

Results for the Mobile-Bearing Rotating Platform Knee: Minimum 10-Year Follow-Up

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Background: The mobile bearing knee was introduced in 1977. Since then, many reports have examined the long-term results obtained with the mobile bearing knee. Some authors reported significant improvement results and longevity for the mobile-bearing knee over the fixed-bearing knee, but some authors reported no significant improvement over the fixed-bearing knee. Many reports have examined the longevity and functional outcomes in patients treated with the mobile-bearing knee. The longest follow-up was 20 years follow-up, but no study has examined long-term outcomes in Thailand. Our study reports the long-term results obtained with a mobile-bearing knee LCS system after at least 10-years of follow-up.

Objective: To study the long-term results achieved with a mobile-bearing knee LCS system after at least 10-years of follow-up.

Material and Method: The twenty-one patients were included in this prospective-cohort study. Range of motion, patellar score, American Knee Society scores and the radiographic evaluation. Patients were evaluated at pre-operatively and 6 months, 1 year, 5 years, 10 years after surgery.

Results: After at least 10 years of follow-up, eighteen patients showed no signs of radiographic loosening. The patellar score, knee score and functional score decreased over time. However, the patellar score increased significantly compared with pre-operative values. Only two patients underwent patellar resurfacing, the scores were similar to those reported in other studies at 5 years after surgery. This trend was also observed for the knee score, although it was not significant. This same trend was observed for the functional score and was significant at 10 years after surgery.

Conclusion: The mobile-bearing rotating platform knee achieves a good knee score and fair functional score after 10 years follow-up. Additional multi-center studies will be necessary to collect more data.

Keywords: Mobile-bearing knee, LCS knee, Long-term results

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The mobile-bearing total knee arthroplasty design is intended to standardize and decrease the rate of polyethylene deterioration as compared with the fixed-bearing total knee arthroplasty (Fig. 1,2). Another advantage of the mobile-bearing knee over its fixed-bearing counter part is that the mobile-bearing knee is forgiving with respect to malrotation of tibial tray⁽¹⁾. No previous report has examined long-term outcomes with the LCS mobile-bearing knee in Thailand. The purpose of the present study was to present the long-term outcomes of patients who were fitted with the LCS mobile-bearing knee by a single surgeon.



Fig. 1 LCS mobile-bearing knee

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Material and Method

This prospective-cohort study design included 21 patients. Each surgery was performed by a member of senior staff (KC). The inclusion criteria were a diagnosis of primary osteoarthritis and willingness



Fig. 2 LCS prosthesis

to join the present study. All patients received the LCS mobile-bearing knee (Depuy, Warsaw, USA) and were followed from 2001 to the present. The exclusion criteria were signs of active infection, crystal-induced osteoarthritis, inflammatory joint disease, and revision cases.

The data collected included ROM, patellar score⁽²⁾, American Knee Society score⁽³⁾ and radiographic evaluation⁽⁴⁾. Demographic data including age, sex, diagnosis and extremity involved, were also recorded. Prospective data were obtained at 6 months, 1 year, 5 years and 10 years after surgery. The present study included 18 women and 3 men. The mean age among the patients was 66.3 years (range from 58 to 82 years). The diagnosis of all patients was primary osteoarthritis. The surgery was performed by single surgeon (KC).

Ethical consideration

The present study was approved by the ethical committee code CT99/33.

Surgical technique

The senior staff member (KC) used the medial parapatellar approach and a non-patellar resurfacing

all cases except two due to severe cartilage eburnation. The distal femur was resected first and set at 5° to the anatomical axis. A proximal tibial cut was then made perpendicular to the anatomical axis to balance the extension gap. The next step was sizing the femoral component and balancing flexion gap to maintain the existence of a rectangular gap and to equalize the flexion and extension gaps. The rotating platform was inserted at the proximal tibia and then, the femoral component and the all-polyethylene patella component were inserted. After the patella tracking and the range of motion were inspected, a Radivac drain was placed and the skin was closed. The ambulatory program included early weight bearing as tolerated and a range of motion exercise early in the next morning. The Radivac drain was removed within 3 days after surgery. All patients were discharged within one week after surgery.

