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RESEARCH ARTICLE

Knee Arthroplasty: With or Without Patellar Component?

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Arthroplasty is used when there is irreversible damage to the articular cartilage of the knee. It involves implanting a bicompartimental (femoral and tibial components) or a tricompartimental (femoral, tibial and patellar components) prosthesis. It is a very invasive and costly operation, so our **objective** was to evaluate the necessity of the patellar component.

Material and methods: During our study we've included 39 patients: in 27 cases we used tricompartimental prosthesis, while the other 12 received only the bicompartimental components. Patients were evaluated preoperatively and postoperatively using the International Knee Documentation Comitee score. We've also compared our results with the results of other published authors.

Results: We've found that there is little to no difference between the two groups regarding mobility and complication, however patients with bicompartimentalarthroplasty complained of less pain.

Conclusion: We've found that bicompartimentalarthroplasty – being a less invasive procedure – is better not only in terms of pain management, but there is also less hemorrhaging, shorter intraoperative time is considered, revision is easier and also has financially advantages, both for the patient and for the medical facility.

Keywords: knee, arthroplasty, prosthesis, patellar resurfacing

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Introduction

Knee replacement surgery, knowm also as knee *arthroplasty*, represents a surgical procedure dedicated to replacement of the knee joint weight-bearing cartilage surfaces with metallic implants. The procedure is usually performed having as indication the relieve of pain and disability and also to allow a continued motion of the knee. The replacement can be *partial o*r *total* and the most common indications are represented by osteoarthritis, rheumatoid arthritis or traumatic injury.

It is a very invasive procedure that involves numerous risks: deep vein thrombosis, periprosthetic fractures, loss of motion, instability and/or infection.Itis also a very costly procedure – an average tricompartimentalimplant cost per case ranges from $1.700 to $12.000 [1].

Because of the aforementioned considerations, the aim of this study was to compare the outcome of total knee replacement with patellar resurfacing with those withoutpatellar resurfacing and to compare our results with the results of other authors.

Material and Methods

A total of thirty nine patients were included in the present study based on age and the severity of osteoarthritis. The sex ratio was 1.8, while the mean age was 67.3 years. Twenty eight of these patients presented primary osteoarthritis of the knee, while the rest – eleven – presented secondary osteoarthritis as a result of previous trauma or deformity. Six percent of patients underwent previous open meniscus repair surgeries in their youth; thirty one percent underwent arthroscopy with an average of 3.2 years prior to knee replacement surgery, while thirty one patients had hyaluronic acid joint injections, average 5 years before. All patients suffered from Albach type III and IV osteoarthritis of the knee.

The patients were divided in two groups: twenty seven underwent total knee replacement surgery using tricompartimental prostheses (i.e. femoral, tibial and patellar components) while twelve of them received bicompartimental prostheses (i.e. femoral and tibial components). Prior and after surgery, patients were asked to describe their level of pain using a visual analog scale (VAS); they were also examined using the International Knee Documentation Committee score (IKDC).

The authors have also reviewed a number of articles that focus on the matter of patellar resurfacing vs. patellar conservation. The findings of these authors where compared with the result found during the present study.

Results

Prior to surgery, the VAS results showed an average of 8 points, meaning the patients suffered from significant knee pain, while the IKDC score in both groups showed values between 41-53 points.

Postoperatively, however, we see a considerable improvement in the patient's scores (Table I, Table II).

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Table I. Postoperative IKDC scores of patients with patellar resurfacing

3 days	1 month	3 months	6 months	12 months
39-50	62-69	64-72	68-75	74-91

Table II. Postoperative IKDC scores of patients without patellar resurfacing

3 days	1 month	3 months	6 months	12 months
35-47	61-72	64-70	65-74	84-93

Postoperatively, there were no early complications, however, in case of the tricompartimentalgroup, two patients had undergone patellar revision surgery after one and a half years, because of anterior compression syndrome.

We've compared our results with similar results of other authors (Table III).

Discussion

Early knee arthroplastie, being associated frequently with failure to acknowledge the patelo-femoral joint, are frequently accompanied with severe pain at the level of anterior knee. However, patellar resurfacing procedures led to a significantly increased patient satisfaction but the scientific community has divergent opinion on this subject (Table IV).

In order to identify those patients with a higher potential to present an improvement in clinical outcomes following this procedure, the concept of selective resurfacing has been introduced and tested. This attempt is also necessary in order to avoid potential complications associated with unnecessary resurfacing [25-32]. The authors who support this procedure consider many patient- and prostheses-related factors as certain prerequisites in favor of the intervention. Among the factors mentioned in the literature as having a favorable effect on patella retention, the age of patients below 65 years, the absence of anterior knee pain or crystalline disease, a relatively well preserved retro-patellar cartilage, anatomical integrity and normal patellar mechanics have been suggested

In the case of patients suffering from different inflammatory arthropathies, Sledge and Ewald suggested that non-resurfacing of the patella in rheumatoid arthritis, for

