United States Patent [19]

Swanson

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[54] **PATELLAR IMPLANT AND METHOD**

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[52] **U.S. Cl.** ..... **3/1.91;** 128/92 C

[51] **Int. Cl.**[2] **A61F 1/24**

[58] **Field of Search** ..... 3/1, 1.9–1.911; 128/92 C, 92 R

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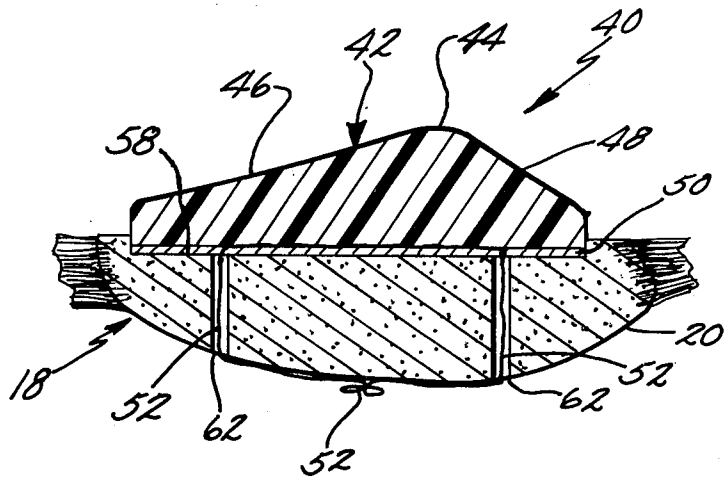
Primary Examiner—Ronald L. Frinks

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[57] **ABSTRACT**

A patellar implant replaces the damaged underlying cartilage of the patella. The implant, formed of silicone rubber, is contoured to fit into a depression formed in the resected posterior surface of the patella. The contact surface of the implant within the formed depression is covered with Dacron velour. Sutures are embedded in the Dacron within the implant. The sutures are pulled through four drill holes through the Patella to the anterior surface and tied in place. A smooth silicone surface is presented to the patellofemoral joint.

12 Claims, 8 Drawing Figures



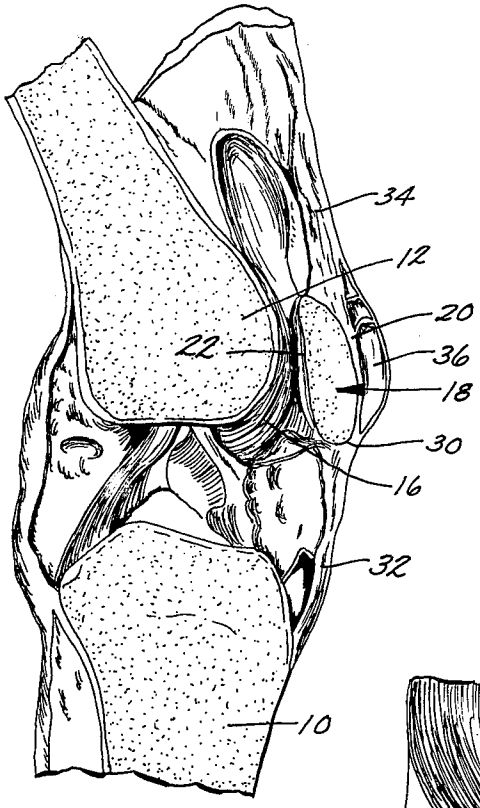


FIG. 1.

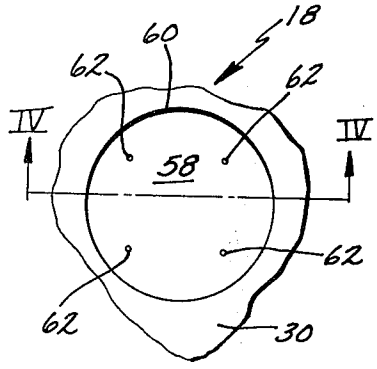


FIG. 3.

