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FUSION OF THE KNEE JOINT WITH INTERNAL FIXATION BY STAPLES

A Preliminary Report

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Fusion of the knee joint is a procedure which, in carefully selected cases, presents the best solution for the ailing patient. Techniques advocated to achieve solid union between the components of the knee joint have changed, starting with the simple removal of cartilage (Hibbs 1930) and going on to internal fixation by bone grafts, screws or nails (Green et al. 1967). During the last two decades the Charnley compression method has been preferred by many (Charnley 1948, Charnley & Baker 1952, Charnley & Lowe 1958, Stewart & Bland 1958). The difficulty encountered in these cases is the maintenance of a strong contact between the denuded bone surfaces and the prevention of even slight movement between the components of the joint. The long lever of the lower leg and the thick muscle mass around the femur are the reason for the inadequacy of P.O.P. immobilization, even if a plaster spica is used.

By compression arthrodesis, very good contact and immobilization are achieved, necessitating only a groin-to-ankle plaster tutor. There are, however, some disadvantages to this method which were encountered in our series. The apparatus is bulky, protruding on both sides of the knee. Twice, one of the pins broke, making a new intervention necessary. The changing of a plaster cast is difficult because of the pins and apparatus included in the soiled postoperative cast. There were some cases with pin track infections, one of them with extension of the infection to the fusion area.

In order to avoid these disadvantages we have used staples for internal fixation. Staples have been used before for internal fixation in other joints (Allredge & Riordan 1953, Kirkaldy-Willis et al. 1958).

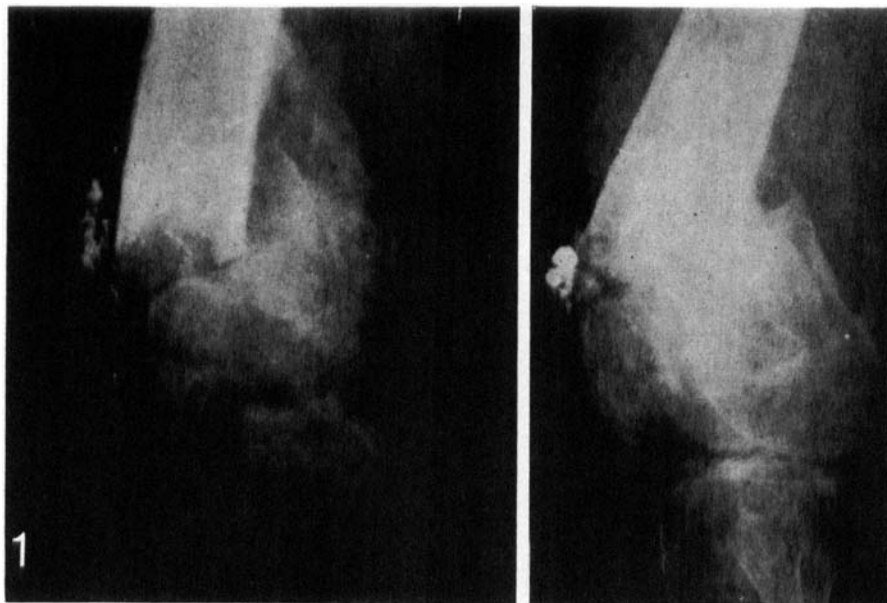


Figure 1. Case 1.—State after compound comminuted fracture of the Supracondylar region of right femur.

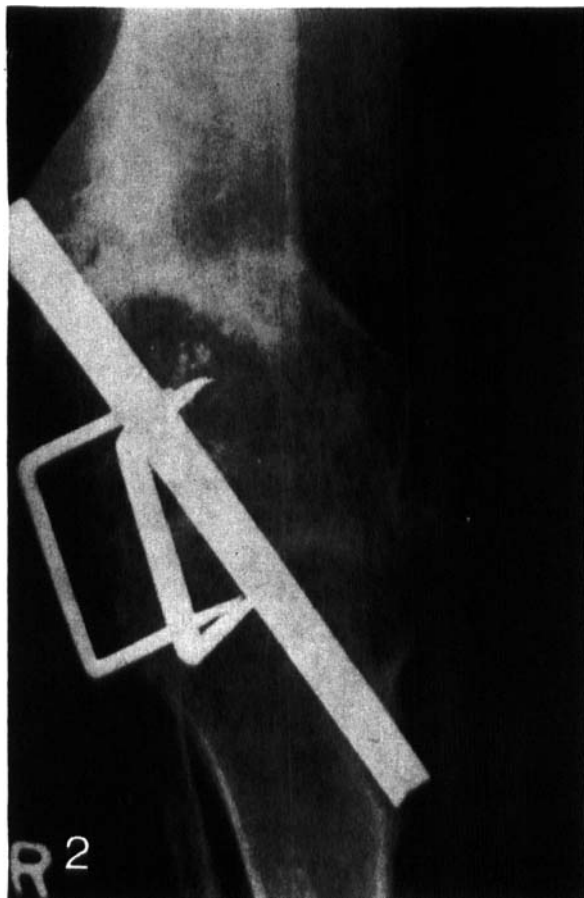
For the knee joint we used staples made locally of stainless steel, measuring six cm for the span and four cm for the legs.

