

BUMPER FRACTURE OF THE KNEE

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In 1929, Cotton and Berg¹ coined the name bumper fracture for the injury caused by the impact of the automobile bumper against the outer aspect of the extended knee. Their definition reads in part: "This is the fracture of the outer side of the tibial head, produced by abduction of the leg forcible enough to smash the external tuberosity against the fulcrum of the outer condyle of the femur." Many articles have been written on this subject since then, but there still exists considerable difference of opinion as to the most desirable method of treatment. In this brief communication we wish to discuss some of the problems involved and outline a plan of treatment that has aided us materially in preventing the knock-knee deformity which so commonly occurs.

The violence sustained is of the crushing type and, if severe, leaves the knee with a squashed, depressed, comminuted, external tibial condyle. On examination, the most characteristic finding is the marked lateral instability of the joint which permits the leg to be abducted on the thigh to a varying extent. The external semilunar cartilage may be dislodged or even forced down between the condylar fragments. The tibiofibular joint is disrupted and the head of the fibula is sometimes crushed. The external and internal lateral ligaments are torn or remain intact, depending on the severity of the injury.

Many different methods of reduction, both open and closed, have been devised. In principle, all these seek to obtain restoration of an even tibial articular surface and to correct the knock-knee deformity. Even with a minor amount of persistent depression of the external condyle, the knee will be forced into a valgus position when weight bearing is started, and the entire limb will be thrown out of proper alignment. The type of reduction adopted will depend on the exact nature of the fracture and to determine this accurately, it is necessary to have multiple roentgenograms which are made not only in the anteroposterior and lateral positions, but also at quarter angles. With the aid of these, the fracture may be classified in one of three groups according to the following simple scheme:

1. Those in which the condyle has been displaced mainly in a lateral direction (squash fracture).

BUMPER FRACTURE OF THE KNEE

2. Those in which the condyle has been displaced mainly in a downward direction without extensive comminution (depression en masse).

3. Those in which the condyle has been comminuted and depressed.

For the first class, closed reduction is indicated. This may consist of pounding the condyle with a mallet in an upward and inward direction or compressing the site with a carpenter's wood clamp fashioned after Boehler's redresseur for calcaneal fractures. Great caution should be exercised to avoid injury to the soft parts, especially the common peroneal nerve. The reduction may be carried out immediately or after a week or ten days. The latter has the advantage of allowing organization to proceed to the stage when the fragments are more likely to remain in position. The leg should then be immobilized with the knee in varus.

For the second class, closed reduction may be tried if there is only a single fragment, but open operation will give better results in the majority of cases.

For the third class, and unfortunately most cases are in this group, open operation gives the best chance of preserving optimum joint function. The problem is, first, to elevate the depressed fragments so that the external condyle is on a level with the internal condyle and, secondly, to maintain the fragments in the corrected position.

The details of the operation will depend on the findings. The fracture site is approached through a longitudinal incision along the lateral aspect of the knee. The contour of the condyle should be reestablished by elevating the crushed bone with a dull chisel, periosteal elevator, or similar instrument, until the articular surface is even and level. When the comminution is extensive, it may be necessary to insert bone chips or a single solid graft taken from the crest of the tibia. An attempt should be made to save the external semilunar cartilage but there are cases in which this has to be sacrificed. This in itself need not be a source of disability since it is well known that joint function is not necessarily dependent on the presence of the semilunar cartilages.

In fractures of the second class and in the less extensively comminuted fractures of the third class, the depressed fragment or fragments may be retained in position by a suitable peg or screw. Some surgeons have suggested passing a small bolt from the lateral to the medial side of the tibia to obtain compression, but we have not found it necessary to resort to this procedure.

