

# DERANGEMENTS OF THE KNEE

## THEIR RECOGNITION AND TREATMENT

MR. J. D. OSMOND, F.R.C.S.,

Head of Department of Orthopaedics, Livingstone Hospital, Port Elizabeth.

The Physiotherapist has always fulfilled an integral and important role in Orthopaedic Surgery. One can state categorically that modern orthopaedics is just not feasible without the assistance of the "Physio". We "Orthopods" are very jealous and proud of this special relationship.

I have chosen to speak about the knee-joint as this is a surgical field where our combined talents are commonly required. Also, the knee-joint ranks second only to its upstairs neighbour, the hip, in importance.

Derangement, in its orthopaedic context, means a mechanical malfunction. The knee-joint is a reasonably uncomplicated hinge-mechanism but is particularly vulnerable to derangement on account of a number of factors:

1. **THE ANATOMY** is such that there is no bony stability such as we encounter in the other great weight-bearing joints of the lower limb, i.e.

The ball-socket of the hip,

the ankle-mortice,

the virtually unshiftable sacro-iliac joint with its great supporting interosseous ligaments.

This means that the knee depends for stability on its ligaments and muscular support, the latter principally provided by the quadriceps. The quadriceps are all-important and maintenance or restoration of quadriceps bulk and power is without doubt the most important single orthopaedic function of the "Physio".

"Quads. Ex." is the cardinal way back to health of the deranged knee and I cannot over-emphasize its importance. It is furthermore a paradox of locomotor function that these great muscles are invariably inhibited and wasted in any derangement, while the hamstrings are not similarly affected.

2. **SUSCEPTIBILITY TO TRAUMATIC DERANGEMENT.** In this era of high-speed travel and organised

vigorous sporting activity, it is not surprising that the knee commonly bears the brunt of a traumatic misfortune. The classic rugby tackle is directed against the outside of the knee, and before this winter is over, a few more crippled players will be receiving your and our attention.

Articular fracture of the knee is outside the scope of this address and traumatic injuries will be confined to soft-tissue structures.

3. **MINOR CONGENITAL ANOMALIES.** The knee-joint is quite commonly the seat of minor congenital anomalies such as knock-knee or patellar instability. These may give rise to quite severe disability.

Furthermore, aggravating deformities or predisposing weakness may result from malnutritional states, such as rickets.

Derangements of the knee are usually classified as *internal* or *external* but for the purpose of brevity, and since this classification does not really help one appreciate the problem any better, I am going to describe derangements in their order of clinical frequency.

A. **LIGAMENTOUS INJURIES.** These may vary from minor sprains to complete ligament rupture or avulsion. Since the disability caused by, and treatment required for rupture or avulsion is the same, I will not separate these two entities and refer to them under the common heading 'Rupture'.

**Minor Sprains** are benign and will recover whatever treatment is, or is not, instituted. They may be associated with considerable early pain and thus be over-diagnosed and, consequently, overtreated. Certain simple criteria should help one to ascertain whether a sprain is a minor one:

- (a) The patient can take weight without excessive limp or pain. There is no instability.
- (b) The joint is not effused,
- (c) There is not much bruising or swelling,
- (d) The X-ray is normal. Obviously a thorough examination should preclude radiography anyway.

A firm 6 in. crepe bandage, a handful of aspirins and some instruction regarding quads exercises should suffice. Two or three weeks off vigorous sport is advisable.

**Severe Ligamentous Injury.** At the other end of the scale, we encounter severe ligamentous injury, namely, a complete rupture; or a stretching, without actual disruption, resulting in a general slackness. The history reveals a heavy blow or twist to the knee and these patients are severely disabled. On examination, we will find:

- (a) the patient cannot take weight without severe pain and the knee tends to collapse;
- (b) there is generally much swelling and bruising;
- (c) the joint is distended with a bloodstained effusion;
- (d) there is ligament instability. This may be gross and easily demonstrable;
- (e) the X-ray (an essential investigation) may well show a widening of one aspect of the joint-space, and there may be avulsion fragments of bone pulled off by the damaged ligament or ligaments.

