

A Research on the Early Effect of Unicompartmental Knee Arthroplasty for Unicompartment Osteoarthritis of the Knee

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Abstract

Objective: To evaluate the early clinical effect of unicompartmental knee arthroplasty (UKA) for medial unicompartment osteoarthritis of knee in the old people, providing the evidence for the treatment of clinic. **Methods:** From January of 2016 to January of 2017, 20 cases of knee osteoarthritis in medial unicompartment were treated by unicompartmental knee arthroplasty. The knee joint range of motion (ROM), visual analogue scale (VAS) and knee functional Hospital for Special Surgery (HSS) scores were preoperatively recorded. The loss of blood and time of operation were intraoperative recorded. The satisfaction of patient, knee joint range of motion (ROM) and knee functional special surgical hospital score (HSS score) were postoperatively recorded at one year. **Results:** All patients have been followed up at an average of twelve months. The operation time was 94 - 135 min, mean 105.6 min. The blood loss was 150 - 500 ml, mean 315 ml. The postoperative HSS and ROM were both reduced. The last follow-up, there were no meniscus subluxation, loose prosthesis, and lateral ventricular osteoarthritis or other complications. **Conclusion:** Unicompartmental knee arthroplasty has the advantages of small operation trauma, early postoperative effect and quick recovery.

Keywords

Unicompartmental Knee Arthroplasty, Medial Unicompartment, Osteoarthritis

1. Introduction

Unicompartmental knee arthroplasty (UKA) has been the subject of controversy for its unsatisfactory surgical outcomes since the emergence in the late 1970s [1]. In recent years, with the improvement of prosthesis design and surgical tech-

niques, UKA has achieved satisfactory surgical results, and the survival rate of prostheses has been apparently improved. Squire, *et al.* [2] have reported that for 22 years, survival rate of UKA prostheses was 84%, it has no significant difference compared with total knee arthroplasty (TKA). In recent years, through the comparative study between UKA and TKA, it has been cleared that the UKA has the advantages of the retained cruciate ligament, less osteotomy, while it has no significant difference with TKA in the long-term treatment effect. Manzotti, *et al.* [3] have reported that the postoperative knee joint scores in UKA were higher than TKA, and in UKA the operation time and hospitalization were significantly shorter than total knee replacement. In recent years, with minimally invasive UKA and Oxford mobile platform unicompartmental surgery carried out, the UKA treatment of medial knee osteoarthritis of traumatic surgery, quicker postoperative recovery and other advantages are more obvious. In this study, we analyzed 20 cases from 2016-01 to 2017-01 of unicompartmental knee arthroplasty to treat knee osteoarthritis of medial unicompartment, to explore its early curative effect. Present reports are shown as follows.

2. Materials and Methods

2.1. Clinical Information

From October 2015 to March 2017, 20 patients with osteoarthritis of the knee were treated with the Oxford unicompartmental knee arthroplasty in the orthopedic department of Tianyou Hospital, Wuhan University of Science and Technology. There were 12 males (12 knees) and 8 females (8 knees), aged 55 - 84 years (mean 65.8 years), weighing 55 - 85 kg, mean 66.5 kg, body mass index (BMI) average 25.1 (20.2 - 27.7) (See **Table 1**).

All cases are selected with the following criteria: 1) Diagnosis of knee osteoarthritis consistent with ACR diagnostic criteria, clear clinical symptoms and signs; 2) Knee without internal, valgus deformity, or varus less than 15°, flexion contracture not exceed 15°, flexion 90° or more; 3) Concomitant knee medial

Table 1. The basic information of the study patients.

Patients' information	Number of cases (%)
Gender	
Male	12 (60)
Female	8 (40)
Age (years)	
50 - 65	9 (45)
66 - 75	8 (40)
76 - 85	3 (15)
Body weight(Kg)	
55 - 65	6 (30)
66 - 75	12 (60)
75 - 85	2 (10)

unicompartment osteoarthritis imaging diagnostic criteria; 4) There were no articular cartilage destruction in the lateral compartment of knee joint, no damage to the anterior cruciate ligaments and lateral ligaments.

