

This policy proved successful and popular (both with the patients and the physiotherapists) during my forty years at St. Thomas's and should be adopted all over the world. The patient remains under medical supervision throughout and is treated by trained ethical personnel.

All that need be done now is for doctors to recognise suitable cases at once and for physiotherapists to equip themselves to treat accordingly. Neither presents the slightest difficulty, merely the exercise of a little goodwill.

SUMMARY

In my experience, the only good reason for spinal manipulation between the third cervical and fifth lumbar vertebra is an endeavour to reduce a displacement of a small fragment of disc. This is what lay-manipulators, still without realising it, have been doing for the past hundred years and have gained much kudos thereby. This has led them on to untenable hypotheses. An attempt is made to substitute a valid anatomical explanation for these successes, in the hope that doctors and physiotherapists will now accept these logical measures and incorporate them in their daily practice.

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The Value of Deep Transverse Frictions in Sports Injuries with particular reference to the knee

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Deep transverse friction is an invaluable treatment for sports injuries. However, when this type of massage is being carried out, it must be given to the exact spot and in the correct way; it is of no use to look for the tender area and to massage there. One must examine the patient, find out which tissue is at fault and then look for tenderness along *that* structure. The friction must then be given transversely to the tissue, not longitudinally.

AIMS OF DEEP TRANSVERSE FRICTIONS

1. In muscular lesions the aim is to mobilise the muscle by separating the adhesions between the individual muscle fibres that are restricting its mobility towards broadening each time it contracts. The muscle must be kept fully relaxed during the friction.

2. In ligamentous lesions, the objective is to move the ligament to and fro over adjacent bone in imitation of its normal behaviour and thus maintain its mobility.

3. When a tendon has a sheath, crepitus may be present indicating roughening of the tendon sheath. Deep transverse friction smoothes the gliding surfaces. During the transverse friction the tendon must be kept taut. In tendons without a sheath, deep transverse frictions break up scar tissue at the insertion of the tendon into bone or scar tissue within the tendon.

TECHNIQUES OF DEEP TRANSVERSE FRICTIONS

1. As mentioned earlier, the right spot must be found.
2. The physiotherapist's fingers and the patient's skin must move as one. If movement takes place between the patient's skin and the physiotherapist's fingers, then the massage reaches only the skin and not the tissue at fault, and will also give rise to a blister.
3. The friction must be given across the fibres composing the affected structures, i.e. transversely.
4. The friction must be given with sufficient sweep.
5. The friction must reach deeply enough. It is more effective to massage deeply for a few minutes than to go on indefinitely with gentle massage.
6. The patient must adopt a suitable position which ensures that the tissue is either taut for a tendon sheath or relaxed for a muscle. If the structure to be treated is ordinarily out of reach of the physiotherapist's fingers, then a position must be adopted whereby the tissue becomes accessible, e.g. the supraspinatus tendon at the shoulder. The arm is put behind the patient's back whilst the patient is in the half-lying position, thereby fixing the arm in adduction and medial rotation. In this position, the tendon can be easily felt as it passes from the base of the coracoid process directly forwards over the head of the humerus to the greater tuberosity.

RECENT INJURIES IN THE KNEE

The knee is a very rewarding joint for the physiotherapist to treat, both by deep transverse frictions and by manipulation. A full history must be taken and the knee examined to single out the tissue at fault before starting treatment.

History. This is most helpful at the knee. The following points should be ascertained:

- What is the age and occupation of the patient?
- What was he doing when the pain first appeared?
- In what position was his body and his leg, and what forces were acting on his knee at the time?
- Alternatively, did the pain come on for no apparent reason?
- Did the knee give way; if so, did the knee lock; if so, did it lock in extension or flexion; if so, how did it become unlocked?
- On which side of the knee was the pain or was it right inside, or was it all over?
- Did the pain change from one side of the knee to the other?
- Did it spread; if so where to?
- Was the patient able to walk?
- Did the joint swell; if so, how quickly?
- For how long was he disabled?
- Were there recurrences; if so, what brought them on?
- What is the effect of going up and down stairs; is going down more troublesome than up?
- Are there sudden twinges?
- Does the knee click?
- Does it grate?
- Does it feel as if it might give way; if so, does the patient actually fall?
- What treatment has he had, and with what effect?