Clinical evaluation

The patients were assessed by a member of the senior staff (KC), who determined the arc of motion, the patellar score and the American Knee Society score and performed a radiographic evaluation. The authors defined score of 80-100 as excellent, 70-79 as good, 60-69 as fair and below 60 as poor⁽⁵⁾. The primary outcome was survival of the prostheses, aseptic loosening is the end point of survival prostheses (radiographic loosening without symptoms not include). The secondary outcome was the patient's functional score. The demographic data are presented in Table 1.

Radiographic evaluation

For each patient, AP radiography was obtained in the standing view, lateral view and skyline view. The authors used the Knee Society Radiographic assessment⁽⁴⁾ to evaluate the alignment of prostheses and the radiolucent lines around prostheses from both the AP and lateral views. The definition of prostheses loosening was subsidence component, a change in position from the previous radiograph and a radiolucent line > 2 mm around the prostheses.

Statistical analysis

The authors used the paired t-test to evaluate the arc of motion, patellar score and American Knee Society score.

Results

In total, 21 patients received 21 LCS mobile-bearing knees (left 8, right 13). Three patients fail to complete the project: one patient died as a result of

cancer and two patients refused to continue the follow-up at year 5. Eighteen patients continued with the follow-up (mean time 10.3 years). No patient required revision surgery.

The result for arc of motion, patellar score and American Knee Score are presented in Table 2. The patellar score decreased over time to 25.8 at 10 years, the mean knee score was 91.6 and the functional score was 77.8. The scores decreased over time. 94% (17/18) of the patients still had excellent knee scores but only 61% (11/18) of the patients obtained excellent functional scores. Five patients displayed radiolucency in zone 1 at the site of the femoral component as viewed from the lateral view. At 10 years of follow-up, this radiolucency had not progressed in any patient, nor was there any other sign of radiographic loosening.

Discussion

The mobile-bearing knee was developed in the mid-1970s to minimize the problems associated with fixed-bearing knee such as wear and loosening. The area of contact in the mobile-bearing knee is greater than that in the fix-bearing design. In theory, this modification should decrease the rate of wear and decrease the malrotation of the tibial tray. In fact, the device can self-correct malrotation to some degree⁽¹⁾. There are many possible mobile-bearing knee designs, most long-term survival more than 90%⁽⁶⁻¹⁶⁾. Callaghan's series⁽¹⁶⁾ involved the longest period of follow-up: 20-year. To date, the mobile-bearing design has not demonstrated significant longevity over the fixed-bearing knee⁽¹⁷⁻²³⁾. In the present study, 100% of the knees in 18 patients had survived at 10 years. The arc of motion decreased slightly over times, at fifth year 5 after surgery ROM had increased slightly compared with the first year, but this change was not statistical significant ($p = 0.227$). At 10-years of follow-up, the mean arc of motion was 117 degrees, which is slightly more than that reported by Callaghan⁽¹⁵⁾.

The patellar score increased significantly after surgery ($p < 0.05$), although only 2 patients underwent

patellar resurfacing. The score decreased slightly over time, but this difference was not statistical significant at year 10 ($p = 0.0522$). These results imply that the design of these prostheses may be "patella-friendly".

Compare to Aglietti⁽²¹⁾ patellar score at year 5, the present study have mean patellar score approximately (The present study patellar score was 27.4 and Aglietti's reports patellar score were 27.1, 27.4 for LPS, MBK respectively).

Most patients still have excellent knee scores. These scores have decrease over time but this change is not statistically significant. Functional scores also decreased over time and this change was significant at year 10 after surgery ($p < 0.05$). This result may be due to the older age of the patients included in the present study (mean 66 years). After 10-years of follow-up, the demands of patient decreased, which resulted in a reduction in the scores; nonetheless, the prostheses still worked well and yielded excellent knee score. Both the knee score and the functional knee score are still higher than those reported by Callaghan⁽¹⁵⁾ (knee score 91 vs. 85, functional score 77 vs. 58).

The limitation of the present study were the small sample size, the refusal on the part of some patients to continue with follow-up and the fact that one patient died of another cause. In the future, additional multi-center long-term studies will be necessary to gather more data.