METHOD

The knee joint is opened widely by a Kocher incision reaching from the medial femoral condyle, in the form of a U, to the tibial tuberosity and on to the lateral femoral condyle. The soft tissues of the knee joint are excised, the bone surfaces are denuded of cartilage, and care is taken to obtain good contact of the bone surfaces in the desired position. The assistant maintains the contact with manual compression of the joint components. Four staples are driven in, crossing the joint at different angles, converging against the center of the joint, two in front and two from the sides. The wound is sutured and a groin-to-ankle tutor plaster cast is applied. This cast is changed easily whenever necessary, until solid fusion has been achieved.

CASE REPORTS

Case No. One: O.L., age twenty seven, female, was admitted for knee fusion about one year after an accident which caused a compound and comminuted supra-



*Figure 2. Case 1.
14 weeks after fusion by
a Smith-Peterson nail
and two staples.*

condylar fracture of the right femur. A compression arthrodesis was inadvisable because of the shift of the femoral shaft anterior and lateral to the knee center. After denuding the joint surfaces, a long Smith Peterson nail was driven in from the lateral femoral condyle, crossing the joint and penetrating the tibial cortex medially. This internal fixation proved to be unstable. Two staples were added in front of the joint. The internal fixation was then very stable. The wound was closed. Sound fusion followed after fourteen weeks in P.O.P. (Figures 1, 2, 3).

Case No. Two: A.J., age fifty five; fusion of the right knee was performed because of opst-traumatic arthritis. The joint surfaces were denuded and four staples were inserted. The internal fixation was felt to be very stable on the operation table. The wound was closed and P.O.P. applied. Sound fusion was achieved in twelve weeks (Figures 4, 5).

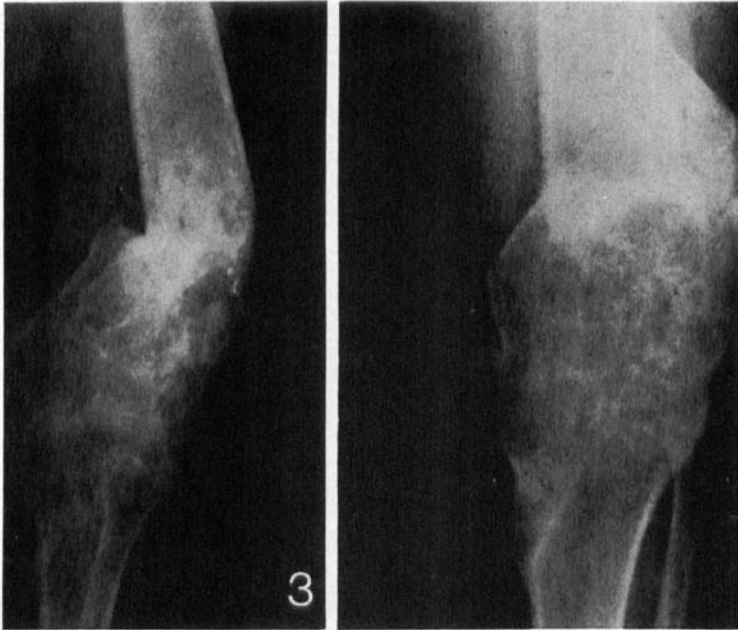


Figure 3. Case 1.—Six months after fusion, four weeks after removal of nail and staples.

