SURGICAL PROCEDURES IN GENERAL PRACTICE

This is one of a series of articles contributed by invitation.

FRACTURE AND DISLOCATION OF THE PATELLA

BY

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The most common injury of the extensor mechanism of the knee-joint is a transverse fracture of the patella, the result of a sudden contraction of the quadriceps while the knee is held in a position of flexion. Often such an injury would seem to occur with relatively slight violence. Other fractures, such as a comminuted fracture or a compound fracture, are due to direct violence and are much less common. They result from falls directly upon the patella or from motor-car accidents.

In addition to fractures of the patella two other injuries to the extensor mechanism may be met with. The first is a rupture of the quadriceps tendon just above the patella or a detachment of the whole tendon from the patella. This injury appears to occur in much the same circumstances as does a fracture. The second injury is a rupture of the patellar tendon, which is torn off from its attachment to the lower portion of the patella. The history of the accident, except when due to direct violence, is always much the same, and it would seem to be a matter of pure chance whether the tendon or the patella is damaged. The usual story is that the patient stumbles or misses his step and a sudden effort is made to avoid a fall. The knee gives way and the patient falls down, with pain in the limb. On attempting to rise he finds he is unable to do so, or, if he does get up, discovers that he is unable to walk or to take any weight on the injured limb. The differential diagnosis is seldom difficult. There is a loss of function, inability to extend the limb voluntarily, and immediate or very rapid swelling and pain.

Transverse fracture of the patella with much separation of the fragments is easy to diagnose, as a depression between the fragments can be palpated. Such fracture without separation, whilst it may be suspected owing to the tenderness upon pressure on the bone, may not be recognized without the help of an x-ray examination. Likewise a comminuted fracture may be difficult to differentiate on a purely clinical examination. The same applies to a compound fracture, except that there will be a wound over the patella from which blood and serum may leak.

A transverse rupture of the tendon of the quadriceps is often easy to diagnose; if there is any doubt the knee should be flexed slightly, when the separation becomes obvious and pressure on the hole gives rise to marked tenderness. Rupture of the patellar tendon has symptoms similar to those observed in these other injuries, but upon examination a hollow can be felt below the patella, which itself lies on a higher level than does that of the other limb. In addition we must remember that in both fractures and injury of tendons a haemarthrosis is present, except in rupture of the patellar tendon, which is an extra-articular lesion. Also most fractures are associated with a rupture of the joint capsule and the lateral expansions of the tendon, and if the separation of the portions of the

patella is considerable these soft structures must be badly torn. If there is no separation there is unlikely to be much damage to the soft structures.

First-aid Treatment

The patient will be unable to bear his weight on the limb and probably will be found lying upon the floor or may have been carried to bed. If he has to be moved the limb may be splinted temporarily with a back splint or, if this is not available, the two lower limbs should be tied together. If the fracture is compound the wound should be covered with a sterile dressing until arrangements can be made to deal with the condition properly. After removing the patient's clothes a clinical examination must be made to decide the nature of the injury. The limb must be radiographed, but as the patient is probably badly shocked it may be wise to wait until the next day before doing this.