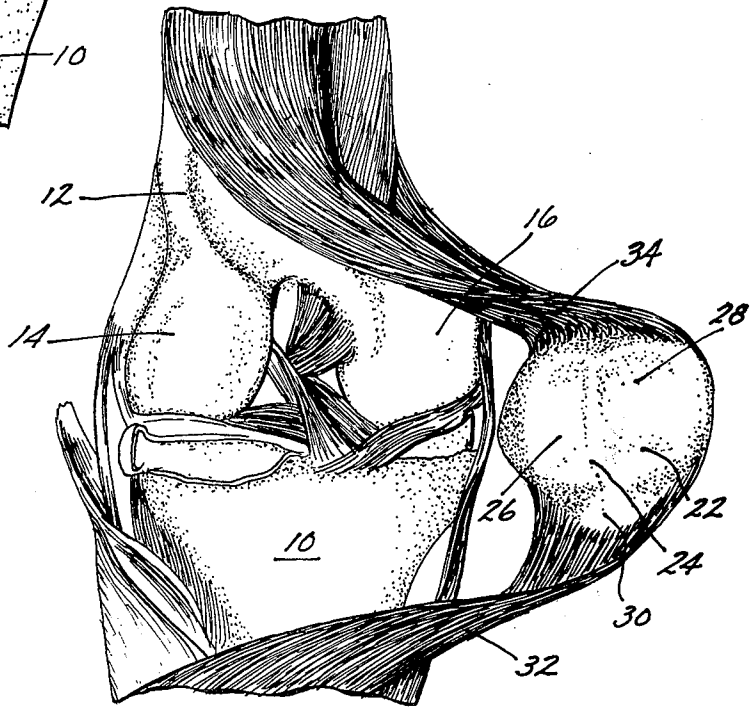


FIG. 2.

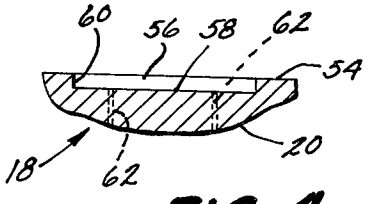


FIG. 4.

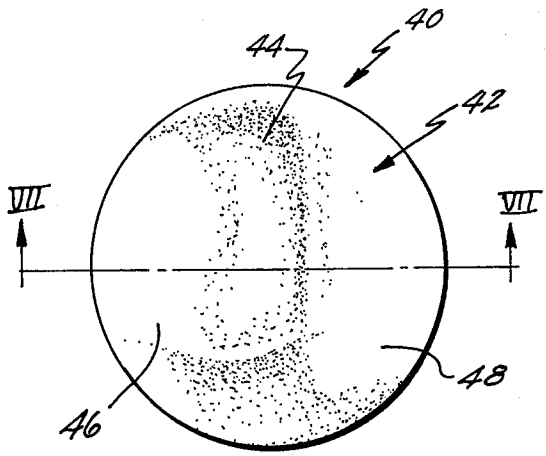


FIG. 5.

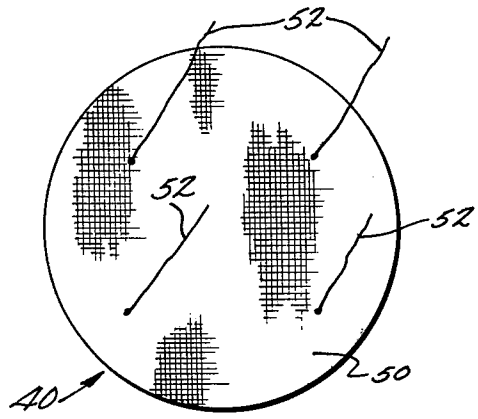


FIG. 6.

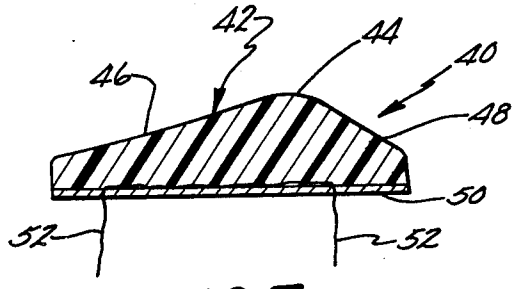


FIG. 7.