Case No. Three: S.B., age fifty two; a patient with advanced arthritis. Four years before admission a surgical intervention had been performed on the left knee, probably a synovectomy. Fusion was performed because of severe pain and disability. Good stability was achieved by four staples before wound closure. Groin-to-ankle P.O.P. was applied for four months. Bony union was confirmed by X-ray after sixteen weeks (Figures 6, 7).

DISCUSSION

The advantages of this method are obvious. The technique is very simple. It does not necessitate special instruments, as these big staples may be driven in with a simple hammer, without drivers or impactors. The internal fixation achieved is very stable from the start. Cortical bone is very thin around the knee and the legs of the staples penetrate easily into the cancellous bone. No P.O.P. hip spica is necessary. An ankle-to-groin plaster is sufficient for external fixation, which may be changed for removal of sutures or because of muscle atrophy without endangering the fusion area by moving the leg.

This method does not maintain compression between the compo-

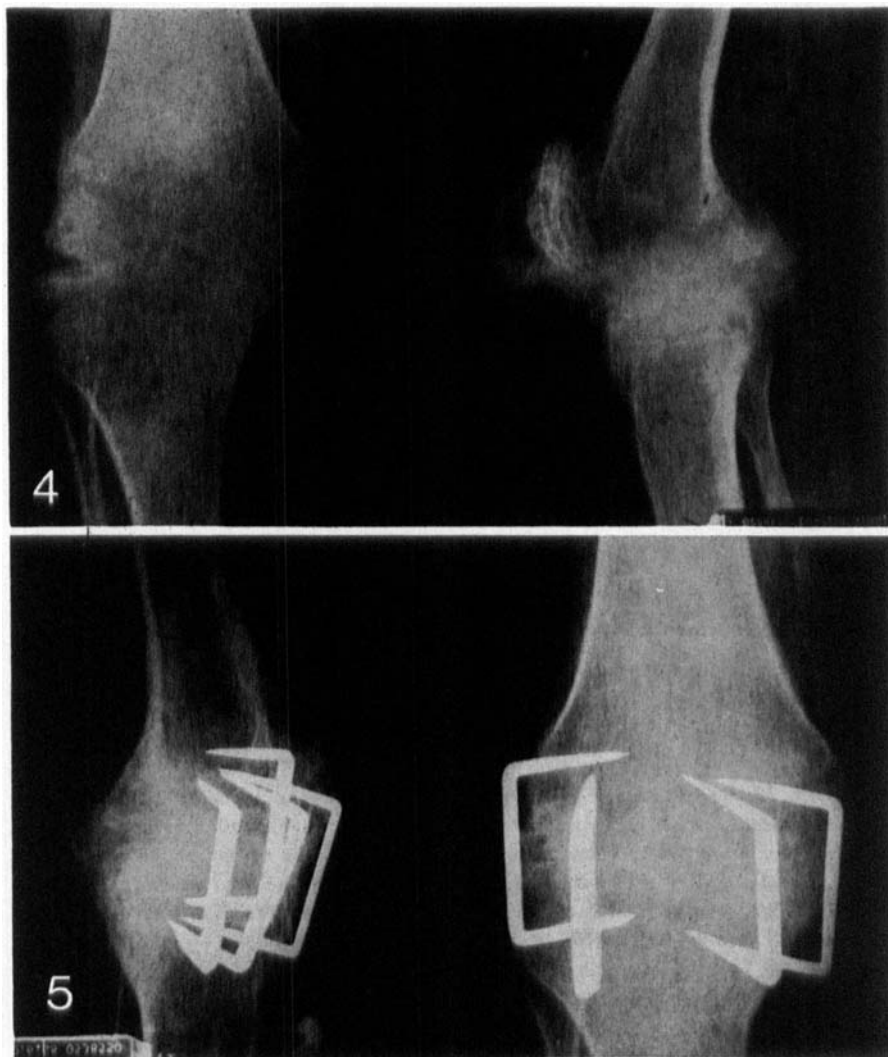


Figure 4. Case 2.—Post traumatic osteoarthritis.

