ABSTRACT

An artificial hip-joint in which there is provided an endoprosthesis for the acetabulum, of which the outer surface is adapted to be embedded in the bony tissue of the pelvis, an endoprosthesis for the proximal portion of the femur having a head with a spherical surface rigidly connected by a neck with a shaft introduced into the femoral modular canal, and an insertion piece providing for a hinged joint between the acetabulum endoprosthesis and the endoprosthesis of the proximal portion of the femur, with the insertion piece having an inner spherical surface interacting with the spherical surface of the head. The height of the cavity of the insertion piece defined by the inner spherical surface is smaller than the radius of the head, and the insertion piece is fixed in the seat of the acetabulum endoprosthesis by a nut.

1 Claim, 1 Drawing Figure
ARTIFICIAL HIP-JOINT

BACKGROUND OF THE INVENTION

The present invention relates to artificial hip-joints employed in intra-articular prosthetic replacement surgery thereof. The invention is designed for restoration of hip-joint mobility lost in Behchterev's disease, arthritis deformans, arthritis infectious, aseptic necrosis of the femoral head, as well as in certain femoral neck fractures in the aged.

PRIOR ART

Artificial hip-joints are known in the art comprising an endoprosthesis of the acetabulum and an endoprosthesis of the proximal portion of the femur which incorporates a head, a neck, and a shaft introduced into the femoral medullary canal. The known acetabulum endoprosthesis may be of several designs, both in terms of the outer surface and the inner surface which is to be in contact with the head of the endoprosthesis of the proximal portion of the femur.

In one of the embodiments of the known artificial hip-joint, the outer surface of the acetabulum endoprosthesis is provided with a single long screw which is screwed through the acetabulum and into the wing of the iliac bone of the patient, thereby immobilizing the acetabulum endoprosthesis in the pelvis. The inner surface of this endoprosthesis of the acetabulum is semispherical in shape and the head of the endoprosthesis of the proximal portion of the femur is immersed into it to a depth equal to its diameter and remains there unfixed. (see: Journal of Bone and Joint Surgery, Vol. 50-B, No. 4, pp. 720–31).

Such a design has a disadvantage in that there exists the possibility of dislocating the head of the endoprosthesis of the proximal portion of the femur from the acetabulum endoprosthesis.

Another known artificial hip-joint comprises an acetabulum endoprosthesis, of which the outer surface is studded with tenons which help cement the acetabulum endoprosthesis in the pelvis (see: Teta Orthopaedica Belgica, 1965, Vol. 31, No. 5, pp. 681–97). The inner surface of this endoprosthesis is formed as a hemisphere, where the head of the endoprosthesis is fitted into the proximal portion of the femur.

This design is likewise insecure against the dislocation possibilities of the head of the endoprosthesis of the proximal portion of the femur. Another disadvantage is the need for cement.

The outer surface of the acetabulum endoprosthesis may also be provided with blades having apertures, through which the burgeoning bony tissue may advance (see: U.S.S.R. Inventor's Certificate No. 278,022, Cl. 30 d 1/01). The inner surface of this endoprosthesis of the acetabulum has a seat adapted to receive an insertion piece which is made in two halves. The outer surface of the insertion piece is designed to correspond to the shape of the seat, whereas its inner surface is formed as a sphere enveloping the spherical head of the endoprosthesis of the proximal portion of the femur such that the contact area is larger than the head hemisphere.

The mentioned insertion piece is designed to couple the acetabulum endoprosthesis with the endoprosthesis of the proximal portion of the femur. The coupling is effected by riveting the ends of the insertion piece onto the outer surface of the acetabulum endoprosthesis, thereby achieving a permanent connection.

The disadvantages of such artificial hip-joints consist in that they are difficult to install and that their separate component parts are not interchangeable.

Thus, out of the known artificial hip-joints, some are dismountable but not secure against the dislocation of the head of the endoprosthesis of the proximal portion of the femur from the acetabulum endoprosthesis, whereas others are non-dismountable and unwieldy not only at surgery, but also when it is required to replace one of the component parts of the artificial hip-joint.

SUMMARY OF THE INVENTION

An object of the present invention, therefore, is to provide an artificial hip-joint, which is dismountable and which may be assembled during surgery and which simultaneously prevents the head of the endoprosthesis of the proximal portion of the femur from being dislocated from the acetabulum endoprosthesis.

In accordance with the above and other objects, the present invention contemplates providing an artificial hip-joint, comprising an endoprosthesis for the acetabulum, which the outer surface is adapted to be immobilized in the bony tissue of the pelvis and which incorporates a seat, and an endoprosthesis for the proximal portion of the femur having a head with a spherical surface, the head being rigidly coupled with the neck of a shaft introduced into the femoral medullary canal, and with there being an insertion piece mounted between the surface of the seat and the outer surface of the head providing for a hinged joint therebetween, the inner surface of said insertion piece having a spherical shape and interacting with the spherical surface of the head, wherein, in accordance with the invention, the height of the cavity of the insertion piece defined by the inner spherical surface thereof is less than the radius of the head, and with the insertion piece being fixed in the seat of the acetabulum endoprosthesis by a nut, of which the surface interacting with the head is spherical in shape.

