

Results of total knee replacement using a cemented stemmed prosthesis

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ABSTRACT

Objective: To present the results of total knee replacement at the King Abdul-Aziz University Hospital in Jeddah, Kingdom of Saudi Arabia (KSA).

Methods: The medical records of 205 patients who received 309 prostheses was reviewed. The study took place at King Abdul-Aziz University Hospital, Jeddah, KSA between May 1989 and August 2005, where patients were either examined in the outpatient clinic or interviewed on the phone. Seventeen patients (22 prostheses) were lost for follow up. The scores were registered according to the Knee Society Clinical Rating System.

Results: There was a significant improvement in all-functional scores postoperatively in the first year, which continues without significant change throughout the follow up period. Symptomatic deep vein thrombosis was

observed in 5 patients, 3 of them had pulmonary embolism, which was fatal in 2 cases. Early deep infection occurred in 3 cases. Superficial wound infection was seen in one patient. One patient suffered peroneal nerve palsy, while 4 patients had aseptic loosening of the femoral implant. One patient had rupture of the patellar tendon. Metal breakage was observed once and one patient is diagnosed to have polyethylene wear. In the early phase, when a prosthesis type without dislocation protection was used, 7 dislocations occurred. This type was not used anymore and no such complication was observed.

Conclusion: Total knee replacement relieves pain and improves quality of life significantly. The observed complications compare well with the results reported in the literature.

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Degenerative disease of the knee joint is a common health problem in Saudi Arabia and is far more prevalent than degenerative disease of the hip joint. In a recent study, the prevalence of knee osteoarthritis above the age of 40 years was estimated to be 36%, reaching up to 60.6% in the age group 66-75 years.¹ Agunwa² reported an incidence of 6.3% for gonarthrosis compared to 0.2% for coxarthrosis. Ahlberg et al³ reported a ratio of 1:80 for osteoarthritis of the hips and knees. Gonarthrosis also affects younger age groups than coxarthrosis.^{2,3}

It is therefore a leading cause of morbidity and reduced quality of life.⁴

When medical treatment fails to achieve sufficient pain relief and patients are increasingly limited in their daily activities, joint replacement can bring good pain relief and can improve quality of life.

In this paper, the results of primary knee joint replacement using a stemmed, cemented prosthesis (the ENDO® Rotation knee prosthesis, manufactured by W. Link GmbH, Hamburg, Germany) was evaluated.

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Methods. Out of approximately 500 primary knee replacements carried out between May 1989 and August 2005, 309 prostheses of the above-mentioned type were implanted to 205 patients. **Table 1** shows the diagnoses of these patients. The gender distribution and mean age and body mass index (BMI) are summarized in **Table 2**. There were 154 operations on the right and 155 operations on the left side. **Table 3** shows the distribution of uni- and bilateral replacements. The axis of the operated knee was in varus in 208 cases (67.4%), in valgus in 2 cases (0.6%), and straight in 99 cases (32%). Of the 101 patients who had one knee replaced by this type of prosthesis, 25 had the other knee replaced by a different prosthesis (unicompartmental or resurfacing type).

The indication to operate was given when pain was significant in spite of sufficient amounts of analgesia with negative impact on patient's daily activity in the presence of obvious degenerative changes radiologically.

Operations were carried out under general or epidural anesthesia. A tourniquet was used except in a few cases. All patients received prophylactic heparin subcutaneous injection, starting the day before surgery and continued till discharge from the hospital and prophylactic antibiotics intravenously, starting on call to the operating room and continued till the wound drain was removed (2-4 days).

Operatively, the medial parapatellar incision and subvastus approach were chosen routinely. The technical steps were carried out according to the manufacturer's recommendations. Patellar resurfacing was never performed. Prosthesis with patellar flange was used only in a few cases when the patellar groove showed marked degenerative changes. Gentamycin loaded bone cement was used in all cases. The same surgeon carried out all operations

Isometric and isotonic exercises were started on the first postoperative day. Weight bearing mobilization was allowed on the second postoperative day or even earlier if a patient wishes it. During the hospital stay, the surgeon supervises patient's training. After discharge from the hospital, follow up was in the outpatient clinics by the surgeon himself. The outpatient physical therapy visits were rather the exception.

The pre- and postoperative scores were recorded according to the Knee Society Clinical Rating System.⁵ Scores were collected preoperatively and postoperatively at 3 months intervals in the first year, at 6 months intervals in the second year and then yearly.

The analysis of results was based on the follow up of 160 patients (241 knees) who are being seen regularly or interviewed on the phone on August 2005 and 28 patients (46 knees) who were followed up until they deceased. Seventeen patients (22 knees) were lost for follow up. The mean follow up was 63 months (3-192 months).