Simple Transverse Fracture with no Displacement

If the injury is a simple transverse fracture of the patella with no displacement it can be assumed that the capsule is not ruptured on either side and therefore, beyond protecting the limb from any further violence, it is not necessary to treat the fracture itself. The condition we have to deal with is a traumatic synovitis with perhaps a little blood in the joint. If the patient is in much pain there is a very definite haemarthrosis. The patient is kept in bed to start with, the knee being supported by a pressure pad and bandage. A layer of wool is applied to the injured knee and a few turns of bandage put on; another layer of wool is then applied, with further turns of bandage, followed by a third layer of wool, the bandage now being finished off. Besides splinting the limb this treatment will help to get rid of the fluid. While rest is indicated for the traumatic synovitis the muscular control must be maintained. It is therefore essential that the patient should have a masseuse—not to do any massage, but to help him exercise the quadriceps and if necessary to give faradism to these muscles. As soon as the very acute symptoms have subsided, active movements of flexion and extension of the knee must be begun; they may be increased in range as rapidly as symptoms permit. Treated in such a way, the patient with a simple transverse fracture of this nature should be on his feet within a few days, and if his work is of a sedentary character and transport is easy there is no need for him to be away from work for more than a week or ten days. When all the fluid has disappeared from the joint a crêpe bandage is preferable to an elastoplast bandage: it can be removed for physiotherapy and does not tend to cut in behind the knee or make the skin sore. If the patient's work is heavy six weeks will elapse before he is fit to undertake it. Should he return too soon the knee will fill up with fluid and complete restoration of function will be delayed.

Transverse Fracture with Separation

This, the most common injury, is best treated by open operation unless the patient is very old and there is some

other contraindication. To relegate the patient to a knee cage is a policy of despair rather than a par with the ordering of a calliper for a fractured neck of the femur. Open operation, no matter what its nature, is not a serious procedure, and can be rapidly performed. It is wise, whatever is done to repair the damage, to allow the patient to rest quietly for a few days before operation. After a fracture of the patella the soft tissues become so oedematous that if operation is performed at once it is difficult to identify with any ease the structures one is handling. After a few days the oedema subsides, making the operation easier.

As with most surgical problems, considerable difference of opinion exists as to the most desirable procedure, in the way of open operation, for the repair of this fracture. There are two things we must set out to do at operations: first, the capsule which is torn transversely must be sutured; and, secondly, the fragments of the patella must be dealt with. These may either be wired together or they may be removed. The former is the more classic procedure, and probably cases still occur in which it should be done; but for most patients removal of the patella is the most satisfactory operation, and if upon opening the joint there are already signs of arthritis it quite definitely is the operation of choice. The points in its favour are that it is easy to do and that it can be done very quickly. There is nothing to refracture afterwards, and the chance of the development of an arthritis between the patella and the femur is avoided. Wiring the fragments together, however well done, may leave a ridge on the articular surface of the bone and involve the risk of a chronic persistent pain in the joint. The function of the knee after excision of the patella is excellent, and there is no loss of power in the quadriceps. The only thing that the patient notices afterwards is that when the knee is flexed the condyles of the femur appear very prominent.

THE OPERATION

The limb is prepared in the usual manner, from the groin down to and including the foot. The towels are arranged in such a way that the knee can be flexed without risk of any part not prepared becoming uncovered. It is better not to employ a tourniquet or an Esmarch bandage, because they tighten up the quadriceps and may make it difficult to suture the torn surfaces together.

The fracture may be approached through either a longitudinal or a transverse incision about four inches long over the site of the fracture. The torn fibres of the quadriceps expansion which lie over the surfaces of the fracture require clearing away but not removing. The blood clot which fills the joint is removed. The upper fragment of the patella is held with forceps and dissected out of the tendon of the quadriceps, taking care to keep the scalpel close to the bone so that the tendon remains as intact as possible. The lower fragment is then removed in a similar manner. All bleeding is carefully stopped, and the expansion of the quadriceps torn upon either side is sutured with interrupted sutures of No. 1 chromic catgut. It is not necessary to suture the synovial membrane, and in suturing the capsule care should be taken not to shorten the expansion, otherwise this may contribute to difficulty in obtaining full flexion of the knee. The hole left where the patella has been removed can be closed by suturing the capsule longitudinally in this part. It does not matter if closure is not complete. The skin incision is closed with interrupted salmon-gut sutures and a dressing applied. The limb is then bandaged over layers of wool from the middle of the thigh down to the middle of the leg. This

will provide all the splintage necessary. The bandage may need slackening after twenty-four hours.