CLINICAL EXAMINATION

Examination requires ten movements, eight passive and two resisted. *Passive Movements.* These are eight; four primary and four secondary movements:

The primary movements indicate the state of the joint; they are flexion, extension, medial rotation, lateral rotation. The capsular pattern (indicating arthritis) is much more limitation of flexion than of extension, e.g. 10° limited extension corresponding with 90° limitation of flexion. Except in gross arthritis, rotation remains of full range.

The secondary movements test each ligament in turn; valgus for the medial collateral ligament; varus for the lateral ligament; anterior pressure on the tibia for the anterior cruciate ligament; posterior for the posterior. If range proves excessive, the relevant ligament is overstretched.

Resisted Movements

These are two; resisted flexion for the hamstrings and resisted extension for the quadriceps mechanism. Pain indicates a muscle lesion; weakness, rupture, or a nerve lesion. Both weakness and pain on resisted extension characterize a factured patella.

PALPATION OF THE STATIONARY JOINT

Heat

Warmth indicates an active lesion; localised warmth reveals the site. Active lesions are: repair after a sprain, operation, or local fracture; haemarthrosis, persistent internal derangement, rheumatoid arthritis and its variants, gout, spondylitis or osteitis deformans, Reiter's disease, psoriasis, etc.

Fluid

This may be clear or blood, or (but not in physiotherapeutic cases) pus. The patella can be tapped against the femur if a large quantity of fluid floats the patella off it. A more delicate test is fluctuating the fluid from the supra-patellar pouch to the area at each side of the patella. It is well to realise that 'synovitis of the knee' means merely 'fluid in the knee joint'.

it is not a diagnosis; for intra-articular fluid is common to many conditions, as disparate as a sprained ligament, a displaced loose body, or rheumatoid arthritis. No treatment is possible until the cause of the fluid in the joint has been ascertained.

Capsular Thickening

The detection of capsular thickening by palpation of the synovial reflexion at each femoral condyle indicates one of the rheumatoid group of arthritides, e.g. spondylitis, psoriasis, Reiter, or gout, tuberculosis, and so on. Capsular thickening contra-indicates active physiotherapy.

Tenderness

Since most of the tissues at the knee lie superficially, this lends great accuracy to diagnosis. Tenderness is sought along the structure singled out by the clinical examination, always provided that it lies within finger's reach.

LIGAMENOUS SPRAIN

Medial Collateral Ligament

The knee is forced towards valgus; a sudden pain is felt at the inner side of the knee. The patient picks himself up and can walk, but he becomes increasingly disabled. After a few hours the knee becomes very swollen and so painful that he can hardly stand.

Signs: In the acute stage, lasting some ten days, examination is difficult since the acute traumatic arthritis overshadows the ligamentous signs. The knee is hot, full of fluid, with say 10° limitation of extension, and 90° limitation of flexion range. But the patient knows he strained the inner side of his knee, and localised tenderness at some point along the ligament is easily detected.

In the subacute case, which lasts a good month in the untreated case, the amount of movement gradually increases, the heat and fluid abate, and examination becomes practicable. The ligament can now be tested with the knee straight; valgus strain is found to hurt. If it has ruptured, excessive range is obvious.

In the chronic stage, adhesions have formed, binding the ligament abnormally to bone. Impaired ligamentous mobility leads to a knee that is painless on ordinary activities, but any full use of the joint, e.g. running or at games, leads to pain at the inner side of the knee and some days heat and fluid.

The aim of treatment during the acute stage is to move the ligament in imitation of its normal behaviour by deep transverse friction. In the chronic stage, when adhesions have formed, manipulation is performed in an endeavour to break down the adhesions.

Deep Transverse Friction: When this is given to the medial collateral ligament, it has to be carried out with the knee held first in extension and then in flexion, in order to maintain mobility of the ligament at the anterior and posterior extremes of its range.

In extension: The patient lies supine on the couch with the knee in as much extension as possible. The physiotherapist sits facing the patient and places her index finger, reinforced by her long finger, on the inner side of the knee, the thumb on the outer side of the knee acting as a fulcrum. Flexion and extension of her wrist draws her index finger over the ligament, which is moved over the bone at the anterior part of its range of movement. A large increase in range of flexion can be expected within hours of this treatment.