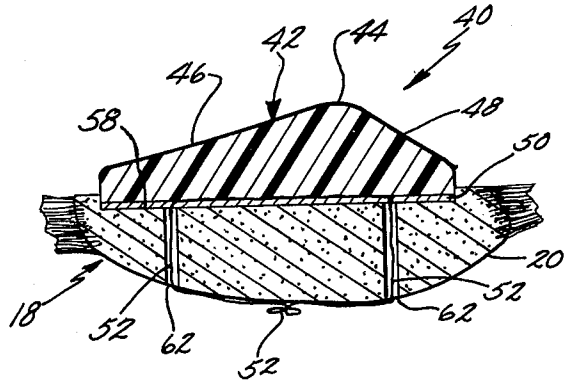


FIG. 8.

PATELLAR IMPLANT AND METHOD

BACKGROUND OF THE INVENTION

The present invention relates to surgically implantable prosthetic devices for replacing the posterior surface of the patella. More particularly, the invention relates to a patellar implant and a method for surgically installing the same which is particularly useful where it is desired to avoid patellectomy.

The replacement of damaged or diseased joints in the human body has been known for some time. If the device used to replace the natural joint structures was to be movable in a manner similar to the natural joint, it was once necessary to provide a multiple part structure of rigid clinically inert material. Generally, metals such as stainless steel alloys were used for this purpose. Such rigid structures, however, were subject to breakage and were difficult to implant and hold in place once implanted. The rigidity of the appliance can cause undue pressure on the underlying cartilage and bone. Furthermore, while some metals are considered to be clinically inert, some risk of deterioration of the device with time continues to exist.

One prior art patellar implant, for example, utilized a Vitallium cap pinned in position over the cartilage covered posterior surface of the patella for gliding movement upon the femoral condyles. Unfortunately, however, such devices are difficult to fix to the patella and eventually will work loose. Since the material is hard, there is also a certain amount of inherent abrasion against the adjacent bone surfaces and cartilage eventually causing the implant to hang up and cease to function properly.

SUMMARY OF THE INVENTION

The present invention overcomes the difficulties encountered in the prior art and provides a prosthetic implant for replacing the posterior surface of the patella. The implant is formed as a body of flexible inert material and replaces the underlying cartilage of the patella. The implant is particularly adapted for use in cases of chondromalacia when the femoral portion of the patellofemoral joint is reasonably smooth. One side of the implant is contoured or shaped to fit into a recess formed in the resected posterior surface of the patella. The opposite side, forms a new posterior surface for the patella and has a compound articular surface for gliding engagement with the femoral condyles.

The many objects and advantages of the present invention will become readily apparent to those skilled in the art from a consideration of the following detailed description of the preferred embodiment of the implant and method for installing same when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical cross section of a knee joint;

FIG. 2 is a front view of the knee joint with the patella rotated to expose its posterior surface;

FIG. 3 is a fragmentary view illustrating the resected posterior surface of the patella, the support ligaments and the like having been removed for clarity;

FIG. 4 is a cross-sectional view taken along plane IV—IV of the patella shown in FIG. 3;

FIG. 5 is a top plan view of the patellar implant of the invention;

FIG. 6 is a bottom view of the patellar implant shown in FIG. 5;

FIG. 7 is a cross-sectional view of the patellar implant taken along the plane VII—VII of FIG. 5; and

FIG. 8 is a cross-sectional view illustrating the implant of FIG. 7 installed in the resected portion of the patella of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, a human knee joint and the patella are illustrated in simplified diagramatic form while the implant of the invention is illustrated in detail in FIGS. 5–8. With specific reference to FIGS. 1–4, a simplified anatomical illustration will be briefly described to aid in a better understanding of the structure and installation of the patellar implant. Basically, the knee joint shown in FIGS. 1 and 2 provides a connection between the upper end of the tibia bone 10 and the lower end of the femur bone 12. The lower end of femur bone 12 is formed with a pair of generally rounded surfaces 14 and 16 known as the femoral condyles. The inner condyle of the femur is generally identified by the numeral 14 while the outer or external condyle is identified by the numeral 16.

