CURRENT CONCEPT REVIEW

Medial Unicompartmental Osteoarthritis (MUO) of the Knee: Unicompartmental Knee Replacement (UKR) or Total Knee Replacement (TKR)

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Abstract

The aim of this review article is to analyze the clinical effectiveness of total knee replacement (TKR) compared to unicompartmental knee replacement (UKR) in patients with medial unicompartmental osteoarthritis (MUO) in terms of survival rates, revision rates and postoperative complications. The search engine was MedLine. The keywords used were: medial knee osteoarthritis. Three thousand and ninety-six articles were found on 28 April 2014. Of those, only twenty-eight were selected and reviewed because they were strictly focused on the topic of this article. Compared with those who have TKR, patients who undergo UKR have higher revision rates and lower survival rates at 5, 10 and 15 years. The reported overall risk of postoperative complications for patients undergoing TKR is 11%, compared with 4.3% for patients undergoing UKR. In conclusion, UKR have higher revision rates and lower survival rates than TKR. There is, however, an increased risk of postoperative complications after TKR.

Key words: Comparative results, Knee, Medial osteoarthritis, TKR, UKR

Introduction

There are two basic approaches to knee replacement for patients with medial unicompartmental osteoarthritis (MUO): some surgeons think that it is always best to perform a total knee replacement (TKR); whereas others feel it is best to carry out a medial unicompartment knee replacement (UKR) (1-4). Both techniques are established and well-documented procedures. Little evidence exists to prove the clinical effectiveness of either management option. This explains the high variation in treatment of choice by different surgeons for the same knee problem.

In Woolson´s report two surgeons performed a retrospective radiographic and chart review on a series of patients who had undergone TKR to determine the percentage of those patients who could have been candidates for medial UKR. Flexion contracture >10°, an arc of motion <100°, or inflammatory arthritis were contraindications to UKR (5). The surgeon who was a proponent of medial UKR found that 26% of these patients had acceptable radiologic and clinical indications for UKR, whereas the surgeon who had a bias against the procedure felt that only 12% of these patients were UKR candidates.

The aim of this review article is to analyze the clinical effectiveness of total knee replacement (TKR) compared to unicompartmental knee replacement (UKR) in patients with medial unicompartmental osteoarthritis (MUO) in terms of survival rates, revision rates and postoperative complications.

Materials and Methods

A review has been performed on the surgical treatment of MUO by means of TKR and medial UKR. The search engine was MedLine (PubMed). The keywords used were: medial knee osteoarthritis. On 28 April 2014, three thousand and ninety-six articles were found. Of those, only twenty-eight were selected and reviewed because they were strictly focused on the topic and the questions of this article. The types of studies reported have a low level of evidence (most of them are level III-IV studies, and only a few are level II studies).

Results

Indications

Some authors have stated that medial UKR should only be done for MUO if there is bone on bone (6). Niinimaki et al have reported that UKR should only be performed when the preoperative medial joint space on standing radiographs is ≤40% of the lateral joint space, even if

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Table 1. Mean survival rates (%) of UKR and TKR in the literature at 5, 10 and 15 years (4, 9-20). UKR= Unicompartmental knee replacement. TKR= Total knee replacement. NA=Nonavailable

Reference	UKA-5 years	TKA-5 years	UKA-10 years	TKA-10 years	UKA -15 years	TKA-15 years
Lyons (4)	95	98	90	95	NA	NA
Rougraff (9)	NA	NA	92	NA	NA	NA
Capra (10)	NA	NA	93.75	NA	NA	NA
Yang (11)	NA	NA	95	NA	85	NA
Amin (12)	85	98	NA	NA	NA	NA
Gioe (13)	NA	NA	NA	NA	NA	85
Koskinen (14)	NA	NA	NA	NA	60	80
Foran (15)	NA	NA	NA	NA	93	NA
Niinimaki (16)	89.4	96.3	80.6	93.3	69.6	88.7
Costa (17)	85	100	NA	NA	NA	NA
Newman (18)	NA	NA	NA	NA	89.8	78.7
Berger (19)	NA	NA	98	NA	NA	NA
Kristensen (20)	NA	NA	85.3	NA	NA	NA

severe cartilage damage is found via arthroscopy (7). The aforementioned authors encountered a relationship between the reoperation rate and the joint space on preoperative standing weight bearing radiographs taken in extension. When the thickness of the preoperative medial joint space was >2 mm, the reoperation rate was 6 times higher. Finally, the reoperation rate was 8 times higher when the thickness of the preoperative medial space was >40% of the thickness of the lateral space (7). In another report young age, obesity, and early degeneration in the patellofemoral joint were not contraindications to UKR (8).

Clinical effectiveness: Survival and revision rates

The reported mean survival rates of UKR and TKR are summarized in Tables 1 and 2 (4, 9-20). They have been shown to be higher in TKR than in UKR in the short-term and in the long-run. Regarding the revision rates, Lyons et al reported 13% for UKR versus 7% for TKR, while Gioe et al reported 32.3% for UKR versus 15.5% for TKR (4, 13).

