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A NEW COMPRESSION PLATE FOR HIGH FEMORAL OSTEOTOMY FOR OSTEOARTHRITIS OF THE HIP

Preliminary Report

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During the last few years some new nails and plates for high femoral osteotomy have been designed, most of them have meant compression between the two bony fragments, which must be said to be a great improvement compared with former devices.

Figure 1 shows a new compression plate. It is 174 mm long and 12 mm wide. The head of the plate is bent twice at an angle of 90 degrees and has been given the form of a thin tip. The other end of the plate is also given the form of a thin tip, but straight. Though this tip one hole is drilled and through the stem of the plate four holes. Hole number three from the top is oblong. Three forms are supplied, a straight plate and plates bent at an angle of 10 and 15 degrees just above the top hole. It is made in 832 SL, an acid-fast steel from Avesta Jernverks AB, Avesta, Sweden. Zimmer stainless screws are used to avoid corrosion.

OPERATION

The patient lies supine on an orthopaedic table, Figure 2. The leg to be operated upon is slightly adduced, the other leg is extended, and the upper part of the body is bent slightly away from the operation side. This causes the greater trochanter to protude and facilitates insertion of the plate. The skin is incised laterally in the usual way, but the incision passes proximately by the greater trochanter half-way to the iliac crest. The upper end of the shaft of the femur is exposed in the usual way. The gluteal muscles are divided longitudinally and the top of the greater trochanter is made free. In a simple osteotomy a plate angled 10 or 15 degrees is chosen. If a 15-degree plate is chosen, the

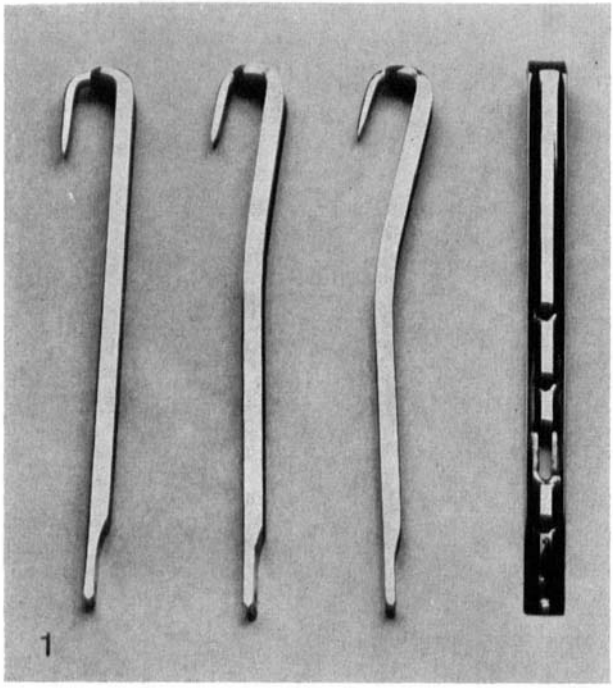


Figure 1. The new compression plate.

