the tibia — a sudden movement of extension will then cause the internal condyle of the femur to roll on to too much of the cartilage — the alar pad will then fail to fit into its place, and complete extension will be impossible. Mr. Knott in Dublin Medical Journal 1882 states that there is then spasmodic action of the quadriceps extensor femoris; but whether this be the case or not, the rotation outwards
of the tibia " inseparable from complete extension " (Goudain) then comes into play. In this movement, the inner tuberosity of the tibia must make a sweeping motion forward and outwards. Thus, the semilunar cartilage at the point A will be held by the femoral condyle, and as the bone say at the point B makes its curve forward and outwards, the coronary ligament between these two points will be stretched, or it may be, torn and this is doubtless what occurs in aggravated cases, or in cases where the luxation has recurred frequently and it is well known
Rough diagram of head of tibia, to illustrate how the inner tuberosity will move when the rotation outward takes place, associated with complete extension of the leg.
that; and this, as well as all the other forms of internal disarrangement of the knee joint, is very apt to recur, after it has once taken place.

In the mildest forms, there may be only a stretching and relaxed condition of the coronary ligaments at the points indicated, and a failure of the alar pad to sit into its place, and hence inability to completely extend the limb; but there is always the risk that sudden extension of the joint with the foot in a faulty position may result in destruction of the coronary ligament.

Prolonged flexion of the knee joint, as in kneeling, strains the anterior part of the coronary ligaments, and hence the disorder may also be produced in this manner.

In "The Lancet" of Sept 16, 1857, Mr. Smith records the case of a fall
who suffered this luxation from a dancing master, roughly turning her toes outwards.

After many attempts to produce this luxation on the cadaver, the writer has hardly met with any success, probably owing to the lax condition of parts, but it is on record that Bonnet succeeded in producing it on the dead body. But apart from evidence of this nature, the clinical evidence confirms completely the importance of the anatomical points to which attention has here been called, and which anyone can verify in his own person, by examining the gaps between the tuberosities of the tibia and the femoral condyles when the leg is rotated respectively inwards and outwards.

It is unnecessary to multiply clinical cases, for the writer knows that in his own person,
the luxation can be produced only when the toe is turned outwards - and on 11 Dec. 1875, a student who is subject to this form of internal derangement, and whose case is still under observation, informed us that he found much benefit from the simple advice to keep the toe turned inwards. "The joint was much firmer, felt safer and not so liable to go out."

On the other hand, M. S. now a general practitioner, writes in answer to the question "Does it feel as safer or stronger when the toe is pointed inwards or outwards?"

"The toe is pointed outwards. When the toe is pointed inwards, I always feel as if the accident was going to happen. But this latter is a case of subluxation..."
of the external cartilage and will be afterwards cited in detail.

The chief clinical features of this variety of internal dislocation are thus accounted for. The slight projection at the antero-internal part of the joint is the outer pad pushed forward along with part of the infrapatellar pad. The undue projection of the semilunar cartilage over the inner tubercle of the tibia results from its failing to assume its proper oval shape which is requisite in complete extension of the joint. Its anterior part has fallen backwards on the head of the tibia, and its inner part consequently projects inwards.

The inability to completely extend the limb is amply accounted for by a consideration of the anatomy.
and mechanism of the parts concerned in complete tension.

Treatment.

After this accident occurs, there is generally some synovitis and effusion into the joint. This is doubtless nature's method of attempting to cure, viz. by distending the joint and so allowing the displaced parts a chance of falling into their places, and at the same time enforcing rest.

The value of the treatment recommended by the writers quoted is considerably lessened from the fact that they did not distinguish between luxations of the internal and those of the external cartilage, and the importance of making this distinction has already been conclusively shown.

Most of the authors recommend that the knee be flexed, and then
suddenly and forcibly extended. Should this fail, the Knee has to be shaken about in all directions in a haphazard manner and sometimes the cartilage will then resume its normal position.

Vincent, however [Observations on Surgical Practice] p. 75, deprecates the use of force, and it will be remembered that he referred only to luxations of internal cartilage and, therefore, his evidence bears on the point now under consideration.

