A hip replacement prosthesis comprises an artificial ball mounted on or integral with an intermediate portion which abuts the end of the bone in question. A shank or stem having a plurality of screw holes is attached to the intermediate portion and is intended for intramedullary insertion. The intermediate portion has at least one locating hole and the stem has a plurality of spaced holes formed therein. The stem is inserted into the medulla leaving the locating holes in the intermediate portion exposed. A rectangular post is fitted into the locating holes and then a template having a rectangular aperture is fitted over the rectangular post. The template has a plurality of screw holes in it positioned, when in place, to be congruent with the holes in the stem. When the template is in place one or more holes are drilled transversely through the template, the near bone cortex, the corresponding prosthetic stem hole and the far cortex portion. The template is then removed and screws are then screwed through the aligned holes in the bone and the stem.

In ordinary bone fixation a similar technique is used except that at least part of the external plate or template is left on and the screws are screwed through it, the bone and the intramedullary nail.

5 Claims, 9 Drawing Figures
PROSTHETIC OR FRACTURE DEVICE AND METHOD

BACKGROUND OF THE INVENTION

A. Field of the Invention

This invention relates to devices and methods of prosthesis and fixation of bones.

B. Prior Art

It is customary in certain cases of disease or injury to replace the head (ball) of the femur, such as in cases of fracture, arthritic attrition, or other lesions. This has been done in the past by inserting a long prosthetic stem or shank with a ball at the upper end thereof through the medulla of the bone. The ball engages the appropriate socket of the pelvis. This prosthesis is maintained in position only by frictional contact of the edge or edges of the stem of the prosthesis with the adjacent wall of the medulla of the bone. Since the medulla of the bone is a curved passage way of irregular shape, the stem of the prosthesis does not contact it evenly along all points of its length. As a result, when the patient walks after the prosthesis has been inserted, there is often some loosening of the prosthesis in place. Furthermore, the metal construction of the ball often abrades or deepens the socket by friction therewith.

It has been known, in order to prevent movement of the prosthesis once inserted, to use a glue. Even if it were desired to further stabilize the position of the prosthesis by inserting transverse screws through appropriate holes in the stem, it would be difficult to locate the holes by fluoroscope since fluoroscope detail is not presently adequate for this purpose.

For fixation of long bone fractures an intramedullary nail has been inserted in the medulla. This nail may have a C-section, a square section or a + shaped section as shown in U.S. Pat. No. 2,675,801. In any event, this nail is usually rigid and straight whereas the medulla is curved and of non-uniform cross-section. Consequently, the nail does not fit tightly at all points within the medulla. As a result the nail moves and rotates about its axis.

In the past, another method of immobilizing the fractured bone has been to place a rigid plate outside the bone and drill a plurality of holes through it and the bone and then screw the plate to the bone by screws passed through the holes. This method had shortcomings in that the long lever arm of the long bone placed too much stress upon the plate. Hence, the transverse screws would often pull loose or the plate itself would bend. Even if the plate does not bend, and even if the plate has been applied under compression, the screws would still tend to pull out.

It is therefore among the objects of the present invention to provide improved devices and methods for installing bone-prosthetic devices and fixation of fractures which securely immobilize the devices within the bone and the bones themselves, thereby preventing rotation, loosening and damage to the prosthesis.

BRIEF SUMMARY OF THE INVENTION

For prosthesis or for fixation of a bone fracture a rigid member is introduced into the medulla of a bone, the rigid member having a first set of spaced apertures. A plate having an identical second set of apertures is applied to the exterior of the bone in a position in which both sets of apertures are aligned with one another. A plurality of holes are then drilled in said bone inwardly through said second set of apertures, the holes being aligned with at least some of said first and second sets of apertures. Then the plate is removed and fasteners such as screws are inserted into said holes and through said first set of apertures thereby immobilizing the rigid member.