*The physical examination of any sprained knee should include:*

1. Determination whether the joint is effused. If an effusion is present, it should be aspirated. Aspiration is essential both as a diagnostic and therapeutic manoeuvre. It is inexcusable not to aspirate a large effusion without delay.

2. The state of the main ligaments, i.e. the collateral ligaments and the cruciates. You will all know the simple clinical tests for these structures.

3. Examination for "cartilage-block". Two factors may obstruct full extension of the knee: Hamstrings spasm or a true intra-articular mechanical block to the joint surfaces, classically seen in the case of the torn, displaced meniscus. It requires considerable experience to distinguish between these.

4. The integrity of the quads mechanism. Many middle-aged or elderly people have a degree of degenerative change in either the patellar-tendon or supra-patellar expansion of the quads. Either of these structures may rupture, sometimes during a simple stumble. Clearly, this individual is quite incapable of extending the knee and the examining finger should localise the rupture without difficulty.

5. The site of tenderness should be noted. Good stability plus tenderness localised to a ligamentous attachment to bone indicates the need for conservative treatment. In addition, immediate relief can be obtained by injection into the tender area of some suitable local anaesthetic, possibly mixed with hydrocortisone.

One small word of caution; patients who have complete rupture of a main ligament may present with little pain and only slight tenderness. Other criteria, however, will confirm the diagnosis.

The treatment of the ruptured collateral ligament should be operative. Ruptured cruciates alone (which incidentally is most uncommon) and the "stretched" collateral ligament, may all be treated conservatively. Here one depends on plaster of paris cylinders, quads drill and masterly inactivity to allow nature to repair the damage.

Ruptured ligaments are eminently reparable and one should not delay surgical intervention. I personally sew the ends together with monofilament nylon which is strong and remarkably non-irritant. By the same token, the ruptured supra- and infra-patellar tendons should be similarly managed.

At operation, one has the chance of a good look around the joint and can deal with any other derangement such as a concomitantly torn meniscus or loose flake of bone lying free in the joint.

I might mention the syndrome known as the "Terrible Triad" of knee injury, i.e.

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|-------------------------------|--|
| 1. Ruptured medial ligament   | } which is not all that uncommon nowadays. |
| 2. Ruptured anterior cruciate |  |
| 3. Torn medial meniscus.      |  |

A single operation would deal with all three aspects. You, of course, are all aware that the most commonly damaged knee ligament is the *Medial*.

The results of operative repair followed by six weeks in a plaster of paris cylinder plus plenty of quads ex. can be quite brilliant.

**B. THE TORN MENISCUS:** You are all aware of the problem of the torn meniscus and the way it may cause pain, effusion, clicking, locking, giving-way, and quadriceps wasting. The giving-away is due to momentary quadriceps inhibition due to noxious reflex activity being set-up in certain sensory end-organs of the deranged joint. The meniscus itself is very richly innervated by both pain and proprioceptive nerve endings.

There is no question that the torn meniscus should come out, and the sooner the better. Minor contusions or peripheral detachments can and do resolve spontaneously and completely. Clearly these minor injuries should be given every chance to get better without surgery. Clinically they present as a "sprained-knee" and should be treated as such.

However, the badly torn meniscus presents a real danger to the joint and recurrent grinding and jamming of the torn part between the articular surfaces can only result in severe degenerative change, proceeding to a full-blown O.A.

A patient presenting with a locked knee should be admitted forthwith and operated on within a day or two. Otherwise the Surgeon is perfectly justified to operate at his and the patient's convenience. If there is to be some delay, it is most important that the patient performs daily quadriceps drill.

Remember that menisci can also cause trouble by being discoid or by becoming cystic.

Meniscectomy is a good operation and a good orthopedist by definition, a good meniscectomist.

The bad results are due to:

1. Misdiagnosis resulting in the removal of a lily-white normal meniscus.
2. Incomplete removal.
3. Too late surgical intervention so that irreparable joint damage has already been sustained.
4. Clumsy surgery.
5. Inadequate post-operative physiotherapy, i.e. super-vised graduated quads drill.