Modes of failure

The most common reasons for revision in Kristensen´s series were progression of osteoarthritis, aseptic loosening, and pain without loosening (20). Besides, only 50% of patients revised for pain without loosening had a satisfactory outcome (20). The predominant mode of failure observed by Aleto et al was medial tibial collapse (21).

Table 2. Cumulative mean survival rates (%) and range of UKR and TKR in the literature at 5, 10 and 15 years (4, 9-20). UKR= Unicompartmental knee replacement. TKR= Total knee replacement

YEARS	UKR	TKR
5	90 (85-95)	98 (96-100)
10	88 (80-95)	94 (93-95)
15	80 (60-90)	83 (79-89)

According to Manson et al wear modes differed among UKR designs (22). Articular surface damage was higher in the fixed-bearing designs as compared to the mobile bearing, although the mobile-bearing implants had significantly shorter length of implantation. Backside damage was also graded for the mobile bearing and when combined with articular wear resulted in overall damage scores higher than both fixed-bearing designs. The fixed-bearing designs showed delamination and surface deformation, whereas the mobile bearing had no evidence of these damage types. However, mobile-bearing components showed other types of wear, and significant wear damage was present on the bearing surfaces of the mobile-bearing implants in spite of a short time of implantation. At the time of conversion to a TKR, more than 50% of cases required the use of stems, augments, or constrained inserts for the tibial reconstruction (22).

In Parrate´s report, 15% UKRs were revised (for aseptic loosening, dislocation, and osteoarthritis progression) in the mobile-bearing group and 12% in the fixed-bearing group (for wear and osteoarthritis progression) (23). Parratte´s long-term study, however, did not demonstrate any difference in survivorship between fixed and mobile-bearings (23).

The most common reason for revision in O´Donnell´s report was subsidence of the tibial base plate (58%). Forty percent of patients required particulate bone grafting for contained defects (24). In Oduwole´s report thirteen percent of primary UKR performed were revised to TKR (25). Eighty-six percent of the revisions were required within the first 12 months. Results of conversion of UKR to TKR were less satisfactory than primary TKR.

In Epinnette´s report times to revision surgery were short: 19% of revisions occurred within the first year and 48.5% within the first 5 years (26). Loosening was the main reason for failure (45%), followed by osteoarthritis progression (15%), polyethylene wear (12%), technical problems (11.5%), unexplained pain (5.5%), failure of

the supporting bone (3.6%) and infection (1.9%).

Indications for revision in Bergeson´s report were aseptic loosening, tibial collapse, mobile bearing dislocation, persistent pain, progression of osteoarthritis, infection, and tibiofemoral instability (27).

Primary TKRs and UKRs were compared by Brown et al regarding the incidence of postoperative complications (28). The overall risk of postoperative complications for patients undergoing TKR was 11%, compared with 4.3% for patients undergoing UKR. TKR was associated with increased rates of manipulation, transfusion, intensive care unit admission, discharge to a rehabilitation facility and had longer hospital stays (mean, 3.3 vs 2.0 days). Brown et al also found a trend toward an increased risk of deep infection (0.8% vs 0.2%), readmission (4.2% vs 2.7%), thromboembolic events (1.0% vs 0.64%), and any reoperation (1.4% vs 0.6%).

Discussion

The aim of this review article is to analyze the clinical effectiveness of total knee replacement (TKR) compared to unicompartmental knee replacement (UKR) in patients with medial unicompartmental osteoarthritis (MUO) in terms of survival rates, revision rates and postoperative complications.

The quality of studies reported so far on the topic is poor. Most of them have a low levels of evidence (levels III and IV), although there are some with grade II of evidence.

Regarding the indications for UKR, it should only be used if the preoperative medial joint space on standing radiographs is ≤40% of the lateral joint space (15). Young age, obesity, and early degeneration in the patellofemoral joint are not contraindications to UKR (8).

Concerning the survival rates, at 5 years it was around 90% on average in UKA vs. 98% in TKA. At 10 years, the mean survival rate in UKA was around 88% vs. 94% in TKA. At 15 years, survival rate in UKA was around 80% on average vs. 83% in TKA (4, 9-20) (Tables 1 and 2). Regarding the revision rates, Lyons et al reported 13% for UKR versus 7% for TKR, while Gioe et al reported 32.3% for UKR versus 15.5% for TKR (4, 13).

Regarding the modes of failure of UKR, the most important are components loosening (45%), progression of osteoarthritis (15%), polyethylene wear (12%), technical problems (11.5%), unexplained persistent pain (5.5%), failure of the supporting bone(3.6%) and infection (1.9%) (26). Medial tibial collapse, subsidence of the tibial base plate and mobile bearing dislocation are not so common (21-27). In a study, eighty-six percent of the revisions were required within the first 12 months (25). In another report 19% of revisions occurred within the first year and 48.5% within the first 5 years (26). Results of conversion of UKR to TKR have been less satisfactory than primary TKR (24).

In conclusion, the optimal treatment of MUO is unclear at present. Recent literature appears to indicate that patients who undergo UKR have higher revision rates and lower survival rates than those undergoing TKR. The increased risk of postoperative complications after TKR should be considered when counseling patients if they are an appropriate candidate for either procedure. Prospective randomized studies are needed for the future to confirm the aforementioned findings.

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