Seeing, however, that the exact pathology of the condition was not made out, little attempt could be made to explain the rationale of any of the various methods of treatment, some of which had occasionally proved successful.

In order to reduce this special form of internal Disarrangement, force ought not to be necessary - for as the luxation may be caused
By a very slight amount of violence, it ought to be reducible without the application of any great force. With the symptoms formerly detailed, the treatment ought to be, to flex the knee fully—keep it flexed for a little time, then rotate the leg firmly inward and extend somewhat suddenly while maintaining rotation inward, at the same time pressing the rim of the cartilage inward with the thumb should it protrude, (as it generally does) over the inner tuberosity of the tibia.

Flexion removes the anterior portion of the head of the tibia from the femur and so releases any portion of the cartilage which may have been jammed between the two bones.

"In extreme extension, it is the anterior portion of the tibia which is in contact with the femur—m.
the semiflexed position its middle, and complete flexion its posterior edge.

[stamping on the skeleton]

Flexion will also straighten out the \underline{clavicle} should they be displaced or doubled upon themselves.

Rotation of the leg inward is most important as it brings the inner condyle of the femur more closely in apposition with its corresponding particular surface of the tibia as already explained. Then, by extending the knee while maintaining rotation inward, the internal condyle is kept moving truly in its socket and does not ride upon too much of the semilunar cartilage.

Hey states in a general manner that the disorder may arise from "anything which prevents a condyle of the femur from moving truly in the socket formed for it by the semilunar cartilage" and although that is nearly all he says regarding the pathology, it
accords, as far as it goes, with the theory here professed. The rotation inward makes tense the external (anterior) crucial ligament and Goodwin states of cit that this ligament "guides rotation of the tibia inwards" in order to bring about complete extension. Hence by keeping this ligament tense, the rotary movement necessary in order to completely extend the joint may be brought about. This same point is referred to by Morris "Anatomy of the Joints" p 371. where he says "rotation is limited by external crucial ligament."

Further references to treatment in general will be made after other forms of Internal Dislocation have been described.
The External Semilunar Fibro-Cartilage.

The anatomical and physiological peculiarities of this body have already been referred to, viz. its smaller size and more nearly circular form, also its greater range of movement, and - keeping these facts in mind, as well as the ordinary use of the joint - we can readily understand how its complete luxation is possible, and also why its partial or incomplete luxation is more rare than that of the Internal Cartilage - luxation of this cartilage may be complete or incomplete.

Complete luxation.

Several cases of this variety of Internal Disarrangement of the Knee joint are on record, and a drawing of a dissected specimen shown by Mr. Godlee in Transactions of the Pathological
Society of London vol XXXII.

may be seen—In the words of Mr. Godlee

"The circumference of the fibrocartilage has been torn away from its attachment to the capsule of the joint, and it occupies a vertical position in the intercondylar fossa."

This case appears to be quite unique, and nothing short of opening the joint would have sufficed to completely diagnose or treat the condition. There is no clinical history of the case, but it is conceivable that, by opening the joint and completely flexing the knee, it might have been possible to replace the cartilage between its proper bony surfaces and to fasten it there. This case might be designated one of complete and persistent luxation of the external fibrocartilage. But several
other cases are on record where such luxation was apparently complete although not persistent.

The cartilage slipped from its place only when the knee was flexed, returning into its place when the joint was extended.

Of such nature was the case reported by Mr. Clement Lucas (British Medical Journal Nov. 15, 1879) It is described in the following words:

"On flexing the knee, the leg and foot jerked inwards with a sudden shock, and at the same time, a projection appeared on the outer side of the patella which could be seen and felt. On extension, the leg and foot jerked suddenly outwards and the semilunar cartilage went back into its place.

Other cases corresponding exactly with this are referred to by Mr. J. P. Knott in the Dublin Medical
Journal 1867. One is that of M. le Fort, the eminent French surgeon, whose symptoms were exactly similar to those detailed above, and, in whose case, the lesion subsequently appeared on almost every occasion when the knee was forcibly flexed.

The case recorded by Mr. Clement Lucas was cured by rest and retention in a plaster of Paris case, so that it could not have been a pedunculated tumour attached to the synovial membrane.