The tibia 10 and femur 12 are connected by various ligaments and like connective tissues known to those skilled in the art. The patella generally designated by the numeral 18 is a sesamoid bone somewhat triangular in shape (FIGS. 2 and 3) and situated in front of the knee joint. The outermost or anterior surface 20 (FIGS. 1 and 4) of the patella is slightly convex. The inner or posterior surface 22 of a normal patella is generally concave and in great part cartilage covered, forming a compound articular surface for gliding on the femoral condyles. A slightly marked vertical ridge 24 divides the posterior surface 22 into an external articular facet 26 for gliding engagement with the outer condyle 16 and an inner or internal articular facet 28 for gliding engagement with the inner condyle 14. The lower portion of the patella tapers to a blunt point 30 which is embedded in the patellar ligament 32 while the upper portion is held by the quadriceps tendon 34 associated with the tissues of the femur bone. The bursa 36 is located between the anterior surface 20 of the patella and the skin.

Referring additionally to FIGS. 5–7, the patella implant designated by the numeral 40 is generally circular in configuration and has a top or upper surface 42 which corresponds generally to the configuration of the posterior surface 22 of patella 18 illustrated in FIG. 2.

Preferably, the patellar implant 40 of the invention is molded of flexible elastomeric physiologically inert material. CLEAN ROOM DOW CORNING Silicone Rubber Compound No. MDX4-4515 available from the Dow Corning Corporation, Midland, Mich., is one material selected to meet the requirements of the patellar implant. While the prosthetic implant is described as being made of silicone rubber type materials, it will be realized that other flexible, clinically inert materials having sufficient strength may be used.

The upper surface 42 of implant 40 is molded to include surface areas generally corresponding to the surfaces found on a normal patella. These surfaces include a vertical ridge 44 dividing top surface 42 into an outer, larger curved, surface portion 46 corresponding to the external articular facet 26 and a smaller inner curved, surface portion 48 corresponding to the internal articular facet 28. These surfaces 46 and 48 are adapted for gliding engagement with the outer and

inner condyles **16** and **14,** respectively.

To aid in the installation of the implant as will be hereinafter described, the base or back of the implant **40** is covered with a thin layer of fabric **50.** Preferably, the fabric **50** is a Dacron velour secured to the back surface in any conventional manner as by suitable adhesive or if desired may be fixed simultaneously with molding of the implant.

Two sutures **52** are passed through fabric so as to have their midportions sandwiched between the fabric and the implant. The extremities of the sutures hang free for use in the manner to be described. Preferably, a polyester, clinically inert, suture material is provided as, for example, Tycron.

Referring additionally to FIGS. **3, 4,** and **8,** the preparation of the patella **18** and installation of the implant **40** will be described. By means of conventional surgical techniques, the posterior surface **22** of patella **18** is exposed by slitting the supporting side tendons and rotating the patella to expose the posterior surface **22** thereof. The patella is rotated generally about an axis parallel to the tibia **10** and femur **12.** The posterior surface **22** of patella **18** is resected to remove the damaged areas such that a generally flat surface area **54** remains. A circular relief or depression **56** is formed in the resected posterior surface of the patella to accept the implant, the damaged underlying cartilage on the posterior surface being removed in this process.

Circular depression **56** includes a bottom wall surface **58** and a side wall surface **60** upstanding therefrom. A series of four generally equally spaced holes **62** are drilled from bottom wall surface **58** through patella **18** to the anterior surface **20.** Openings **62** are spaced apart to correspond generally to the location of the sutures **52** extending from fabric **50** of implant **40.** After formation of the circular relief **56** and openings **62,** the implant **40** is positioned in recess **56** and secured to bottom wall **58.** Implant **40** is secured in the resected patella by first cementing it in place to provide an immediate bond, and in addition, by tying the sutures **52** at the anterior surface as illustrated in FIG. **8.** A physical bond between fabric **50** and bottom wall **58** of the recess can be provided by cement such as methyl methacrylate which fills in the spaces between the fabric material conforming to any surface irregularities of bottom wall **84** and eventually grows to the surrounding tissues. The upstanding side wall surfaces **60** stabilize the implant and prevent shifting of the implant with respect to the posterior surface of the patella.

Since the implant **40** is generally symmetrical in line VII—VII (FIG. **5**), about an axis defined by its position in the resected portion of the patella can be reversed, permitting the implant to be used to rebuild the patella of either the left or right knee. A suitable template is preferably utilized by the surgeon in forming the resection and locating the position for the drilling of the suture holes.

