

Unicondylar knee prosthesis: our experience

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Abstract. *Aim of the study:* To compare unicompartmental knee arthroplasty with "all poly" tibial component and "metal back" from a clinical and functional point of view. *Materials and methods:* We evaluated prospectively 50 patients who underwent unicompartmental knee replacement at the Orthopedic Clinic of the University of Trieste. Patients were split into two groups (A and B); in patients from group A has been implanted a Mitus prosthesis (Link) with "all poly" tibial component, in patients from Group B has been implanted an Allegretto prosthesis (Zimmer) with a "metal back" tibial component. The mean follow-up was 36 months. All patients were evaluated using the Knee Society Score. *Results:* The mean preoperative Knee Society Score (objective and functional) was found to be respectively 48 and 49 or the group A and group B; post-operative score was found to be of 95 and 94 respectively for Group A and group B. The average post-operative ROM was 125 degrees (range, 85-140 degrees) for group A and 130° (range 90°-145°) for group B. *Conclusions:* No differences were found between implants with "all poly" tibial component (thickness to be used must be greater than 6 mm) and those with the "metal back". We believe that to achieve positive results over time is important the carefully selection of the patients and the accurate positioning of components. (www.actabiomedica.it)

Key words: knee; unicondylar prosthesis; osteoarthritis; hemiarthroplasty

Introduction

The concept of unicompartmental arthroplasty knee was first proposed by McKeever and Elliot in 1952 (1); a few years later MacIntosh presented a study on the use of a prosthesis, manufactured in vitalium, to substitute only the tibial plateau (2). During the 70s we witnessed numerous attempts to develop the idea of a prosthetic replacement of the only medial knee compartment (3-5), but then the shoddy results in the short term, the high incidence of complications and the complex surgical technique, as published in 1980 by Insall (6), did not allow the unicompartmental wide dissemination. It is enough to remember that in the U.S., between 1996 and 1997, were implanted only 2500 unicompartmental knee arthroprosthesis and that at the Mayo Clinic in the 90s were used only

3 unicompartmental prosthesis compared with about 8500 full implants. Only since the early 90s, the concept of unicompartmental knee has acquired its own identity as a real alternative at the total whole implant (7). Even in Europe, and in Italy in particular, the approach to this type of system is happened with alternating phases and in a manner sometimes controversial. Thanks to technological progress in the context of toolkits, the prosthetic design and materials as well as thanks to the introduction of minimally invasive techniques (8,9), the last decade has seen a sharp improvement of long-term results of unicompartmental prosthesis, almost comparable to those of the total knee replacement prosthesis. Essential, in this sense, was the always more correct surgical indication and the most accurate choice of eligible patients. A study of the Finnish Registry of Arthroplasty, edited in 2007 shows

a percentage of implant survival at 10 years from 53% to 81% depending on the type of prosthesis used (10); other studies show results yet best, with implant survival at 10 years of 93% (11), 94% (12), 98% (13). Berger and colleagues have described a survival of 95.7% at 15 years (14) and O'Rourke and colleagues of 85% (15). It is very significant as, differently than fifteen years ago, the literature is producing encouraging data about implantation of unicompartmental prosthesis both in relation to total knee replacements (19, 20) and the high tibial osteotomy (16-18); the unicompartmental one is in fact characterized by a more rapid and complete functional recovery, from a maintenance of proprioception and, with respect to the total prosthesis, by an easy modality or review in the case of failure. The satisfaction of patient that received this type of prosthesis reflects these excellent results, especially as regards those activities that require a full ROM, as to get down from the stairs and kneel.

One of the most important elements in determining the success of surgery of unicompartmental prosthesis is the selection of suitable patients: the ones that most readily offer the best results are those who suffer from a unicompartmental osteoarthritis of the knee, having the contra-lateral compartment undamaged and a modest varus. They must also have a degeneration of cartilage of second or third degree (according to Ahlback) with asymptomatic patellofemoral joint, a ROM more than 90°, an axial deformity less than 15° and do not require high functional performance. Additional precautions in the choice of patients are the absence of flexion deformity or at least less than 5°, the stability of the anterior cruciate ligament, the absence of joint laxity of the ipsilateral side, a desirable body weight (obese patients at risk) and absence of severe osteoporosis (21, 22). The unicompartmental prosthesis is also indicated in osteonecrosis limited to a single femoral condyle.

The early implant failure is mainly due to a not-accurate positioning of the components that will then lead to a hypo or hyper-correction in alignment of loading arthroplasty. The bad alignment leads to increased polyethylene wear which aggravates the framework of the local contralateral compartment and of patellofemoral and then promotes the mobilization of implant. A posterior tilt of the tibial component greater

than 7° is sometimes associated with a mobilization of itself and to an increase of localized stress on the cortical bone and cancellous bone also up to rupture of the posterior cruciate ligament (25).

For all these reasons we believe that the longer-lasting results over time are determined by the correct positioning of the prosthetic components and the correct alignment of the knee, which must be achieved without overcorrect the axis, which needs to be kept as physiological as possible. The implant of a unicompartmental prosthesis requires the maintenance of an optimal tension of the capsuloligamentous apparatus and of joint anatomy, replacing only the degenerated parts.