The statistical analysis was carried out using the Statistical Package for Social Sciences version 10 for windows.

Results. The mean preoperative values for each of the sub-scores of the Knee Society Clinical Rating System are summarized in **Table 4**. The rating scheme was subjected to reliability testing and was found to have a Cronbach alpha coefficient of 0.8347. After ensuring that factor analysis was appropriate the analysis showed that the items pain, range of movement (ROM), walking, and stairs climbing explained 85.4% of the total variance. Therefore, only the postoperative scores of these items are presented in detail.

Figure 1 shows graphically the development of the average scores for pain, ROM, walking distance and stairs climbing over the follow up period and in **Figure 2** the values for the total positive, the total negative and the grand total scores are shown.

Complications encountered are summarized in **Table 5**.

Five of the 205 patients developed clinically deep vein thrombosis (DVT) in the operated leg (2.4%). Three of them had signs and symptoms of pulmonary embolism (1.5%), 2 of these ended fatally (1%).

Initially, prosthesis type without dislocation protection was used. Dislocation of the prosthesis (disconnection of the tibial from the femoral component) occurred in 7 patients. The use of this type was discontinued. Three of these patients had closed reduction and required no further procedure. Three patients underwent conversion to the dislocation-protected version due to redislocation. One patient required open reduction. This patient developed postoperatively an infection with *Candida albicans*, which was treated locally and systemically. Until now (12 years postoperatively), there are no signs of recurrence of the infection. A second case of early infection occurred in a patient who underwent bilateral replacement in one sitting. He developed a synovial leak on one side on the sixth postoperative day, which was closed operatively. Unfortunately, the leak reoccurred but the patient refused any further operation. At present (4 years postoperatively), he continues to have a recurrent fistula formation. The femoral component is radiologically loose. The

Table 1 - Distribution of preoperative diagnoses.

Diagnoses	Patients	
	N	(%)
Primary osteoarthritis	180	(87.8)
Post-traumatic osteoarthritis	3	(1.5)
Rheumatoid arthritis	22	(10.7)
Total	205	(100)

Table 3 - Distribution of uni- and bilateral replacements.

Operative stage	Number of patients	(%)
1	27 (13F + 14M)	(13.2)
2	28 (15F + 13M)	(13.6)
3	49 (37F + 12M)	(23.9)
4	101 (75F + 26M)	(49.3)

1 - bilateral replacement, simultaneous, 2 - bilateral replacement, staged, same admission, 3 - Bilateral replacement, staged, different admissions, 4 - Unilateral replacement, F - female, M - male

Table 2 - Patients characteristics.

Characteristics	Females		Males	
	N	(%)	N	(%)
Count (%)	140	(68.3)	65	(31.7)
Mean age (SD)	63.2	(8.6)	67.2	(11.5)
Mean BMI (SD)	32.3	(6)	29.8	(4.9)

BMI - body mass index, SD - standard deviation

Table 4 - Average preoperative scores.

Positive scores	Scores	Negative scores	Scores
Pain	8.5	Flexion contracture	5.5
Range of movement	16.2	Extension lag	0
Anteroposterior stability	8.2	Axial deformity	7.9
Mediolateral stability	6.8	Walking aids	11.9
Walking distance	13.5		
Stairs climbing	12		
Total positive score	65.2	Total negative score	25.3

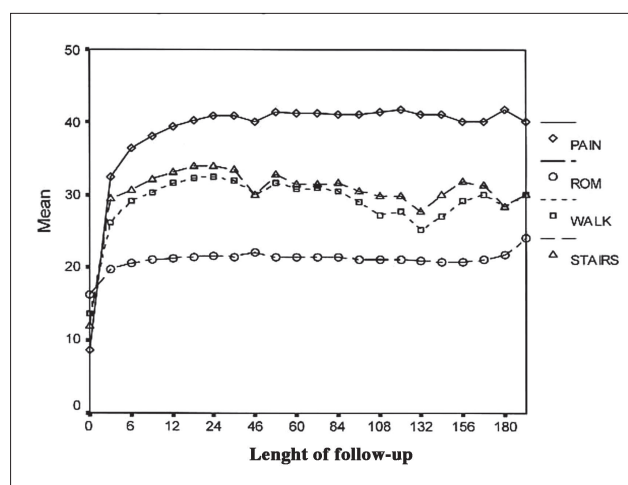


Figure 1 - Development of functional scores.