2.2. Surgical Method

After anesthesia, take the supine position, limb with tourniquet, take the knee patellar medial approach, reveal the medial compartment, and double-check the two compartments to make sure they fit the UKA. A small amount of tibial osteotomy, assessment of extension position and flexion spaces, balance flexion and extension joint space, the right line down the right distal femoral osteotomy, knee flexion 90° measurement of femoral size, and reference to the tibia correct alignment, the installation of specimens, re-check the lower extremity alignment and prosthesis position to ensure that the joints in the straight position and flexion position are stable during the entire movement, not too tight or too loose phenomenon. In the surgery through the X-ray fluoroscopy, we found that the lower limb line is correct. Wash the wound, modulate of bone cement, install prosthesis, joint cavity to place drainage device, and buckle 30° - 45° bit to sew the incision [4].

2.3. Postoperative Treatment

The cephalosporin antibiotics need to be used to one time postoperative. We need to pull out the wound drainage tube after 24 - 48 h, do quadriceps muscle strength recovery on the day of surgery, use CPM to assist the knee flexion and extension exercise on the second day after operation and gait training on the third day after operation.

2.4. Observed Indicators and Follow-Up Criteria

The operation time and intraoperative blood loss were recorded. All the patients were reviewed at the hospital for one month, three months and one year after operation and related functional scores were evaluated. They need to take X-ray examination, including anteroposterior, posterior, and patellar axial imaging. Analyze and compare the knee joint function score (HSS), knee joint activity (ROM) and pain visual simulation score (VAS) before and after surgery. Observe the complications such as loosening and subsidence of prosthesis.

2.5. Statistical Processing

The SPSS 19.0 statistical software was used to process the preoperative and postoperative HSS and joint activity. The data from the preoperative and postoperative follow-up at one year after the last follow-up were matched with *t* test, and 95% confidence interval, with $P < 0.05$ as a significant difference.

3. Result

Twenty patients were all followed up for one year after surgery. The operation

time of all patients was 94 - 135 min, an average of 105.6 min. Intraoperative blood loss was 150 - 500 ml, an average of 315 ml. Postoperative incision healing was Grade A; no wound infection, deep vein thrombosis and other complications occurrence. In the follow-up, patients with knee joint pain were significantly relieved, VAS scores were declining from the preoperative 8 points to 3 points. Preoperative HSS scores were (52.4 ± 5.8) points, the average scores increased to (91.6 ± 4.3) points postoperative one year. The preoperative knee ROM was also increased from $(95^\circ \pm 5.6^\circ)$ to $(120^\circ \pm 3.5^\circ)$. There were significant differences in HSS and ROM between the two groups ($P < 0.05$). The last follow-up, we did not find prosthesis meniscus dislocation, prosthesis loosening, contralateral interventricular osteoarthritis and other complications, only 2 cases have mild medial knee pain, but it has no effect on the joint flexion and extension activities (See **Table 2**).

4. Discussion

Knee osteoarthritis is a common disease in the elderly, and at present, the main methods to treat knee osteoarthritis are TKA and UKA [5]. A large number of studies have shown that in the development of diseases knee osteoarthritis, the medial unicompartments lesions were progressing rapidly, while the other two compartments were not involved or slightly affected. In the early stage of disease, if total knee arthroplasty was performed, it destroyed the normal joint space and ligaments compared with UKA. The surgical trauma was large and the treatment was magnified. The unicompartments knee arthroplasty is only for the lesion of the knee joint room (mostly medial unicompartments) for surface replacement, the normal knee joint rooms have no injury, and also have the advantages of retaining the knee ligament structure, with less osteotomy and quick recovery [6]. According to Riddle [7] and others' report in 2008, the number of UKA in the United States increased from 6570 knees in 1998 to 44,990 knees in 2005. Berger [8] and other scientists found that the postoperative effect of UKA after the 6 to 10 years follow-up, excellent rate was 98%, which is comparable with the total knee arthroplasty after long-term survival rate. As the UKA retains the cruciate ligament, having small effect on normal anatomy, the patients are in short hospital stay and quicker recovery. Combined with minimally invasive technique, unicompartments knee arthroplasty is accepted by more and more patients.

Table 2. Preoperative and one year postoperative of knee function and VAS ($n = 20$, $\bar{x} \pm s$).