In flexion: The patient lies supine on the couch with his knee well bent up. The physiotherapist sits facing the patient and places her hand so that her index finger, reinforced by

her long finger, lies at the central point of the medial aspect of the joint line. Her thumb acts as a fulcrum on the lateral side of the knee. Flexion, then extension, of the wrist draw her thumb over the ligament, which is now moved to and fro over the bone in the posterior part of its range. The massage should be followed by passive movements in the early stage and by stronger forced movements in the later stage. Fifteen minutes' massage three times a week for two or three weeks should suffice.

Manipulation: This is indicated when the ligament has developed adhesions and its mobility is impaired.

Forced extension: The patient lies supine on the couch and the knee is flexed as much as possible. The physiotherapist stands beside the patient, and raises the patient's heel off the couch with one hand whilst placing her other hand on the patient's knee. The manipulation is carried out by giving a quick jerk. The adhesions part with a small snap.

Forced flexion: The patient is placed in the half-lying position whilst the physiotherapist stands facing him. The hip is flexed as far as it will comfortably go. She then places one hand on his knee in order to steady it and also to maintain flexion at the hip. Full flexion is now forced by the physiotherapist pushing sharply with her other hand on his ankle.

Forced rotation in flexion: The patient adopts the half-lying position with the hip flexed. The physiotherapist keeps the knee bent by pressing with one hand on his knee. She places the fingers of her other hand round the back and outer side of the patient's heel, applying her forearm to the inner border of his foot. Lateral rotation is then forced. For medial rotation the physiotherapist stands level with the patient's thigh, and clasps her hands tightly round his heel while holding the hip and knee flexed. By moving both wrists she twists his heel strongly, thus forcing medial rotation at the knee joint.

These forced movements should be followed by active movements to maintain the range of movement which has been achieved.

Coronary Ligament

The knee is forcibly rotated and a sudden pain is felt at one or other side of the patella. The pain does not at first prevent walking, but that evening the knee is warm, swollen and painful.

Signs: Though acute traumatic arthritis obscures the ligamentous signs, it is less severe than in medial ligament strain and more likely to amount to 5° limitation of extension, 45° limitation of flexion. But the patient describes a rotation strain and the coronary, not the medial, ligament is tender.

Spontaneous recovery is very slow and takes at least three months.

Treatment: Mobility must be maintained at the tibio-mensal joint, but manipulating the knee moves the femoro-tibial — the wrong — joint. Hence mobility is maintained or restored by deep transverse friction in the acute, subacute or chronic stage of the sprain, and cures cases of a few days' or several years' standing in about a fortnight.

This is an example of a lesion which benefits only from deep transverse friction. The patient lies supine on the couch with the knee not quite fully flexed. The physiotherapist sits facing him and presses her index finger, reinforced by the middle finger, downwards and backwards on the shelf formed by the superior aspect of the tibial condyle. Here the physiotherapist's finger comes into contact with the coronary ligament as it passes backwards towards the meniscus. The friction is performed by a to-and-fro movement of her forearm and hand. Fifteen minutes' massage three times a week for two or three weeks is usually sufficient.

Cruciate Ligaments

The knee is sprained, the pain being felt within the centre of the knee. Unless other ligaments are strained too, the patient has a warm, painful knee containing fluid, but just about a full range of movement. Stretching one or other cruciate ligament hurts and may reveal excessive range if it is lengthened. There is no pain at either side of the knee and no tenderness of any accessible structure.

Spontaneous recovery is very slow, six to twelve months is the minimum. Identification of the ligament and ascertaining at which end the lesion lies is difficult, but one adequate infiltration of hydrocortisone at the right spot is curative, unless marked lengthening with consequent instability is present. Physiotherapy is useless and manipulation harmful.

Torn Meniscus

This follows a rotation sprain that first over-stretches the coronary ligament; then continued force tears the meniscus. The patient feels a severe pain at one side of his knee and falls to the ground. Attempting to rise, he finds his knee fixed in flexion, unable to bear weight. The knee is manipulated, a click is felt and heard, and full extension is restored to the knee. He still has the coronary sprain.

The medial meniscus is the more often torn. Therefore, the manipulation described here is for a lesion on that side.