With the limb in extension active contraction of the quadriceps is started after three days and the patient encouraged to begin slight movements of flexion in another two days. The stitches are removed on the ninth day and the limb firmly bandaged. If the incision is satisfactorily healed active flexion continues and, provided that the patient maintains voluntary power of full extension, can be quickly increased in range. After twelve to fourteen days the patient may be got walking with two sticks, the knee being still supported by a firm bandage or, if he is nervous, a posterior plaster slab. The rapidity with which full function is recovered varies greatly, but in six to eight weeks the patient should be fit to resume all but the most strenuous of occupations, such as climbing ladders. He will have to wait to do this until he has complete confidence in the limb. Sometimes full flexion is difficult to obtain in elderly patients, especially if they have been afraid to bend their knee in the first two or three weeks. Rupture of the capsule in the portion where the patella has been excised is known, but it is rare; when it does occur it calls for a secondary suture.

Suture of Transverse Fracture of Patella

The initial stages of the operation with regard to excision of the fragments are identical with those just given. When the portions of the patella have been cleared they are pulled together so that the fractured surfaces fit, and are held thus by an assistant with two sharp hooks. They may be fixed now by suture, with catgut, of the transverse expansions and the expansion over the surface of the patella, or else the two fragments are drilled transversely and then the material used is threaded through and tied. At one time silver wire was employed for this purpose, but this has been replaced by Viennese twist, size 3. This material has the advantage that it can be tied like an ordinary ligature; silver wire is much more difficult to tighten, and the knot made was very liable, however well it was bent down and buried, to spring up again and cause trouble under the skin: also it often broke. If the patella is wired in this way it is essential to suture the torn expansions upon either side with catgut. The after-treatment is exactly the same as for removal of the patella, except that flexion cannot be obtained so rapidly; if it is, the patella is likely to unite with fibrous tissue and not with bone. Subsequent stiffness of the knee is also likely to be more troublesome than when the patella is removed.

Simple Comminuted Fractures

The treatment of this type of fracture will depend upon the degree of comminution and the amount of separation of the fragments. In many of them, although the patella is split up into a number of pieces, there may be little separation and no evidence of the expansion of the quadriceps over the patella, nor of the lateral expansions being seriously damaged. In such circumstances there is no need to operate upon the knee. The fragments will unite up well, and treatment is required only for a bad synovitis or haemarthrosis. The limb is bound up firmly or, if very painful, fixed on a posterior plaster slab until the pain subsides. The quadriceps are treated to prevent wasting, and movements begun as soon as symptoms permit. The prognosis is good unless the patient develops an arthritis. Should this happen it will be necessary to remove the patella, but it does not follow that an arthritis is bound to develop. After such an injury the patella

always appears to be larger than does the patella of the other limb. In instances where the fragments are widely separated it is better, as soon as the skin has recovered from the trauma, to remove the fragments of the patella rather than to attempt to fix them together. Such a task must be very difficult, and at the best the result will be a joint which is very sensitive and liable to swell upon even the slightest of injuries or over-use.

Compound Fractures

These are fortunately very rare, but are seen in motor-car or street accidents. In such cases the treatment of the fracture is of secondary importance, and attention must be directed to preventing the knee-joint becoming infected. As soon as possible, under an anaesthetic, the wound must be cleaned and any dirt or fragments of bone sticking out of the wound removed. It may be necessary to enlarge the skin wound to enable this to be done. The joint if widely opened must be washed out, but no attempt must be made to repair the damage to the capsule or patella. The surfaces of the wound may be approximated with salmon-gut sutures but not closed tightly, so that any serum which may collect can drain into the dressing and not collect under tension in the joint. The limb must be fixed in a Thomas splint, with skin extension applied to the leg. The dressing should be changed every day, and the stitches removed if any sign of infection appears. Should the joint become infected it will require treatment as for any other acute infective arthritis. When the joint has recovered from the risk of infection and the skin has completely cleared up, the fractured patella will receive the appropriate treatment.