These pedunculated tumours, although rare, give rise to symptoms closely resembling luxations or subluxations of the semilunar cartilages but are only mentioned here incidentally.

The movements so carefully detailed by Mr. Clement Lucas deserve attention, as they seem to be explained by the mechanism.
involved in completing flexion.

As already indicated, in order to complete extension of the knee joint, a rotation of the leg and foot outwards takes place; the surfaces chiefly implicated being the head of the tibia, also pads on and the peculiar oblique surface on the anterior portion of the internal condyle of the femur as already fully detailed.

Similarly, in completing flexion, a rotational movement in the opposite direction takes place; the leg and foot rotate inwards and the portion of the femur chiefly implicated is an oblique portion at the posterior extremity of the external condyle (Good sir).

Here then this rotation takes place, for in flexion, the rotational movement of Good sir will carry the external terebrum of the tibia forwards and inwards in a curve, carrying with it the
external semilunar cartilage, and this cartilage is the more readily able to escape from under the external condyle of the femur, because the coronary ligament, which assists in maintaining the cartilage in position, is broken and weakened by the passage through it of the tendon of the popliteus muscle.

This break in the coronary ligament exists at the point where its fibers are brought into connection with the posteriorexternal part.

Treatment:

Seeing that this location occurs only when the knee is completely flexed, the best treatment will be to avoid this movement, or the joint may be put under plaster of Paris as was done by Mr. Lucas in order to give the coronary ligament a chance of healing.
Incomplete Luxation of External Cartilage.

In this form of disarrangement, the symptoms are more obscure than they are when luxation occurs to the Internal Cartilage, for the external cartilage does not approach so near the surface, and, consequently, less can be made out by palpation.

Without having discussed the nature of any of the varieties of Internal Disarrangement of the Knee Joint, and, although he did not distinguish between luxations of the internal and those of the external cartilage, he, in his work already quoted, alludes to a case which was evidently of the nature indicated in this heading. It occurred in 1783 to a gentleman, as he was "turning himself in bed," it was evidently the external cartilage which was affected, for
...Hey states "that there was some pain at the insertion of the tendon of the biceps femoris into the head of the "fibula." A sudden and accidental cure took place as the patient was standing or moving about and talking to her.

In Cooper's Surgical Dictionary the case is recorded as having been treated at the London Hospital. It was diagnosed "as a dislocation of external semilunar cartilage and all efforts to reduce it were ineffectual, and the patient left hospital in a month "unable to bring the heel to the ground or to extend the knee beyond a certain point."

Sir W. Thomsen, Practical Surgery 5th ed. p. 373 records a case of a gentleman about 40 years of age who from an accident which had happened to him twenty
Years previously, "Sprain of Knee," suffered dislocation of external semilunar cartilage. Like Mr. Boy's case, it went in at first suddenly and accidentally (or accidentally if the term may be allowed) after having caused lameness for a considerable time, but afterwards, it frequently suffered displacement.

"The limb, during the displacement could never be fully straightened until, by pointing the toes outward "as much as possible, and then lifting the foot forward—which the patient usually did with the "other foot behind the Dorsal Achilles, a sudden slip at the knee was "felt, when all was at once "right again," he adds.

"I have seen two other instances "within the last 12 mos., where there was every reason to suspect "such displacement of a semilunar "cartilage, and in both of them, "
There appears every likelihood of permanent lameness. —

A case of this description has been under the notice of the writer for some years.

It occurred in the person of a fellow student, now a graduate in medicine and surgery, and the following is the history of the case.

Mr. L—aged 19, was playing football. He was just in the act of "dropping" when he was charged over. He could not say exactly how the violence was applied to his knee, but when it was applied, the knee was demiflexed. The pain at the time of the accident, was very severe, localized, and almost exactly over the biceps tendon and external semilunar cartilage. He could not completely flex nor extend the limb. There was no effusion, and in three days he was
allowed to get out of bed.

"A fortnight later, he started
playing football again—and
from this it may be concluded
that there could have been no
serious rupture of ligaments, for
healing of such could not
have taken place in a fortnight.