After implant **40** is installed and secured in the resected posterior surface of the patella, it is folded back into position with the formed surface of the implant in engagement with the condyles. Normal surgical procedures are followed thereafter to complete the operation.

Those skilled in the art will, of course, readily appreciate the many advantages of the present invention. Those so skilled will also recognize that many modifications may be made, and it is intended that modifications be covered unless the following claims by their wording expressly state otherwise.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A surgically implantable prosthesis for replacing the underlying cartilage on the posterior surface of the patella, the posterior surface of the patella having a recess provided therein, said prosthesis comprising: a body of flexible inert material, said body having a first compound articular surface corresponding generally to that of the posterior surface of a normal patella for gliding engagement with the femoral condyles; a second surface of said body opposite saaid first surface being adapted for positioning in the recess formed in the posterior surface of the patella; and means for securing said body in the recess.

2. A surgically implantable prosthesis for replacing the underlying cartilage on the posterior surface of the patella, the posterior surface of the patella having a recess provided therein, said prosthesis comprising: a body of flexible inert material, said body having a first surface forming a compound articular surface for gliding engagement with the femoral condyles; a second surface of said body opposite said first surface being adapted for positioning in the recess formed in the posterior surface of the patella; and means for securing said body in the recess, said securing means including said second surface having a layer of inert fabric secured thereon, said fabric adapted to form an interface between said body and a bottom wall of the recess; and suture means in and extending from said fabric, the patella having openings formed therethrough from the bottom wall of said recess to the anterior surface thereof to receive said suture means to secure said body in said recess to thereby position said first surface to form a prosthetic posterior surface on the patella.

3. The prosthesis of claim **2** wherein said securing means further includes a layer of acrylic cement on said fabric layer and adapted to contact the bottom wall of the recess.

4. The prosthesis of claim **2** wherein said fabric layer is Dacron velour.

5. The prosthesis of claim **4** wherein said fabric layer is Dacron velour.

6. The prosthesis of claim **3** wherein said acrylic cement is methyl methacrylate.

7. A surgically implantable prosthesis for replacing the underlying cartilage on the posterior surface of the patella, the posterior surface of the patella having a recess provided therein, said prosthesis comprising: a body of flexible inert material, said body having a first surface forming a compound articular surface for gliding engagement with the femoral condyles, a vertical ridge dividing said compound articular surface into an outer larger portion for gliding engagement with the external condyle and an inner smaller portion for gliding engagement with the internal condyle, said outer and inner portions corresponding generally in configuration to the external and internal facets respectively of the patella in which the prosthesis is implanted; a second surface of said body opposite said first surface being adapted for positioning in the recess formed in the posterior surface of the patella; and means for securing said body in the recess.

8. The prosthesis of claim **7** wherein the recess formed in the posterior surface of the patella is generally symmetrical in configuration, said second surface

of said body being generally symmetrical for mating engagement with the recess and wherein said body can be positioned in said recess to accommodate the condyles of either the left or right femur.

9. The method of rebuilding the damaged underlying cartilage on the posterior surface of a patella comprising the steps of:

exposing the posterior surface of the patella;

resecting the posterior surface and forming a recess in the resected posterior surface;

providing a body of flexible inert material having a compound articular first surface formed thereon corresponding generally to the external and internal articular facets of a normal patella and having an opposite surface adapted for mating engagement with said recess;

securing said body in said recess; and

replacing the patella with said body secured therein such that said compound articular surface is positioned for gliding engagement with the femoral condyles.

10. The method of rebuilding the patella as defined in claim **9** wherein said body of flexible material is provided with suture means extending from said opposite surface, and wherein said securing step includes placing a layer of adhesive between said opposite surface and said recess and suturing said body to said patella.

11. The method of rebuilding the patella as defined in claim **10** wherein said step of forming a recess in said posterior surface includes the further step of forming at least two openings through aid patella from the bottom wall of said recess to the anterior surface thereof to receive said suturing means.

12. The method of rebuilding the patella as defined in claim **11** and further including the step of tying said suturing means at the anterior surface of the patella.

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