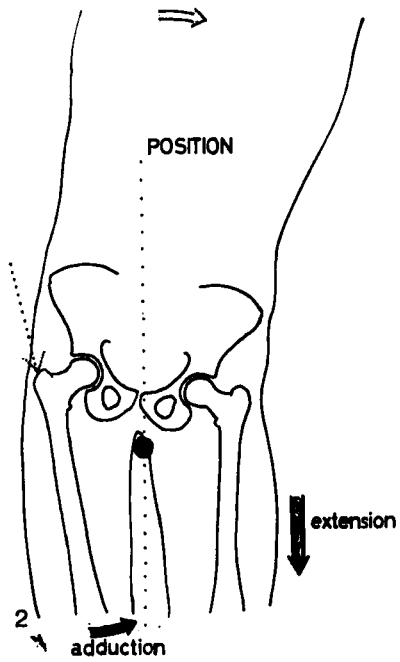
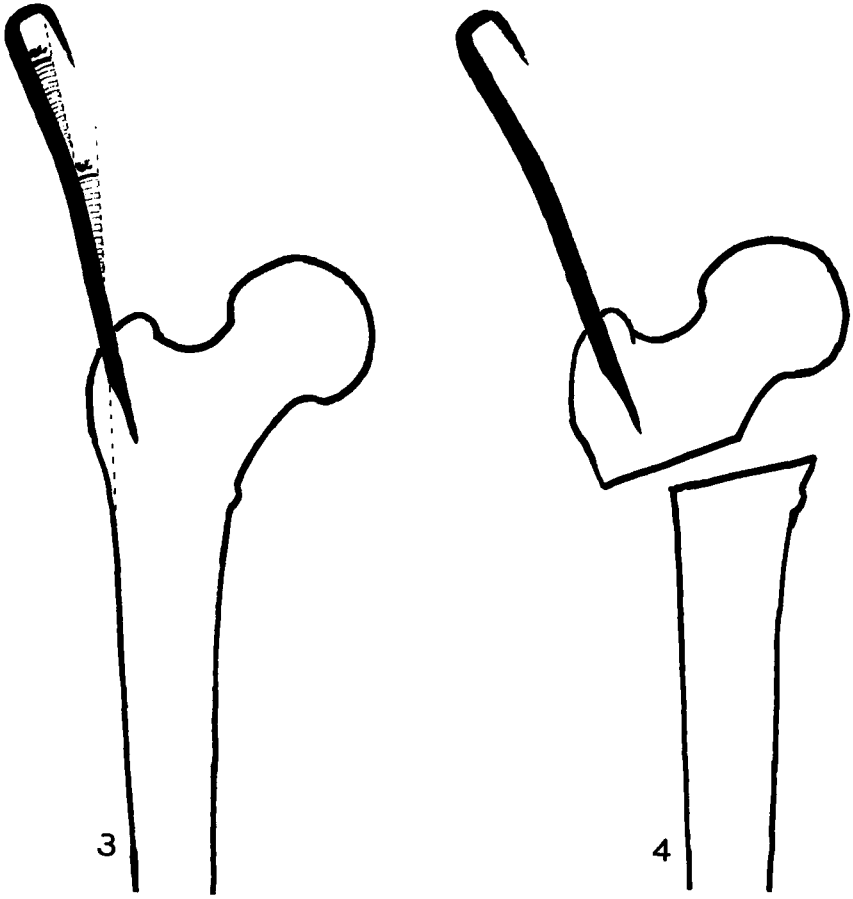


Figure 2. Position.

insertion of the tip of the plate must be just lateral to the top of the greater trochanter so that the direction of the tip of the plate makes an angle of 15 degrees with the shaft of the femur. The plate is inserted 3–4 cm to get a firm grip in the desired direction, Figure 3. After this, the osteotomy is performed in the usual way. The leg is extended a little to make the fragments free, Figure 4. The plate can now be driven in until the cross-piece of the head is pressed against the top of the greater trochanter and the thin tip of the head perforates the cortex at the base of the neck of the femur. The lower tip of the plate is now bent at an angle of 45 degrees with a Rush-pin bender, Figure 5, and a screw is driven in through the femur in the distal end of the oblong hole in the stem of the plate so as to adapt but not compress the plate to the shaft of the femur,



Figures 3–7. A simple osteotomy. $\alpha = 15$ degrees.

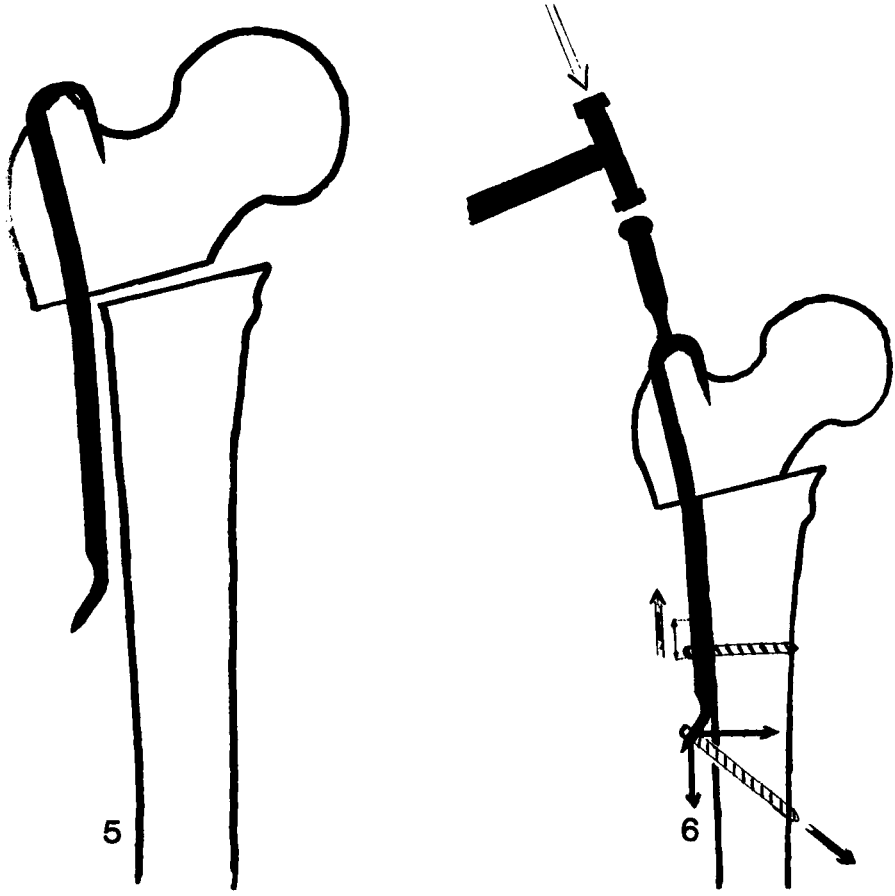
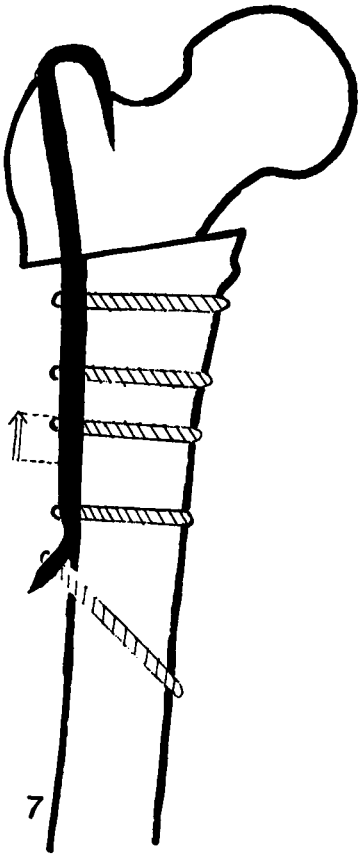