The artificial hip-joint of this invention offers a number of advantages.

The endoprosthesis of the acetabulum and that of the proximal portion of the femur may be installed independently, which provides for the precision and the security of impact thereof to the bone. Furthermore, the proposed design permits the replacing of only one of the endoprostheses, if same is required.

The secure coupling of the two endoprostheses of the proposed artificial hip-joint eliminates the possibility of any dislocation of the endoprosthesis from the proximal portion of the femur or out of the acetabulum endoprosthesis.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the present invention will be appreciated from the following description of one embodiment thereof taken in conjunction with the accompanying drawing in which the sole figure is a partial section of an artificial hip-joint.

The proposed artificial hip-joint comprises an endoprosthesis 1 of the acetabulum and an endoprosthesis 2 of the proximal portion of the femur.

The endoprosthesis 1 of the acetabulum has a plurality of blades 3 mounted exteriorly thereof in tiers one
above the other. The blades have tapered edges and a plurality of cavities extending therethrough for the advancement of the burgeoning bony tissue. A seat is formed in another surface of the endoprosthesis of the acetabulum, which seat may be of a through type (as shown in the drawing) and of a non-through type. The endoprosthesis 2 of the proximal portion of the femur comprises a head having a spherical surface, a neck, a stop lug and a tapered shaft which is to be introduced into the femoral medullary canal. There are apertures formed in the shaft, through which the burgeoning bony tissue may advance.

The shaft 9 has a pin for fixing the trochanter major.

In order to provide a hinged joint between the endoprosthesis of the acetabulum and the endoprosthesis of the proximal portion of the femur, an insertion piece is provided between the head 6 and the seat 5. The outer surface of the insertion piece corresponds in shape to the inner surface of the seat, whereas the inner surface of the insertion piece 12 is spherical. The height of the cavity of the insertion piece is defined by the inner spherical surface thereof is smaller than the radius of the head 6 by a value a. The insertion piece 12 is fixed in the seat 5 by a nut, of which the inner surface interacting with the head is spherical. The outer surface of the nut 13 is threaded, and the seat 5 has a corresponding thread at the section which interacts with the nut 13. The nut 13 is provided with a locking means to prevent self-unscrewing. If the endoprosthesis of the proximal portion of the femur is assembled by the manufacturer, the nut 13 is fitted over the neck 7 before the head is press-fitted in place. The nut 13 may also be fitted at the side of the shaft introduced into the femoral medullary canal. In such a case, a large-diameter washer should be placed under the stop lug after the nut 13 has been fitted.

Also, the nut 13 is provided with lugs serving for convenience and for nut tightening speed during surgery. The height and thickness of the nut 13 are chosen such that the nut 13 should ensure a reliable coupling and have optimum mobility for the head relative to the endoprosthesis. With this in view, it is recommended that the height of the nut be materially in excess of the value a and that the nut be flush with the plane of the last blade 3, as indicated in the drawing.

The artificial hip-joint of this invention is installed during surgery in the following manner. Prior to surgery the endoprosthesis of the acetabulum is separated from the endoprosthesis of the proximal portion of the femur by unscrewing the nut. The endoprosthesis of the acetabulum is impacted into the depression in the patient's pelvis prepared in advance. Then the shaft of the endoprosthesis is then inserted into the endoprosthesis of the acetabulum, after which the head 6 with the insertion piece 12 is fixed by the nut.

After the nut has been tightened, it is finally locked.

The artificial hip-joint of this invention facilitates the replacement operation, provides for the interchangeability of its various component parts and eliminates altogether any possibility of the dislocation of the endoprosthesis from the proximal portion of the femur, or out of the endoprosthesis of the acetabulum.

What is claimed is:

1. An artificial hip-joint comprising an endoprosthesis for an acetabulum having a seat; said endoprosthesis of the acetabulum having an outer surface adapted to be fixed in the bony tissue of the pelvis; an endoprosthesis for the proximal portion of the femur having a head provided with a spherical surface, a neck and a shaft rigidly connected by way of said neck with said head of said endoprosthesis of the proximal portion of the femur; said shaft being designed for introduction into the femoral medullary canal; an insertion piece installed between the surface of said seat and said spherical surface of the head and providing for a hinged joint between said endoprosthesis of the proximal portion of the femur; said insertion piece having a spherical inner surface which interacts with said spherical surface of the head; a cavity for said insertion piece defined by said inner spherical surface of the insertion piece; the height of said cavity being less than the radius of said head; a nut for fixing said insertion piece in said seat of said endoprosthesis of the acetabulum; said nut having a spherical surface interacting with said head and an external screw thread which cooperates with an internal screw thread of said seat, the nut having a lower end flush with the plane of the lower end of the endoprosthesis of the acetabulum and means for locking said nut.

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