Time	HSS scores	ROM	VAS
Preoperative	52.4 ± 5.8	95 ± 5.6	8
One year postoperative	91.6 ± 4.3	120 ± 3.5	3
<i>T</i>	14.32	5.87	-2.5
<i>P</i>	<0.001	<0.001	<0.001

UKA has achieved better surgical effect as its strict indications for surgery. The strict indications for surgery are the prerequisite for the effect of preoperative. Therefore, in the selection of cases, the patients meet the following conditions: more than 50 years, no knee joint, valgus deformity, or varus flexion contracture not exceed 15°, knee ligament structure intact, before the cross ligaments, after the cross ligaments and lateral ligaments without damage. Patient selection criteria for early unicompartmental knee arthroplasty are typically over 60 years, as the revision rates increase significantly with the unicompartmental prosthesis lifetime increases. If the patients' life expectancy is 15 - 20 years, then whether we need to do the unicompartmental knee arthroplasty. However, in this experiment, we relaxed the patients' ages to about 50 years. On the one hand, UKA can be performed first, if TKA is required after more than 10 years, it is more convenient to switch to TKA on the basis of UKA. On the other hand, with the invention of mobile platform prosthesis and the improvement of the operation method, the service life of the prosthesis is further prolonged, so that the criteria of age for unicompartmental knee arthroplasty patients are further relaxed. Because obese patients' knee withstands greater stress, the knee, after UKA postoperative, is unevenly distributed, leading to prosthesis loosening. According to Berend *et al.* [9], if the body mass index is greater than 32, the revision rate of the prosthesis greatly increases. Therefore, the experimental group strictly controlled the weight of the patient under 85 Kg, body mass index less than 32.

According to a lot of reports, the effect of postoperative UKA depends on the integrity of the ligament structure and function of the patellofemoral joint and contralateral compartment articular cartilage [10]. If the patients have lateral compartment osteoarthritis, and the medial collateral ligaments or anterior cruciate ligaments are relaxed, UKA postoperative the joint is instability inevitably, resulting in prosthetic loosening or joint wear. However, patellofemoral degeneration in patients with unicompartmental knee arthroplasty is still controversial, such as Berger [11] and other people have proposed that clinical, radiological or intraoperative findings of patellofemoral arthritis signs were not suitable for unicompartmental knee arthroplasty. However, patients with severe knee osteoarthritis (KOA), patellofemoral degeneration has a large proportion, and Oxford condylar prosthesis designers recommended to ignore the patellofemoral joint factors and a large number of data showed that it does not affect the postoperative efficacy. Beard [12] reported that the follow-up results of patients with patellar articular cartilage defect show that preoperative existence of patellofemoral joint degeneration had no effect on the knee function and prosthesis survival rate after unicompartmental knee arthroplasty. Therefore, in this group of experiments, the patellar joint degeneration was not included in the surgical contraindication.

The correction principle of the lower extremity line in operation of UKA, is the principle of mild correction in the domestic and international consensus. It has been reported that it was possible to accelerate the degeneration of the con-

tralateral compartment if the correction of the varus was over-corrected in the treatment of unicompartmental knee arthroplasty. However, if the knee was insufficient, the load of the artificial joint increases and the service life was affected [13] [14]. So this is a higher requirement for the opponent, it must be on the basis of soft tissue or limited loose solution, accurately cut the bone and adjust the padding to ensure that the knee joint is slightly over, the force line of the lower extremity is slightly medial to the center or center of the tibial platform [14].

In this study, we use minimally invasive UKA technique, due to limited surgical field of vision, so the demanding on the surgeon is more severe. However, minimal invasive UKA surgery is less traumatic, hospitalization was significantly shorter than TKA, postoperative recover quickly. In this study, the patients were carefully selected according to surgical indications and contraindications, standardized surgical procedures. The results showed that good results have been achieved, postoperative joint activity and HSS score significantly increased. In the follow-up observation, no complications such as loosening of the prosthesis and joint wear were found, and the satisfaction of the operation was very high. However, due to the small sample size and short follow-up period in this study, the results need to be further verified.

5. Conclusion

In summary, the curative effect of unicompartmental knee arthroplasty for the medial unicompartment of the elderly knee is accurate. Compared with TKA, UKA has the advantages of less blood loss, large postoperative activity, short recovery time, the retained cruciate ligaments body sensory function, postoperative experience closer to normal. However, the success of the procedure depends on the strict selection of surgical indications and skilled surgical operative technique.

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