General anaesthesia may be required on the first occasion a patient displaces part of the cartilage. However, in recurrent dislocation, anaesthesia is seldom necessary.

The patient lies supine on the couch and flexes the hip and knee to a right angle. The aim of treatment is to shift the piece of cartilage medially, away from where it lies displaced between the femoral condyles. A strong valgus strain must be placed on the joint in an endeavour to open its inner aspect and encourage reduction in that direction. The knee must be gradually extended while it is rotated rapidly to and fro. The physiotherapist's hand is, therefore, placed at the outer side of the knee, pressing medially and downwards. Her other hand grasps the foot, rotating the leg strongly and applying valgus strain. She also holds the foot up so that the pressure of the first hand on the knee increasingly extends the joint. A small click is heard as full extension is achieved, indicating that reduction has taken place.

As the meniscus moves it strains the coronary ligament. Unless immediate meniscectomy is contemplated, this now requires deep friction.

Loose Body in Adolescence

Loose bodies, often multiple, frequently form in the knee between the ages of fourteen and twenty, as the results of osteochondrosis dissecans or chondromalacia patellae. As the patient walks along his knee suddenly fixes in extension; he gives the leg a good shake and then finds he can flex it; there is no lasting fixation.

The loose pieces have an osseous nucleus and show on the skiagram; they should be excised.

Loose Body in Middle-Age

This is a common, disabling, and unrecognised disorder, usually easy to relieve but seldom treated correctly. The loose body consists of cartilage and thus is not visible on the skiagram, which instead shows the early osteophyte formation that comes on in middle age and causes no symptoms. The diagnosis is therefore often 'osteoarthritis', but:

- (a) it comes on suddenly;
- (b) only part of the knee hurts;
- (c) examination shows a sprained knee without previous injury;
- (d) it may recover and then recur;
- (e) the patient experiences twinges.

The middle-aged patient states that, for no reason and without any strain, he suddenly experienced localised pain



Reduction of loose body

at the knee, usually the inner side. Every step hurts and he walks downstairs one step at a time for fear of the twinge with giving way that might topple him to the bottom.

Signs: The signs are those of a sprained knee. There is fluid in the joint, and if the pain is on the inner side, localised warmth is usually detectable there; full extension hurts; 5° or 10° limitation of flexion is present. The medial collateral ligament is tender at the joint line. Clearly this ligament is strained . . . but the history indicates that it has not been strained. The cause cannot therefore be external force; it must be intrinsic. It is; a small cartilaginous loose body has suddenly shifted to lie at the inner side of the joint. The space-occupying lesion ensures that, each time the knee is straightened, the ligament is strained. The twinge results from a momentary subluxation.

The intention, when manipulating a loose fragment within the knee joint, is to shift it to the posterior part of the joint where it no longer engages. In order to get the loose piece to move, the joint space has to be enlarged; therefore the manipulation is carried out whilst the joint surfaces are distracted.

The patient lies prone on the couch with the knee flexed to a right angle. The physiotherapist places one hand on the dorsum of the patient's foot and the other on his ankle. The web of her thumb catches under his heel, thus holding the foot in dorsiflexion which ensures good purchase for the other hand. She then lifts the leg strongly and rests his foot on her far thigh. An assistant places her hands on the thigh just above the knee-joint, holding it down. The tibia is now distracted strongly from the femur. Once the physiotherapist has felt the patient relax and the bones come apart, she removes her thigh from under the patient's foot whilst still holding his knee off the couch and retaining her traction during the manipulative rotation. The assistant and/or patient may feel the click of reduction. The knee should be re-examined after each manoeuvre and the manipulation repeated, often several times, until movement is free.

Monarticular Rheumatoid Arthritis

The outstanding features of the early case are:

1. Swelling at the knee coming on for no reason;
2. The discrepancy between the local signs and the articular signs.

There is no injury; warmth, fluid and capsular thickening appear for no apparent reason. Further examination reveals a full range of painless movement—a most revealing discrepancy. Later, of course, movement becomes limited and the capsular thickening extreme. By then the diagnosis is obvious.

Treatment: Intra-articular steroid is the only effective measure unless the cause is gout (butazolidine), gonorrhoea (penicillin), or Reiter's disease (nothing avails).