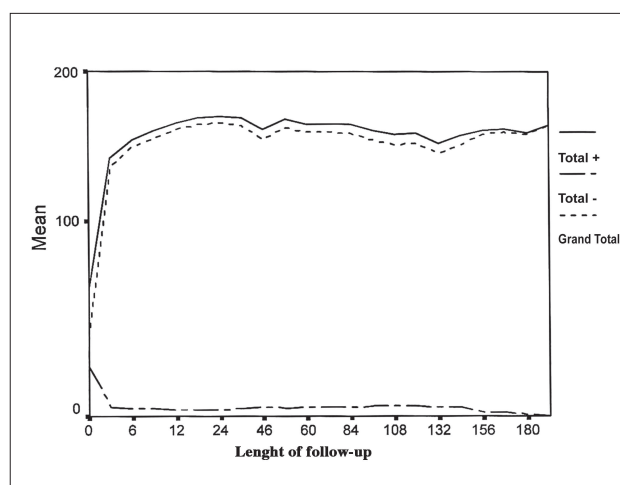


Figure 2 - Development of total scores.

Table 5 – List of complications.

Complications	Patients	
	N	(%)
I. Regional/systemic complications		
A. <i>Clinical deep vein thrombosis</i>	5 patients	(2.4)
i) with pulmonary embolism	3	(1.5)
ii) Fatal	2	(1)
B. Early periprosthetic infection	3 prostheses	(1)
C. Wound infection	1 prosthesis	(0.2)
D. Peroneal nerve palsy	1 patient	(0.5)
II. Mechanical complications		
A. Aseptic loosening (femoral)	4 prostheses	(1.3)
B. Metal breakage	1 prosthesis	(0.3)
C. Polyethylene damage	2 prostheses	(0.7)
D. Prosthesis dislocation (old type)	7 prostheses	
III. Extensor mechanism complications		
A. Avulsion patellar tendon	1 prosthesis	(0.3)

patient continued to refuse any further intervention. The third case of early infection occurred in a patient with rheumatoid arthritis (on immunosuppressant and steroid medication) who presented 4 months after bilateral knee replacement, staged in the same admission, with signs of septic arthritis on one knee. This was treated operatively with washout and continuous irrigation for 3 days combined with systemic antibiotics. He was doing well for one year but presented recently with a fistula at the same knee. The fistula was closed and local and systemic antibiotics were given. Immunosuppressant medication was discontinued, and he is on regular follow up.

Avulsion of the patellar tendon was diagnosed in one patient 3 weeks postoperatively. This was repaired operatively. Due to delayed wound healing, she was treated with systemic antibiotics for a prolonged period. Three years postoperatively, she has an extension lag of 20 degrees and patellar subluxation, but no signs of infection or implant loosening.

Aseptic loosening of the femoral component was diagnosed in 4 prostheses (1.3%). In 2 patients, recurrent joint effusion was noted. After excluding infection, it was thought that this was due to polyethylene (PE) wear. Both patients were subjected to surgery to exchange the PE plateau. Intraoperatively the femoral component was found to

be loose at the metal-cement interface. Both patients are doing well 4 and 6 years after recementing. A third patient showed on follow up 7 years postoperatively an increasing radiolucent space in the cement-bone interface. The femoral component was exchanged. Cultures did not show any bacterial growth. It was noted intraoperatively that the bone of the lower femur was thin and osteoporotic. Recently, she presented with pain on weight bearing. Radiographs revealed further absorption of the bone and instability of the femoral component. She is planned to receive a special prosthesis with replacement of the lower femur. Another patient showed on follow up 7 years after surgery a wide area of resorption at the bone cement interface. Due to advanced ischemic heart disease, she was evaluated as unfit for surgery. Her physical activity level is anyhow limited by her cardiac condition.

One case of metal breakage at the lateral femoral condyle of the prosthesis was observed (0.3%) 7 years after implantation. Since exchange (7 years), there is no further complication.

One patient presented 2 years ago with pain on weight bearing and mediolateral instability of both knees. Radiologically, there was no loosening. She has most likely a damage of the polyethylene plateau. I am hesitant to revise her knees as she is suffering from a skin disease in both lower legs, which are not improving on dermatological medication. On the other hand, she has become immobile due to co-morbidity, making the decision for revision even more questionable. One case of peroneal nerve palsy was observed immediately postoperatively. Recovery was very slow. Five years postoperatively, the patient has peroneal muscle power of 3/5, which he is very unhappy about. His knees are free of pain.

Discussion. These results show that knee joint replacement is a rewarding surgery for patients suffering from degenerative disease.

The most important improvement is in the pain score (from 8.5 points pre- to 31.6 points within 3 months postoperatively). As shown in **Figure 1** this score reaches approximately 40 points within the first year and remains so throughout the postoperative period. Most patients require painkillers 1-2 times per week or at special occasions with relatively high physical activity.