I allow my patients up on the third post-op. day as long as their temperature is normal and good quads. control is present. They may go home, in their original R.J. bandage, as soon as they are ambulant and return to the Orthopaedic Department on the tenth day to have the joint inspected and sutures removed. Any moderate or large effusion is aspirated at this stage.

I would like to mention a number of different derangements which may well be missed if one is unaware of their presentation:

**C. CHRONIC SUBLUXATION OF THE PATELLA:** This interesting condition must rank as the most misdiagnosed derangement of the Knee Joint.

The pull of the quads, is such that the patella has an inherent tendency to subluxate, or even dislocate, towards the lateral side of the knee. This tendency increases with knock-knee and thus is more common in the female who has a "physiological" genu valgum, so to speak. The tendency is counteracted by the horizontal pull of the lowest fibres of the vastus medialis which are inserted into the medial edge of the knee-cap, and also by the forward projection of the large lateral femoral condyle acting as a buttress against lateral shift of the patella.

Relatively minor departures from the anatomical norm may allow of patellar instability. The sufferers who are usually adolescent girls or young women, complain of

sudden attacks of painful giving way of the knee associated with frequent effusions. The condition usually becomes diagnosed as an abnormality of the medial meniscus which innocent organ is promptly removed without any relief. The demoralized patient all too often becomes regarded as a neurotic or hypochondriac.

The diagnosis depends on demonstrating an abnormal degree of side-to-side instability of the patella. A confirmatory finding, which is quite constant, is tenderness along the medial border of the patella and pain in this area on forcibly pushing the patella in a lateral direction. The latter is due to recurrent trauma to the horizontal fibres of vastus medialis and stretching of the underlying capsule.

Minor degrees of this syndrome may respond to quads. ex., particularly aimed at building up the vastus medialis. More severe cases require surgery—not meniscectomy, but transplanation of the patellar tendon into the medial surface of the tibia. One sometimes finds that the articular surface of the patella is severely damaged and pitted due to recurrent trauma and, if this is the case, patellectomy is simultaneously performed. This operation is very effective and most patients are completely relieved of symptoms.

**D. CHONDROMALACIA PATELLAE:** While on the subject of the knee-cap we could with advantage refresh our minds about this common and distressing complaint. Once again adolescent girls are most frequently involved. Either spontaneously or as a result of direct trauma to the patella, the articular cartilage of the patella undergoes a degenerative process resulting in ulceration or fibrillation. Patella-femoral friction ensues which may be very painful. The condition is frequently bilateral.

Treatment should always be conservative in the first place and I advise quads. ex. and inject the knee joint with hydrocortisone. The condition appears to be self-limiting and usually settles after several months or even a year or two. The odd case may, however, come to patellectomy, an operation which no one should undertake lightly on a young woman because of the bad cosmetic result.

**E. OSTEOCHONDRITIS DISSECANS** usually affects the medial femoral condyle of adolescent boys and may result in the formation of a loose body. The symptoms may resemble a torn meniscus or the patient may present with an acutely locked knee due to the loose body. The diagnosis is made on the typical X-ray appearance.

Treatment varies from masterly inactivity with observation, to periods in plaster of paris cylinders with non-weight-bearing, to open operation either to remove the osteocartilaginous flake or to replace it in the pit from whence it came. Smillie designed his special Pin for this operation.

**F. LOOSE BODIES (THE SO-CALLED JOINT MOUSE)**—may result from osteophytes breaking off in the O.A. knee, or can develop in this curious condition of synovial osteochondromatosis. If they cause trouble, they should be localised by X-ray and then surgically removed.

**G. OSTEOCHONDRITIS OR EPIPHYSITIS**—can manifest in the knee as an Osgood-Schlatter's Disease or it may affect the lower pole of the patella as a Sven-Larsen syndrome.

The sufferers here are young and frequently active and sports-minded. Adolescent boys are more commonly involved than girls and may be distressed by the painful lumps at the upper ends of the tibia.

However, these forms of osteochondritis are invariably self-limiting and surgical intervention is never justified.