The rest of the case may be
given in the patient's own words:

"After playing for a time, I slipped
and fell—the pain on this
second occasion was very severe.
As I rolled on the grass for
about 10 minutes—the limb, at
this time was fixed in the
'demiflexed position—After some
hours there was a great deal of
'swelling in the joint. I was
in bed for a fortnight and lame
for about 3 more. After this
accident—On three subsequent
occasions, and at intervals of
about 6 mos from each, the
'same accident happened—the
pain on each occasion being severe, and followed by synovitis with copious effusion. It has also happened while I was in bed and I have since done it while sitting at table. The pain is now nothing to speak of, but always distinctly localised on the external aspect of the joint, exactly opposite the external semilunar cartilage. I think I could always displace it by crossing my left leg (the injured one) over the right. I have never succeeded in replacing what has gone wrong. No abnormal projection was ever seen or felt.

This is the case to which brief allusion has already been made in order to bring out the fact, as stated by the patient, that the limb is "far safer and stronger when the toe is pointed outwards."
From these cases, it will be seen that reliance has to be placed mainly upon subjective symptoms in order to diagnose this condition.

Another case recently came under the observation of the writer where there was reason to suspect this variety of derangement.

The patient was seated on a low chair with the right leg considerably flexed, thrown under the chair and resting upon the outer edge of the foot, that is, flexed and rotated inwards.

On attempting to extend the limb, it was found that the knee joint was fixed, and there was great pain. The disorder was at once reduced by flexing the limb still further and rotating the leg outwards and then extending the joint.

In discussing the mechanism involved in this location or displacement.
three different movements require to be kept in view. 1st there is the rotation of the tibia inward described by Goodair as inseparable from complete flexion of the joint. This however, will not explain the condition, for after the accident has happened, there is not only inability to flex the joint completely, but there is also inability to extend it—the joint is more or less completely locked. In the publication at anterior part of internal semilunar cartilage already described, there is only inability to completely extend the limb as asserted by Smith, Sir A. Cooper & and verified by the writer in his own person—

2nd there is a sort of pendulum movement without any rotation which may take place between the tibia and femur when the ligaments are relaxed in flexion.
3° There is the movement of rotation of which the tibia is capable in flexion around a prolongation of its own axis. This rotation may extend through about 36° in the horizontal plane of the joint and to it must be referred the dislocation now under consideration.

In experimenting on the cadaver, this is the displacement (subluxation) which can be produced with greater ease and certainty than any other. The knee requires to be well flexed (it will then be found that the external femoral condyle almost entirely leaves the external semilunar cartilage) the foot is then rotated simply forwards and the leg gently extended while maintaining rotation inwards—a little pressure on the outer rim of the external
*The fact must be directed to some extent in order to show this.*
semilunar cartilage may be required to assist, but the external condyle of the femur can be readily made to ride upon the posterior external part of the rim of the external semilunar cartilage, and the 'locking of the joint' more or less completely effected even on the dead body. Of course, in the living, the so-called locking is more complete by reason of the great pains when attempting to move the joint.

When the leg is rotated inwards, the crucial ligaments are rendered tense, and it must be borne in mind that the posterior corner of the external semilunar cartilage has an attachment to the posterior crucial ligament. This posterior attachment is then rendered tense when the leg is rotated inwards and tends to draw the semilunar
cartilage more under the external condyle, and it will be remembered that, during this rotation of the leg inwards, the gap between the external femoral condyle and the head of the tibia is increased, and the external cartilage more movable.

In aggravated cases of this lesion, the coronary ligament will probably be torn where it is pierced by the tendon of the popliteus muscle, and thus there might be produced a complete and persistent luxation such as that shown by Dr. Godlee.

It has been asserted that this lesion is in reality a rotary dislocation of the tibia upon the femoral condyles, and not without show of reason—For, the rotary movement of which the tibia is capable when the ligaments are relaxed in flexion might be looked upon
as a dislocation of bone, and it is simply by preventing the re-adjusting movement from taking place when the limb is being extended that the luxation in question is produced.