Figure 6. The plate and the two bony fragments are now adapted. The first compression is achieved by hammering the head of the plate into place. The degree of compression can be recorded by the head of the screw, which moves proximally in the oblong hole. When the tone of the hammer-strokes indicates that the two fragments have been compressed, the head of the screw in the oblong hole has usually moved 4–5 mm in a proximal direction, indicating the same measure of compression. This done, a screw is tightly driven in through the out-bent distal tip, i.e. obliquely to the shaft of the femur. The hole in the lateral cortex is made wider than the threads of the screw and the hole in the medial cortex of ordinary width. The direction of the screw gives the resulting force and the arrows indicate the components, Figure 6, in this way the final compression is achieved. In all the com-

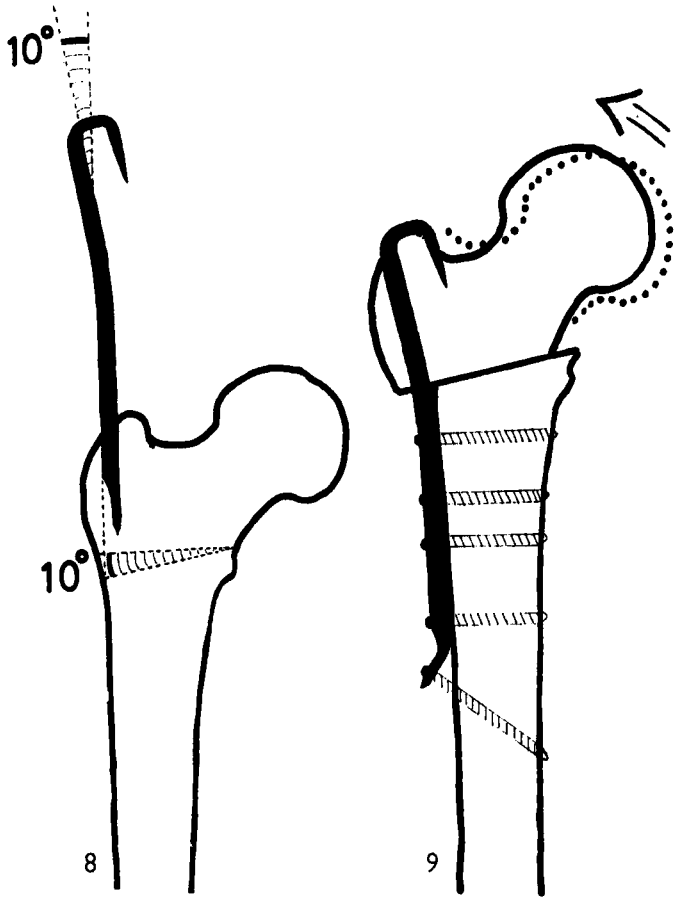
pression usually amounts to 5–8 mm. Finally, Figure 7, the other screws are driven in.