Injuries Related to Fracture of Patella

There are two injuries very closely related to fractures of the patella which require consideration.

Rupture of the Quadriceps Tendon.—This is usually a complete transverse tear, and in nearly every instance if not treated surgically results in a very weak limb. The operative treatment is simple. Through a transverse incision directly over the site of the tear the damaged tendon, with its expansions, is sutured with interrupted catgut. This does not take very long, and the after-treatment is similar to that used in those cases where the patella has been removed. If the rupture is only partial, conservative treatment will give a satisfactory result.

Rupture of the Patellar Tendon.—This is a very rare accident. If the tear is only partial the limb should be fixed in full extension in plaster for six weeks and the patient permitted to get about on crutches. After removal of the plaster active movements may start and, provided full voluntary extension is maintained, flexion may continue to be increased. If, however, the tendon has been completely torn off the lower pole of the patella, conservative treatment will not be sufficient. The patella is pulled up to a higher level by the quadriceps, while the tendon itself contracts. In these circumstances the site of the injury must be explored and the damage repaired. There is little tissue left on the patella to which to suture the tendon back, and it is therefore necessary to use a fascial graft to repair the damage. The lower part of the patella is drilled transversely so that the graft can be threaded through. It is then sutured to the tendon whilst the patella is held by a sharp hook. The limb must be fixed in plaster for six weeks, after which time the quadriceps must be toned up and active movements of flexion begun. Full function will not be restored for four to six months.

Traumatic Dislocation of Patella

This injury is a very rare one. It is always an outward dislocation. The patient is found in acute pain, with the knee held in a position of flexion at about 45 degrees. It may be that some friend has pulled the limb straight and the dislocation has been reduced before medical aid is sought. If the dislocation is seen soon after it has taken place it may be reduced without an anaesthetic. The limb should be held as straight as possible and, with one hand made into a fist placed behind the knee, the patient is instructed to try to press the knee against the hand. This will result in a relaxation of the hamstring muscles, and quite light pressure upon the outer border of the patella will enable it to be lifted forwards, when it will at once slip back into position. If this cannot be done, or if the patient is very nervous, the dislocation may be reduced under gas. Subsequent treatment deals with the traumatic synovitis which results. A pressure pad and bandage are applied to prevent the collection of fluid in the joint, and treatment given to the quadriceps. The joint will lack strength and be sensitive to stress for perhaps a week or two, so that it may swell up. Traumatic dislocation of the patella seldom recurs, and in this respect is essentially different from the habitual or recurrent dislocation which is due to an anatomical abnormality.

THE USE OF RADIUM IN WAR-TIME

WITH APPENDIX ON RADIUM POISONING

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RADIUM UNDER WAR-TIME CONDITIONS

In response to inquiries concerning the necessity or otherwise for rendering radium permanently out of commission under war-time conditions, we submit the following statement of the position as it seems to us.

The Danger Inherent in Use of Radium in War Time

The danger to life lies in the possibility that through a direct hit by high explosive on a building in which the radium is in use the radium containers might be broken and the naked radium liberated, since radium element which has entered the body is only slowly eliminated and may produce severe injuries and ultimately death.¹ If naked radium is lying about in the open air there will be serious risk that some will be breathed as radium dust. Even in a laboratory where radium is handled under comparatively carefully controlled conditions it is possible to detect radium dust in a sample of the air in the room. Further, the amount of radium which is lethal when fixed in the body is definitely known to be extremely small—namely, about one-millionth of a gramme.¹ Thus the complete destruction of a ward in which 500 mg. of radium was in use on a number of patients might liberate many thousand lethal doses of radium.

It is difficult to find data on which to base an estimate of the proportion of the radium breathed which becomes fixed in the body. By experiments with animals it has been found that of the radium which enters the blood stream 50 per cent. is

¹ See Appendix, "Radium Poisoning."