The importance of recognising this condition and treating it properly is very great, for it is somewhat distressing to read of the result of the case treated at the London Hospital (Cooper's Surgical Dictionary) — also of the two cases mentioned by Sir Wm. R. H. Seaman, already quoted, in which there was every reason to suspect the existence of this condition, and in which permanent lameness was the result.

Another case has been brought under the writer's notice recently, where the lesion was, in all probability, one of this nature, and the patient, a
gentleman of active habits, after getting no relief from his own medical attendant, finally had recourse to a notorious bonesetter. He made a sudden and complete recovery, and the 'bonesetter' felt the credit.

This condition then, having been recognised, the treatment ought to be to first free the cartilage by moving the leg from side to side like a pendulum — rotate the foot step firmly outwards and then extend suddenly while endeavouring to maintain rotation outwards.

This treatment slightly resembles that adopted in a case mentioned by Sir A. Cooper "in which the patient used to accomplish the reduction by sitting upon the ground, and then bending the thigh inwards and pulling the
"Foot outwards." [Surgical Textbook]

There is also a resemblance to it in the treatment adopted successfully by Sir W. Peronneau's patient viz. "pointing the toe outwards" then lifting the leg forwards with the other foot behind the tendon Achilles." –

Regarding treatment in general, it may be stated that before attempting the cure of any of these internal derangements of the knee joint, the exact nature of the lesion ought to be made out as fully as possible. No rational treatment can be adopted except that which is founded upon an accurate diagnosis.

In adopting the treatments herein advocated, it will generally be advisable to administer chloroform to the
Patient, especially should there be much pain and locking of the joint, for shorn of the muscles may require to be overcome.

Should the methods of treatment recommended fail after several attempts, the question of opening the joint will be raised, and, as far as can be gathered from all the authors who have written on this subject, the luxations most likely to lead to permanent lameness are those of the external cartilage—

Luxations of the internal cartilage, according to Vincent, do not leave permanent lameness. They probably get reduced either by accident or after distension of the joint from synovial effusion—

Nowadays, rather than accept the "permanent lameness"
which seems to have resulted in several cases of luxation of the external cartilage, it would be advisable to open the joint — and, as a transverse incision would destroy the insertion of the biceps and also the external lateral ligament before a good view of the external cartilage could be obtained, a vertical incision might be advisable.

The only recorded case, however, where the knee joint was opened on account of "internal dislocation" was on account of a troublesome recurring partial luxation of the internal semilunar cartilage. It is recorded by Professor Clouston in the British Medical Journal, April 18th, 1883. "On opening the joint, the semilunar cartilage (internal) was seen to be
"completely separated from its
"anterior attachment, and was
"displaced backward about
"half an inch."
Stitches were introduced to keep
the cartilage in position, and
the result was a complete
success for the patient, who
was seen again some months later,
and was found to have a sound
and useful knee — whereas he
had been unable to work
for 10 months previous to the
operation. This ought to be
termed heroic treatment, and
the question as to whether or
not it ought to be applied
must be decided by the
usefulness or uselessness of the
limb — and the occupation of
the patient must here come
into consideration. — Still, it
must be admitted in favor
of operation that these constantly
 recurring locations are very
unpleasant and often painful, although they may not prevent a patient following his ordinary occupation. And, as with each recurrence, a slight amount of tenderness and synovitis is almost invariably present, extensive disease of the knee joint might be brought on, especially where there happened to be a rheumatic or strumous tendency to general disease of the joint.

Patients will often apply for advice in order to prevent the recurrence of some internal derangement of the joint. The first point to settle will be to exclude the possibility to a "loose body in the joint" or a reaccumulated tumour (the two conditions which must closely simulate luxation or subluxation of a semilunar cartilage). Should operative interference
not be considered justifiable, the
test palliative treatment (it may
be also curative) will be to
recommend the wearing of some
apparatus to restrain the movements
of the knee - either an elastic
bandage or a leather knee-cap.
Probably the latter is the best.

Should the operation be of
the internal cartilage, it is most
important that the patient
should be instructed to keep
the toe pointed inward and,
should the external cartilage be
affected, the toe should be
turned outward to obviate
recurrence of the dislocation.

W. Scott Low