At the top of the greater trochanter the plate perforates the cortex twice. This means a firm fixation which prevents rotation and turning into varus displacement between the two fragments.



In wedge osteotomies for valgus angulation, for example 10 degrees angulation, the procedure is as follows: A 10-degree plate is chosen. The tip of the plate is inserted parallel to the shaft of the femur, Figure 8. A wedge of 10 degrees is taken out and the procedure is as above. The end result is shown in Figure 9.

In wedge osteotomies for varus angulation, for example α degrees, a straight plate is chosen, inserted at an angle of α degrees to the shaft of the femur, Figure 10. A wedge of α degrees is taken out according to the Figure. The end result is shown in Figure 11.

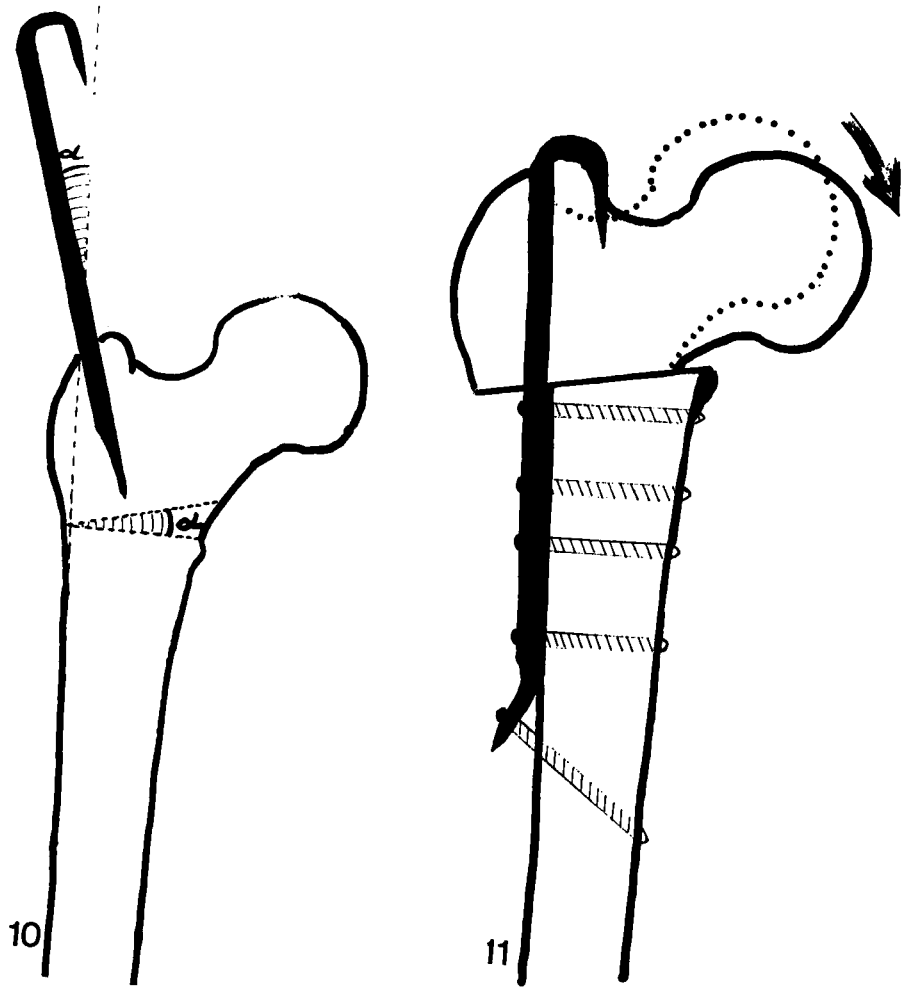


Figures 8 and 9. Valgus angulation.

Figure 12 shows an X-ray picture of a wedge osteotomy at a varus angulation of 10 degrees immediately after operation. Figure 13 shows a simple osteotomy, healed.

More than 40 patients have now been operated upon. In Patient 2 the plate fractured because it was too thin at the beginning. After this incident the plate was made heavier and since then no complications have occurred. No pseudarthrosis or delayed union has been registrated. Furthermore, the plate has been used at two operations where the patient had got a pseudarthrosis after osteotomy with other types of plates which did not give compression in the osteotomy. Both patients have healed without delay.

The postoperative treatment is as follows: On the third day after operation the patient can leave bed and is allowed to load the operated leg with one-sixth of the body weight, as the leg equals one-sixth of the body weight. As soon as the patient can manoeuvre well on crutches, that is, can easily go to bed and get up, manage stairs without help, he is discharged. This means that a male patient with strong arm muscles and a good wife at home can be discharged 2–3 weeks after the operation, while an older, fat woman with weak arms comes home considerably later. It is evident that the physical condition of the pa-



Figures 10 and 11. Varus angulation.