Pain is anyhow the main indication for operation and pain relief is most relevant for patient satisfaction. It should be noted that patients should be aware of pain in the immediate postoperative period and pain control should have a high priority in this period. This

is important for good cooperation in the rehabilitation process.

An important improvement is also noted in the walking distance, although the score goes down slightly, but not significantly, as patients get older, mainly due to cardiovascular disease or other musculoskeletal complaints. It should also be noted that female patients do not have the urge to walk a lot and many of them report a good walking effort during holidays outside the country. In the preoperative counseling, I learned to mention to the relatives of patients with Parkinsonism that the walking distance may not improve well. Patients with coexisting chronic low back pain need careful preoperative evaluation and counseling to give them realistic expectations.

The average postoperative ROM is 100-110 degrees, which compares well with other results.^{6,7} Thin patients achieve 120-130 degrees. Ahlberg^{3,8} mentioned that patients are not satisfied with 100 degrees of flexion. My impression is that most patients are satisfied and can easily sit on the floor if they wish and if they are not too heavy to get up. Squatting for normal prayer position is not allowed as, in my opinion; it increases the stress on the prosthesis and may become a cause of loosening. On the other hand, I do not operate on patients who can pray normally. Patients who have anyhow lost this ability are not unhappy on the advice not to pray in normal position.

The change in the score for stairs climbing is not as obvious as for pain and walking distance. Most patients can go up and down the stairs preoperatively but with major effort and for this reason, they avoid going out of their homes or visiting other people. Postoperatively they may use the rails for support but with far less effort.

The use of walking aids caused negative postoperative scores. Their use is rather personality related than dictated by the disease.

The complications encountered in this series compare well with other series.

All 3 patients with pulmonary embolism had bilateral knee replacement in the same admission, 2-staged and the third one simultaneous. In the literature, there is controversy regarding whether bilateral knee replacement in one admission is associated with higher incidence of complications.⁹⁻¹¹

Reports show symptomatic DVT rates of 0.7-10.6%.¹²⁻¹⁵ The rate of fatal PE is 0.1-0.2%.^{13,15}

All 4 patients with aseptic loosening of the femoral prosthesis had a high BMI in common. In the literature review, no evidence can be found for the weight being a significant factor for implant loosening although obese patients have generally

a higher rate of complications.¹⁵ The presence of established osteoporosis makes implant loosening a major problem, as detailed in the fourth patient in this group.

Extensor mechanism complications were a rare occurrence in this series with only one case of patellar tendon rupture at the tibial tuberosity. I believe that using the subvastus approach, not resurfacing the patella and this prosthesis design with preservation of the patellar groove are factors minimizing the extensor mechanism complications.

Peroneal nerve palsy is reported at a rate of 0.3-2%.¹⁵ In the single case observed in this series it was a cause of major dissatisfaction in spite the good result of the knee replacement itself.

Early infection is reported in the literature at rates between 0.5-1.6%.^{6,9,13,16} The patient with *Candida albicans* infection developed this as a contamination due to suboptimal sterility, taking the small incision for digital guidance of the reduction of prosthetic dislocation too lightly. The other 2 cases of deep early infection had in common bilateral replacement in one admission and diabetes mellitus. One patient was morbidly obese (BMI 41.3) and the other one was on immunosuppressant and steroid medication for rheumatoid arthritis. This raises the question again whether bilateral replacement in one admission is associated with higher rates of complications.

In this series, there is a significant predominance of females. This may be due to predominance of arthritis in women.¹⁷ It is also possible that women are more likely to accept joint replacement at an early stage as they are obliged to perform or supervise home activities personally and to respond to social obligations. It is also likely that males simply have a higher pain threshold, being able to wait with replacement longer, which also explains the higher mean age of male patients.

Roughly seen, males seem to have more complications than females; all 3 pulmonary embolisms in males, 2 out of 3 early deep infections, 3 out of 4 loosening, 5 out of 7 dislocations. On the other hand, more male patients report normal pain free activity postoperatively. This will be the subject of further statistical analysis later.

When patients were asked regarding their overall satisfaction with the operation and whether they would do it again, 2 patients clearly stated that they regretted it. Neither of these patients had any complication. It was obviously due to poor preoperative counseling as they had significant back pain, which did not improve. There were also 5 patients with poor functional results

(4 with bilateral replacement) despite good pain relief, this may be due to poor motivation.

From the number of patients related to the length of follow-up, it is obvious that patients are increasingly accepting knee replacement surgery, mainly as they see good results on other patients. To keep these good results, surgeons involved in such procedures have to be personally involved in the regular follow up and counseling of their patients for reassurance and also for early detection of any complication.

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