Table III. Compilation of the results of published authors

Author	Aim of study	Results
Tanzer et al. [2]	effect of femoral component design on the contact and tracking properties of the unresurfaced patella in total knee arthroplasty;	significant changes in patelo-femoral contact areas, pressures and tracking at higher flexion angles when the native patella was articulated with the femoral component; surface geometries of posterior stabilized femoral components appear incompatible with the native patella, as the apex of the retro-patellar ridge impinges on the prosthetic intercondylar notch at angles beyond 900;
Takahasiet al. [3]	effect of patellar morphology and implant design on patelo-femoral contact stress in total knee arthroplasty without patellar resurfacing;	post-operative osteosclerosis was observed with decreasing patellar facet angle in case of Genesis II and NexGen implants; patients treated with Genesis II had significantly more advanced osteosclerosis than those treated with other implants; patellar morphology and femoral component geometry influence patelo-femoral contact stress in total knee arthroplasty without patellar resurfacing;
Munoz-Mahamud et al. [4]	prospective review of patients who, between 2004 and 2007, underwent secondary patellar resurfacing because of anterior knee pain after a primary total knee arthroplasty; evaluate the clinical outcomes obtained with the SPR and compare them with radiological findings;	63% of patients reported improvement after SPR, while patelo-femoral scores (KSS and WOMAC) showed a statistically significant improvement following the procedure; no significant changes after SPR in the Insall-Salvati ratio, lateral patellar displacement or tilt; postoperative complications were patellar component loosening and acute post-infection;
Volkan et al. [5]	effectiveness of an alternative resurfacing technique: total knee replacement with patellofemoral fascial interposition arthroplasty;	average Hospital for Special Surgery knee score improved from 61 points preoperatively to 92 points at 24 months' follow-up; 65.7% of patients presented anterior knee pain preoperatively, while 18.4% revealed anterior knee pain at their last visit;
Müller et al. [6]	operating 436 knees using the LCS meniscal bearing total knee arthroplasty;	New Jersey Score increased constantly over the 5-year follow-up from 83 after 2 years to 90 after 5 years; there is no deterioration which can be attributed to a deterioration in patellar behavior; nonresurfacing of the patella is a possible solution if the following criteria are met: kinematics of the arthroplasty allows physiological rotation; anatomically built prosthesis; correct alignment; anatomy of the decelerator/extensor mechanism is respected by the approach; good ligamentous stability;

TableIV. Pros and cons of patellar resurfacing

Arguments in favor of patellar resurfacing [7-12]	Arguments opposing patellar resurfacing [13-24]
reduced pain at the level of anterior knee in the postoperative period; no need for secondary resurfacing; higher patient satisfaction; superior overall function; low complication rate; less expensive procedure and not time-consuming when performed during standard knee arthroplasty; prolonged exposure to high compressive forces can cause cartilage erosion, as a result of the unphysiological contact between cartilage and metal	no evidence exists of patellae affected by metal-cartilage contact become symptomatic; the proportion of revisions attributable to the resurfaced patella decreased from almost 50 % in the 1980s to approx 12% nowadays; decreased rates of patelo-femoral complications (4–5 %) similar clinical results in patients with and without resurfacing superior conservation of patellar bone; reduced the risk of patellar osteonecrosis; physiological patelo-femoral kinematics; ability to withstand high patelo-femoral forces in active patients without any concern of prosthetic wear or failure; lower intra- and post-operative complications (they are more frequently associated with patellar resurfacing)

instance, may favor recurrent inflammation resulting from the continued release of sequestered antigen from the retained cartilage [33].

In case the patella remains un-resurfaced, the proper selection of prosthetic design, using a patella-friendly femoral component has proven to be extremely important [34-40]. The supporters of the non-resurfacing strategy prefer to attempt to provide a a better accommodation with the native patella femoral components, using an anatomically shaped trochlear configuration. In case of bicompartmental knee arthroplasty, the patella left non-resurfaced is exposed to the metallic surface of the femoral component, process that leads in time to the so-called "bedding in" in order to adapt to the geometry of the opposing surface. The complex process named "*stress contouring*" represents a type of biological remodeling, gradually adapting different components between them in order to ensure a superior functionality, such as the retro-patellar surface, the subchondral bone plate and the trochlea shape [41]. Keblish and Greenwald noticed that patella exposure to a constant radius of curvature in conditions of uniform femoral geometry is associated with a minimal remodeling, while exposure of patella to a non-anatomical design is associated with an excessive remodelling process [42].

Conclusion

The results of this present study correspond with the results of other internationally acclaimed authors, as we see a general improvement postoperatively. There are always some discrepancies, which are mostly due to subtle individual differences of patients.

All in all, the authors have concluded that knee replacement surgery without patellar resurfacing is a much more advantageous technique in terms of fewer complications (ex. anterior compression syndrome, patella wear and fracture, knee pain, harder revision) and shorter operating time (general operating time in case of knee replacement with patellar resurfacing is one hour and twenty three minutes, while in case of operations without patellar resurfacing, it is shortened to one hour and fourteen minutes).

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