In some instances, the plate may be retained and the screws would be screwed through the second set of apertures in the plate, the drilled holes in the bone and the first set of apertures in the internal member.
post 20 as shown in FIG. 6. A rigid metallic plate 22 having an upper end section shaped to mate with the cut-out portion 21b of the U-member 21 is placed snugly therein as shown in FIG. 6. The plate 22 includes a plurality of apertures 22a which are spaced at predetermined distances from the post 20 and which are aligned with the screw holes 17a. Then a Loman clamp can be placed to hold the plate in proper position and a drill is used to drill through the bone cortex on either side of the intramedullary nail and through the drill holes 17a in the nail. The self-tapping screws 23 would then be screwed into the drilled holes and then the post 20 and the U-shaped member 21 would be removed.

If compression is desired, after the plate 22 is inserted matingly into the U-shaped member 21, drill holes would be made through the plate and the cortex of the bone on either side of the plate and through the screw holes of the nail 17. Compression screws and a compression device could then be placed on the appropriate portions in a conventional manner.

This novel structure takes advantage of the ability of the intramedullary nail to combat the long lever arm action on the fracture site and overcomes rotation of the intramedullary nail. If desired, the plate 22 could be placed on in such a way that it is used as a compression plate in conventional form.

Of course, in the embodiment shown in FIGS. 1-5 the member 12 could be made integral with the template 13 and could have any desired number of prongs and arrangement thereof to fit a corresponding number of holes 16d and arrangement thereof. The shape of the post 12 may also be made to any desired configuration. This is also true of the post 20 in the embodiment shown in FIGS. 7-9 and the shape and spacing of the screw holes 17a. Similarly, it is not necessary that the member 21 be U-shaped; it is only important that the orientation and spacing of the member 21 be fixed relative to the correspondingly shaped end of the plate 22 which must mate with it. Furthermore, the plate 22 may have any desired curvature or cross-section.

The intramedullary nail 17 may also take a number of forms, the one illustrated being shown merely as a suitable one.

Still other modifications and alterations, which do not depart from the essence of the invention, will occur to one upon reading of the present specification and perusal of the drawings. Consequently, it is desired that the invention be limited solely by the claims which follow.

I claim:

1. Medical therapeutic apparatus comprising:

a. a rigid member adapted to be wholly inserted into the medulla of a bone, said member having a first set of spaced apertures formed therein, said member also having position reference means including at least one aperture,
b. a rigid plate having a second set of apertures spaced from one another identically to the spacing of the apertures in said first set, and
c. means adapted to engage said (b) means and said position reference means thereby to bring the first and second sets of apertures in line with one another, said (c) means including:
   i. a pin for insertion into said aperture in said position reference means and
   ii. a holder separate removable engaging the pin and a portion of said plate in a predetermined position.

2. The combination according to claim 1 wherein a plurality of fasteners are passed through said first and second sets of apertures and into said bone.

3. The apparatus according to claim 1 wherein said holder is generally U-shaped and a terminal portion of said rigid plate fits therein.

4. A method of treating a human bone comprising:
   a. introducing into the medulla of said bone a rigid member having a first set of spaced apertures,
   b. applying to the exterior of said bone a plate having a second set of apertures spaced from one another identically to the spacing of the apertures in said first set, said plate being applied so that both sets of apertures are aligned with one another, including the steps of drilling a hole in said bone to locate one of the apertures of said first set, disposing in said last-mentioned hole a positional reference means which fits in said aperture so that a part extends outside of the bone, said reference means including a separate removable member having a portion which interfits with a terminal portion of said plate,
   c. drilling a plurality of holes in said bone inwardly through said second set of apertures in said plate, said plurality of holes being aligned with said first set of apertures in said rigid member, and
d. inserting into said plurality of holes a plurality of fasteners which pass through said first set of apertures thereby immobilizing said rigid member.

5. The method according to claim 4 wherein said plate is removed before said fasteners are inserted.

* * * * *
Claim 1, line 15, should read as follows:

   --ii. a separate removable holder engaging
   the pin and a--