Figure 5. Case 2.—Twelve weeks after fusion by four staples.

nents of the knee joint, which may be a draw-back in comparison with Charnley's method. The small number of operations performed does not allow conclusions to be drawn, although union took place in all of them within a reasonable time. According to Green et al. (1967), who published the results of 124 cases of knee fusion, the time needed

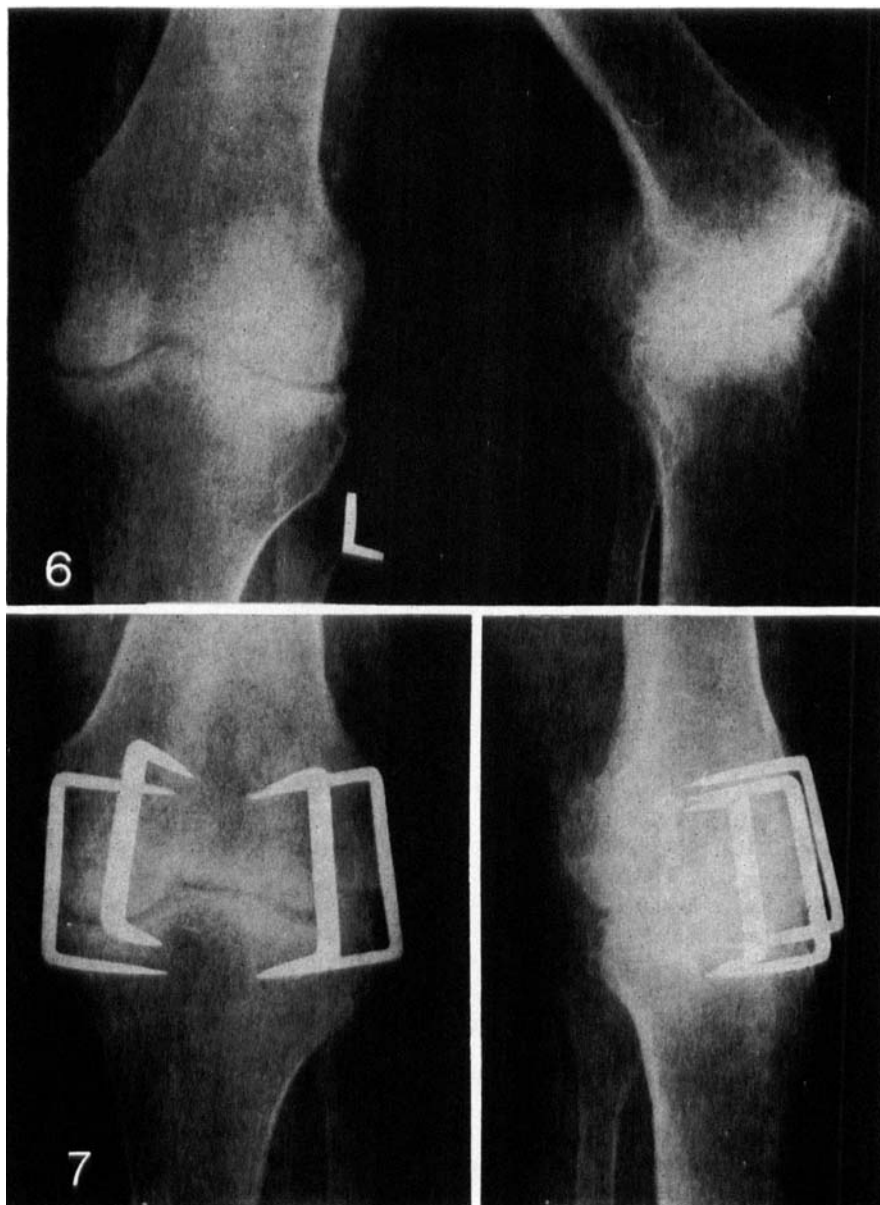


Figure 6. Case 3.—Rheumatoid arthritis. Before knee fusion.

Figure 7. Case 3.—Sixteen weeks after fusion by four staples.

for achieving fusion is not related to the type of fusion technique. They obtained the same average fusion time with compression and with internal fixation of different types. According to their statistics, the time for fusion depends basically only on the type of pathologic lesion and not on the fusion technique. Furthermore, they found that in twenty cases of compression arthrodesis there were three non-unions, whereas in twenty four cases of Hibbs fusion combined with internal fixation (by screws, nails or grafts), there was no case of non-union.

It seems justified, therefore, to advocate a trial with the method described as it avoids most of the disadvantages of compression arthrodesis.

SUMMARY

A simple method of knee joint fusion with the aid of four big staples is described. This method avoids the disadvantages of compression arthrodesis. The time required for immobilization in plaster of Paris until sound fusion was reached, in the reported cases, was from twelve to sixteen weeks.

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