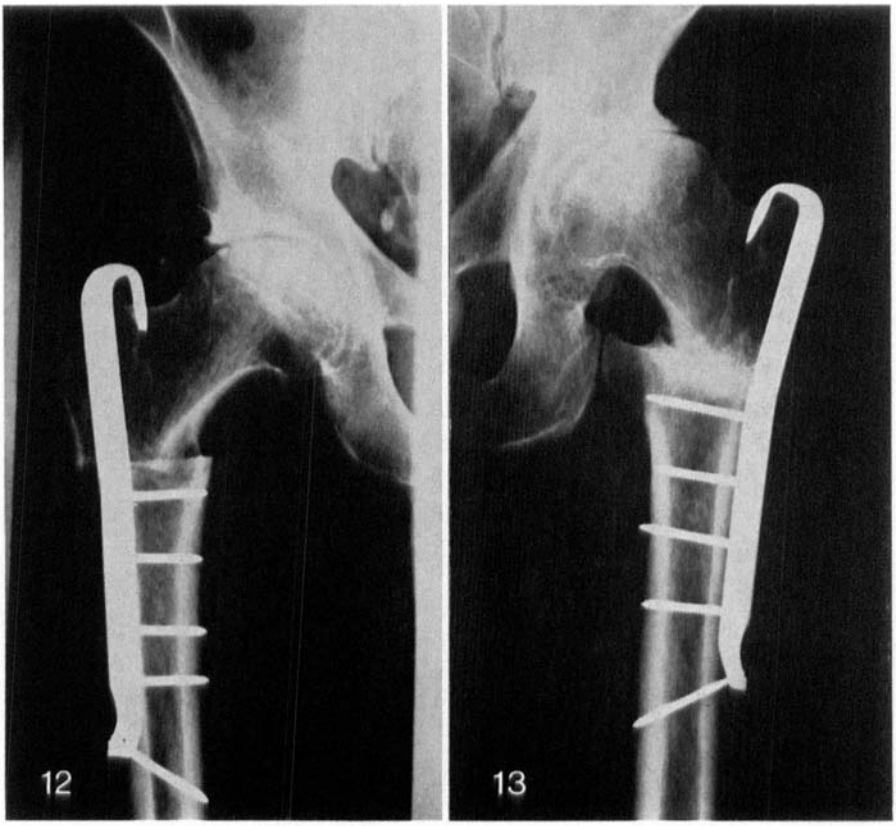


Figure 12. Varus angulation.
Figure 13. A simple osteotomy.

tient and his social conditions affect the length of the stay in hospital. As soon as bony callus is seen on the X-ray film, which occurs 4–7 weeks after the operation, the patient is allowed to load the leg gradually more. When the callus is strong enough—which occurs two to three months after the operation—the patient is trained to walk without sticks with both his arms elevated and his hands clasped above his head. The patient is trained to walk equal steps and to load his legs equally. This rapidly makes the hip abductors sufficient.

The forty patients have been followed three to twelve months. A follow-up of the group two years after the operation is planned.

DISCUSSION

A new compression plate for high femoral osteotomy with the following advantages is described:

1. It can be inserted from above in a distal direction, which from a purely mechanical point of view is sound when the problem is to compress two fragments.

2. No drill jigs or other special instruments are necessary. Hammer, stamp, screw-driver, and Rush-pin bender are available at every orthopaedic operation department.

3. Varus and valgus angulation can easily be performed.

4. Many plates, for example the Tupman and Nissen plates, protrude laterally at the greater trochanter and cause pain and other difficulties. Often the patient cannot lie on the operated side and the plate has to be extracted. The new plate goes through the greater trochanter and cannot cause such trouble.

5. The plate gives exact fixation and compression. The patient can get out of bed quickly. During the first three days in bed the physiotherapist teaches the patient to innervate his quadriceps and to bend his knee. The physiotherapist also has an easy job of teaching the patient to walk on crutches.

6. The patient is discharged after a few weeks, which reduces the costs of hospital stay.

7. No X-ray exposures are needed during the operation.

8. The operation generally takes no more than 30–45 minutes.

SUMMARY

A new compression plate, made of acid-fast steel, for high femoral osteotomies is presented. It is inserted from above in a distal direction. No drill jigs or other special instruments are necessary, and no X-ray exposures are required during the operation. The patient can leave bed on the third day after the operation.