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Table 1. Demographic data of the patient included

Number of patient	21 (F =18/M = 3)
Age (yr)	66.3 (58-82)
Side	Right = 13, left = 8
Mean follow-up time	10.3 yrs

Table 2. The clinical results and scores

	Pre-Operative	6 month	1 st year	5 th year	10 th year
Arc of motion Mean (SD)	112.4 (15.3)	121.4 (12.3)	117.9 (16.2)	122.2 (13.0)	117.0 (20.0)
Patellar score Mean (SD)	22.2 (5.2)	28.7 (2.4)	27.3 (3.3)	27.4 (3.0)	25.8 (4.1)
American kneesociety score					
Knee score Mean (SD)	46 (16.9)	97 (3.6)	95.8 (4.6)	93.0 (5.6)	91.6 (6.9)
FunctionalScoreMean (SD)	48.1 (23.8)	87.6 (12.5)	93.4 (8.2)	89.7 (12.5)	77.8 (28.6)

Potential conflicts of interest

None.

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ผลการรักษาของข้อเข่าเทียมชนิด mobile bearing knee: ติดตามการรักษา มากกว่า 10 ปี

พลสันต์ สันธนะพิพัฒน์กุล, กীরติ เจริญชลวานิช

ภูมิหลัง: ข้อเข่าเทียมชนิด mobile bearing เริ่มมีการนำมาใช้ประมาณปีพ.ศ. 2520 มีรายงานเกี่ยวกับผลการรักษา ระยะยาวของข้อเข่าเทียมชนิดนี้หลายรายงาน บางรายงานแสดงถึงผลการรักษาที่ดีและอยู่ได้ยาวนานของข้อเข่าเทียม ชนิด mobile bearing , บางรายงานพบว่าไม่มีความแตกต่างกันระหว่างข้อเข่าเทียม mobile bearing และ fix bearing รายงานที่ยาวนานที่สุดคือ 20 ปีแต่ไม่มีรายงานผลการรักษา ระยะยาวจากประเทศไทย. การศึกษานี้เพื่อ แสดงผลการรักษา ระยะยาวด้วยข้อเข่าเทียมชนิด LCS โดยติดตามผู้ป่วยไปอย่างน้อย 10 ปี

วัตถุประสงค์: เพื่อศึกษาผลการรักษา ระยะยาวของข้อเข่าเทียมชนิด mobile bearing. หลังจากติดตามการรักษา ไปมากกว่า 10 ปี

วัสดุและวิธีการ: มีผู้ป่วย 21 คน เข้าร่วมในการศึกษานี้ และได้วัดพิสัยการเคลื่อนไหว, patellar score, American knee society score และการประเมินทางภาพถ่ายรังสี. ผู้ป่วยได้รับการประเมินก่อนผ่าตัดและหลังผ่าตัด 6 เดือน, 1 ปี, 5 ปี และ 10 ปี

ผลการศึกษา: หลังจากติดตามผลการรักษาไปนานกว่า 10 ปี ผู้ป่วย 18 คน ไม่พบว่า มีภาพถ่ายทางรังสี ที่บ่งว่าข้อเข่าเทียมหลวม. patellar score, knee score และ functional score ลดลงเมื่อเวลาผ่านไป. อย่างไรก็ตาม patellar score เพิ่มขึ้นอย่างมีนัยสำคัญเทียบกับก่อนผ่าตัด ในขณะที่มีผู้ป่วยเพียง 2 คน เท่านั้นที่ได้รับการเปลี่ยน ผิวลูกสะบ้าซึ่งคล้ายกับผลจากรายงานอื่นที่รายงานผลไว้ที่ 5 ปี หลังผ่าตัด knee score ก็ค่อยๆ ลดลงเมื่อเวลาผ่านไป เช่นกันแต่ไม่มีความแตกต่างอย่างชัดเจนแต่ใน functional score กลับพบว่าแตกต่างอย่างชัดเจนหลังผ่าตัดไป 10 ปี

สรุป: ข้อเข่าเทียมชนิด mobile bearing ให้ knee score ที่ดีและ functional score ที่พอใจได้หลังติดตามการรักษา ไปนานกว่า 10 ปี ควรจะมีการศึกษาร่วมกับสถาบันอื่นเพื่อจะได้ข้อมูลที่มากขึ้นต่อไป