For some years we have begun to use, at our Structure, unicompartmental arthroplasty knee, believing that the only pathological articular compartment replacement leads to a better result, compared to other treatments, such as tibial osteotomy or total hip prosthesis, to the patient that begins a quick rehabilitation with very early functional recovery. To join this imperative clinical and therapeutic we directed to this type of treatment, trying to find prosthetic models with most follow-up and that would provide at a less bone resections. For this purpose we routed to two types of prosthesis, a tibial component with "metal back", the Allegretto (Zimmer) and one with tibial component "all-poly", the Mitus (Link), even to verify if there were any differences between the real

these two solutions. The tibial components "allpoly" allow a lower tibial resection and a greater thickness of polyethylene; there is no evidence, in literature, of a better functional performance of one or of the other model.

Materials and methods

We have included in this study 50 patients (37 females and 14 males) aged between 48 and 85 years (mean age 68 years) that underwent implantation of unicompartmental arthroprosthesis during the period between January 2003 and December 2008 at the Clinic Orthopedic and Traumatological, University of University of Trieste. The patients were split into two homogeneous groups by gender and age; for patients

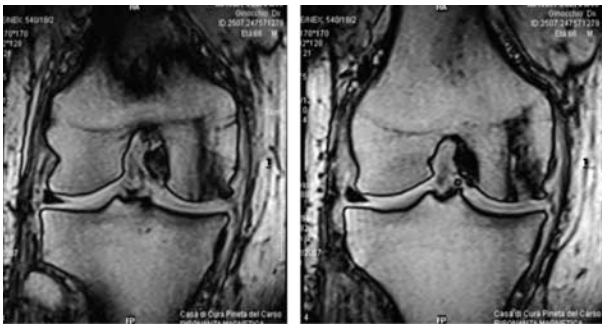


Figure 1. Preoperative MRI of right knee with knee osteoarthritis of the medial and hotbed of osteonecrosis

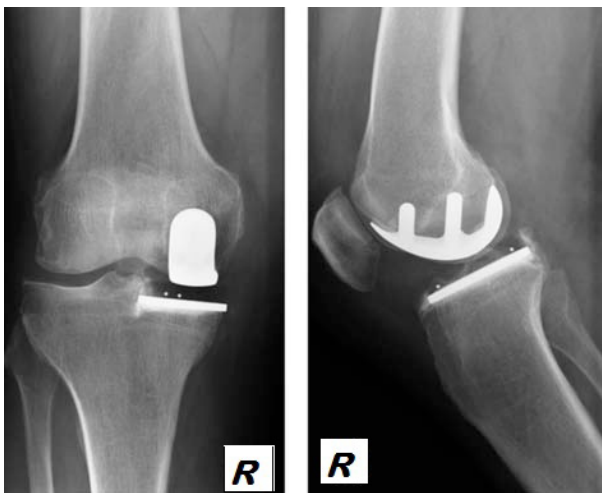


Figure 2. RX knee at a mean follow-up of 4 years with the prosthesis “Allegretto”

Group A was used Allegretto prosthesis (Figure 1-2) and for group B Mitus the prosthesis (Figure 3-4) with the two systems described above. The two groups

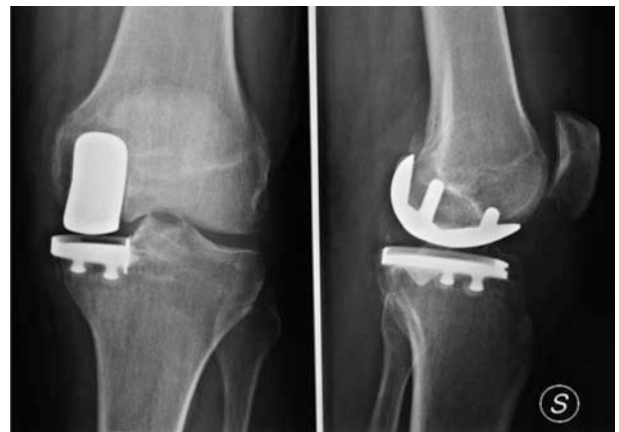


Figure 4. RX knee at a mean follow-up of 2 years with prosthesis with the “metal-back” tibial component

were monitored with a mean follow-up of 36 months. Were implanted 48 prosthesis of the medial compartment, 2 prosthesis of the lateral compartment (equally distributed between the two control groups).

For clinical and functional controls we used the Knee Society Score, and for those radiological we performed radiographs of the knee under load, in anteroposterior and lateral projections to study the mechanical axis and joint space and with patellar projection for the study of the patellofemoral joint. We submitted all patients to preoperative MRI which revealed that in 15 cases there was an osteonecrosis of the medial femoral condyle. Moreover in all patients have been determined the characteristics of body weight and the presence of any severe osteoporosis.

All patients were operated with small patellar access from the lower pole of the kneecap to the tibial



Figure 3. A: Preoperative RX of left knee in load on AP and LL; B-C: MRI preoperative framework of knee

tuberosity side, without eversion of the kneecap and without tourniquet (inflated only for cementation) under spinal anesthesia; the load has been allowed after 3-4 days after surgery.