Reassurance of Mother, anxious that her lad has bone-cancer, and diminished activity of the boy for six months or so, is all that is required plus quads. ex. since reflex wasting occurs rapidly.

**H. POST-OPERATIVE KNEE-STIFFNESS.** This used to be a common problem particularly following femoral shaft fractures. It is due both to intra-articular adhesions and to tethering of the quadriceps bellies.

Nowadays we commonly treat these fractures by Intra-medullary Nailing. It is most important to institute early knee-movements and we like our "Physio's" to begin active and passive exercises on the first post-operative day. There should be a return of 90° of flexion in the first week. I have never seen myositis ossificans as a result of this regime, but have seen ghastly stiffness of the knee in patients who have been left unattended for two or three weeks after the K. Nail was inserted.



### REHABILITATION STAIRS

MISS J. M. WALKER

Lecturer Sub Dept. of Physiotherapy University of Witwatersrand

For use in hospital gymnasiums and Physiotherapy Schools.

Rehabilitation stairs should embody the following features for safety and maximum usefulness to therapists in the variety of conditions with which patients present.

- (a) Safety: strongly and solidly constructed, with non-slip step covering and without "rail play".
- (b) Width: of such width that allows the therapist to stand close to the patient.
- (c) Provide a variety of steps in height and length to enable retraining similar to conditions a patient may meet in public places or at home.
- (d) Rails: Two rails should be present. The distance between the two rails should be such that a patient can commence stair training using two rails and progress to the use of one rail, one walking aid, etc.
- (e) A sufficiently sized platform at the "head of the stairs" should be present which will accommodate both patient and therapist simultaneously, allow the patient to turn with confidence and enable the placing of a chair if necessary.

In observing the above factors it is also desirable, considering the size of most hospital gymnasiums that the stairs take up a minimum of space.

With the above points in view the firm supplying hospitals with Rehabilitation stairs was requested to make certain alterations to their existing type which is considered unsuitable due to the following features.

- (a) steps of polished wood, slippery, promoting a lack of confidence, particularly in the elderly.
- (b) insufficient depth to steps to allow full placing of the average sized foot.
- (c) no variation in the height of the steps.
- (d) insufficiently sized platform at the "head of the stairs" for placement of a chair, or two persons.

The modified Rehabilitation Stairs, now available, contain the following features:

Total length: 105 inches. Total width: 36 inches.

Steps and Central Platform are covered with rubber matting  $\frac{3}{16}$  in., having a diamond mesh pattern.

Steps: All steps have a length of 15 inches. There are 3 steps on one side of 8 in. depth and 4 steps on the opposite side of 6 inches depth.

Central Platform: Has a depth of 39 inches at a height of 24 inches from the floor.

Rails: Provided on both sides, detachable, held in place by wing nuts. Being detachable enables easier transport, thus reduces the total cost and allows a therapist to remove one rail if desired. An additional feature which may be ordered by those centres with a high number of patients, as Paraplegics, who commence stair training using two rails is a second placement position for one rail, at the width of 32 inches as well as the standard width of 36 inches. The rail at the placement of 32 inches would however have slight "play" compared to the position at 36 in.

Construction: Phillopino Mahogany is used for the sides,

rails and upright pieces of the steps. The top shelf, platform and the steps are constructed of  $\frac{3}{4}$  inches conteshelf which is stronger than the normal wood and the step support and frame is of  $\frac{7}{8}$  inch South African Pine.

A recent modification, not shown on the photograph, is the raising of the height of the rails above the platform to the same height above each step and the extension of the slope of the rails upwards at the edges of the platform. It is also planned to investigate the possibility a one rail being metal, adjustable in height and capable of swinging inwards, thus enabling the width between the two rails to be reduced easily.

It is therefore advocated for reasons of increased safety and greater variety in training that these stairs be considered in preference to the former type. Any suggestions for further improvements in design will be welcomed.

The stairs are available from: Protea Electro-Medical Company at an approximate price of R170.

Acknowledgement: Protea Electro-Medical Company in revising their design and dealing with a female non-craftsman-carpenter!