When monarticular rheumatoid arthritis comes on in middle-age, the skiagram is bound to show an osteophyte or two somewhere, and the sedimentation rate is seldom raised. These knees are apt to be treated in the same exercise class as the loose bodies, with equally unsatisfactory results.

Patellar Tendinitis

The pain is felt clearly at the front of the knee only, and walking some way or upstairs elicits the pain. No twinges are experienced. Recurrent dislocation of the patella causes attacks of sudden derangement that must not be mistaken for those of a meniscal tear.

Signs: There is a full and painless range of movement at the joint. Resisted extensions hurts.

Treatment: If the scar tissue has formed at the teno-periosteal junction of the supra- or infra-patellar tendon, it must be broken up by deep transverse friction to the exact spot. Alternatively, the area can be infiltrated with hydrocortisone. When the quadriceps expansion is affected at one or other side of the patella, only friction avails. If the tendons are not affected, and the cause is such erosion of cartilage that bone is grinding against bone at the patellar-femoral joint, only excision of the patella is effective.

Suprapatellar Tendon

The patient lies supine on the couch with the knee fully extended and the quadriceps relaxed. The physiotherapist sits facing him and with one hand presses downwards on the lower pole of the patella with the web of her thumb, her fingers to one side and her thumb to the other side of the knee. This results in the upper pole of the patella being tilted forwards, thus bringing the supra-patellar tendon into the most accessible position for massage. The physiotherapist places the ring finger, reinforced by the middle finger, against the upper pole of the patella. By pressing downwards and backwards, she catches the tendon at its insertion into bone. The friction is performed by a to-and-fro movement of her whole forearm and hand.



Massage to infrapatellar tendon

Infrapatellar Tendon

The position for massage of the suprapatellar tendon is reversed. The upper pole of the patella is pressed backwards, thus tilting the lower pole of the patella and bringing the infrapatellar tendon into prominence. Twenty minutes' massage two or three times a week for a month should be sufficient.

Quadriceps Expansion

Deep friction is the only effective treatment for this lesion. The patient lies supine with the knee fully extended and the quadriceps relaxed. The physiotherapist sits facing him, and with one thumb pushes the patella fully over to the affected side. The ring finger of the other hand, reinforced by the middle finger, is placed under the projection formed by the patella, so that the palm of her hand faces towards the ceiling. The friction is performed by a horizontal movement of her forearm and hand.

In recent sprains only two or three sessions of massage lasting twenty minutes suffice. Long-standing cases may require six or eight sessions.

Hamstrings

Injury to the belly of the hamstrings is common amongst sprinters and footballers. At the time of injury, the athlete feels the muscle give way painfully at the middle of the posterior aspect of the thigh. Some hours later he is scarcely able to walk.

Signs: Prone-lying, resisted knee flexion hurts. If the muscle tear is extensive, the muscle belly will not stretch fully and straight leg raising is not only painful but slightly limited for the first few days.

Treatment: The patient lies prone, his knee held well flexed, his leg supported by a cushion. The physiotherapist sits facing the patient and puts both hands on his thigh. She presses downwards until her fingers on one side, and her thumb on the other, grasp the belly of the muscle. She alternately flexes and extends her thumb and fingers. Patient should be treated daily for the first week and on alternate days after that.

After the massage, faradism should be given with the patient lying prone and the knee kept fully flexed. This permits contraction of the hamstring and full broadening out of the belly at a time when the muscle is held in the position of full shortening, whereby all pull on the healing breach is prevented.

SUMMARY

Clinical examination of the knee entails eight passive and two resisted movements. The patterns that emerge, taken in conjunction with the history, enable a precise diagnosis to be arrived at.

Maintenance of mobility by transverse friction in some cases and by manipulation in others plays a large and most satisfactory part in treatment. For many disorders there is no alternative.

The knee is the joint where collaboration between doctor and physiotherapist has its happiest results.

Note

Though, in Dr. Cyriax's book, he is shown carrying out the manipulations; these are all carried out equally by all his physiotherapists.

ACKNOWLEDGEMENT

The author's thanks are due to Messrs. Bailliere Tindall for permission to reprint illustrations already published in "Orthopaedic Medicine" Volume 2, by Dr. James Cyriax.