Results

The average KSS (Table 1) (objective and functional) preoperative resulted to be respectively of 48 for the A group and of 49 for the group B and the postoperative one was respectively of 95 for the group A and of 94 for B one. The average postoperative ROM is increased for both groups (Figure 5). The alignment of the varus deformity is corrected with about 5° of valgus average for both groups. The patients were discharged from hospital in average of eighth days with a minimum of hospital stay of 2 postoperative days to a maximum of 10 days. Complications, however very moderate, were: a deep venous thrombosis in 4 cases (7%), a superficial skin infection in 3 cases (5%) and

in one patient there has been a fracture of the femoral condyle that did not need further treatment; the femoral component of a prosthesis was partially mobilized after 18 months, as a complication, in a male patient with a middle-high grade of obesity and varicose veins at lower limbs, but the patient did not want to be subjected to surgical revision since he could perform the normal daily activities of life without any particular disturbances.

The prosthesis survival of group A with a follow-up of 5 years, however, is found to be the 100%, while that of group B shows a percentage of 96%.

Discussion

The data obtained from our study with a medium “follow-up” confirm the good clinical and functional outcome of unicompartmental prosthesis of the knee in osteoarthritis of the medial compartment and encourage us to continue in this way.

The preservation of proprioception and reduced surgical trauma allow patients to obtain a clinical result that is very close to the condition of a normal knee. But they have to be precisely respected the directions that we have previously described, such as one-compartment arthrosis, the presence of healthy and stable anterior and posterior cruciate ligament, the varus-valgus deformity and in slight flexion, a not excessive weight gain and the absence of general inflammatory disease. Regarding the status of the patellofemoral joint, however, that very often is not free from degenerative events, there seems to be crucial for the success of the intervention. For this reason we believe possible to implant a unicompartmental prosthesis even in cases of osteophytes in the patellofemoral joint. Also other authors report that the pain suffered at the front of the knee, always considered a relative contraindication to the plant of a unicompartmental prosthesis, does not affect the success of the system using the Oxford Phase 3 prosthesis (26).

The tibial component seems to be indifferent as regards the presence or absence of metal-back, because the clinical and radiological results of our study are similar in the follow-up, without the presence of radiolucent lines or loosening of the components. From

Table 1. Preoperative and postoperative KSS scores of the two groups

KSS score		Result
Group A	Group B	
48	49	preoperatory
95	44	postoperatory

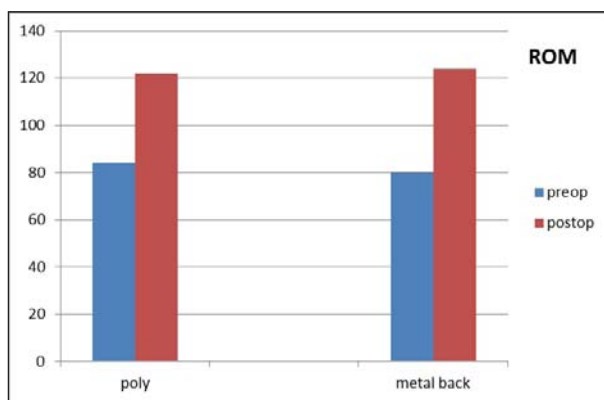


Figure 5. Average ROM pre- and postoperatively in two different tibial components, all poly (group B) and metal back (group A)

our data also obesity is currently not considered a contraindication for implant of prosthesis and we believe that we can allow the indication to the implant even in patients just out of higher limit of 30 kg/m² of BMI. This assessment was also made by other authors who have not found an association between body weight and/or obesity and failure of replacement (27).

Furthermore, a study that compared the “outcome” of the unicompartmental knee prosthesis between obese and not-obese patients, suggests that obese patients have a better survival curve of the prosthesis when they are compared to the group of not-obese patients (28).

Conclusions

Based on our clinical experience and our study we consider that the joint replacement of the degenerated compartment with a unicompartmental prosthesis is a correct indication for surgery in patients over 60 years of age with osteoarthritis of only one compartment of the knee with patellofemoral joint asymptomatic or slightly symptomatic, not-obese and not affected by rheumatoid arthritis or severe osteoporosis. We found no differences between the tibial polyethylene (thickness to be used must however, be more than 6 mm) implants and those with the “metal back”.

To achieve positive results over time, however, important it is the careful selection of the patient together with the accurate positioning of the components, which follows the correction of the axes that must be maintained more physiological as possible, never with too low or too much correction.

We also believe, based on our experience, that we can give indication of the implant unicompartmental prosthesis also in cases where the patellofemoral joint is not perfectly unscathed, possibly by associating a release for the recentering of the kneecap.

The indications can be at the same way be extended to patients whose BMI is not strictly below 30 kg/m², as the benefits on the pain and the recovery of the functionality joint is such as to allow a resumption of normal daily activities very quickly and therefore possibly even weight loss. The surgery is performed with little access and low surgical trauma, saving expander

apparatus and allows rapid functional recovery and of social life with full satisfaction for the patient and for the surgeon.

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