Just as important as the need of accurate reposition is that of main-

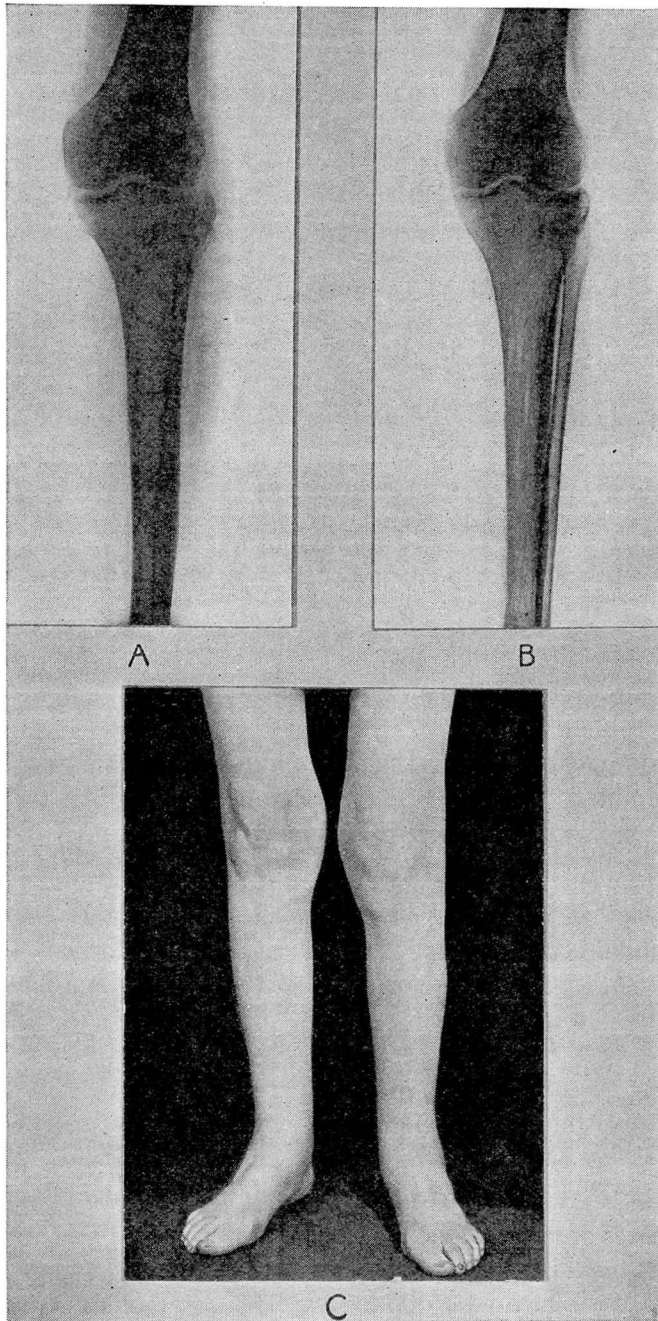


FIGURE A.—Before reduction. Squashed comminuted fracture of external condyle with marked outward displacement.

FIGURE B.—Five months after reduction. Outward displacement corrected. Tibial articular surface even and level.

FIGURE C.—The fracture occurred in the left knee. There is no valgus deformity and the knee has active, painless motions from complete extension to well over 90° flexion.

BUMPER FRACTURE OF THE KNEE

taining the reduction, and it is here that, in our opinion, many errors occur. During the operation and the application of the plaster cast, the knee must be forced into the maximum varus position. Particularly in cases with marked comminution, we have frequently found that, in spite of strict precautions, some depression of the condyle would recur and subsequent roentgenograms would show to our chagrin that less correction existed than had been accomplished at operation. This was in all probability due to the unavoidable handling of the limb while the cast was put on. Such an occurrence can easily change the outcome of an otherwise carefully planned operation. For that reason we have adopted the following technique which has been exceedingly helpful in preventing any untoward postoperative displacement.

After roentgenograms have been taken and operation has been decided on, the knee is manipulated into the maximum varus position and a cast applied, reaching from the trochanters to the toes. The cast is then allowed to harden and a large window is removed from the outer side, exposing the lateral aspect of the knee. The operation, according to the indications mentioned above, is then carried out through the window. It has given us a sense of confidence to know that when the comminuted fragments are replaced, they will remain in position without any chance of shifting by inadvertent movements. We also believe that this method minimizes the need for the various types of pins and screws that have been used.

The accompanying illustrations show the roentgenograms as well as the postoperative result of a typical case treated by this method.

Plaster protection is continued for a period of eight to ten weeks and after this time active motion is started. Weight bearing is postponed for another two weeks, and then the limb should be protected for at least several months by means of a Thomas walking caliper with a leather cuff to support the knee in varus.

REFERENCE

1. Cotton, F. J. and Berg, R.: "Fender fracture" of tibia at knee, *New England J. Med.* 201:989-995. (November 14) 1929.