



## Midterm results of total knee arthroplasty in degenerative knee joint diseases with severe deformity

### *İleri derecede deformiteye yol açan dejeneratif diz eklemi hastalıklarında total diz artroplastisinin orta dönem sonuçları*

Berk GUCLU, Bahaddin GUZEL,<sup>1</sup> Kerem BASARIR,<sup>2</sup> Bulent ERDEMLI,<sup>1</sup> Ilker CETIN<sup>1</sup>

*Ufuk University Department of Orthopaedics and Traumatology; <sup>1</sup>Ankara University Department of Orthopaedics and Traumatology; <sup>2</sup>Hakkari State Hospital Department of Orthopaedics and Traumatology*

**Amaç:** İleri derecede deformiteye yol açan dejeneratif diz eklemi hastalıklarında total diz artroplastisinin orta dönem sonuçları değerlendirildi.

**Çalışma planı:** İleri derecede deformiteye yol açan dejeneratif hastalık nedeniyle 86 hastanın (75 kadın, 11 erkek; ort. yaş 69; dağılım 39-85) 125 dizine total diz artroplastisi uygulandı. Dizlerin büyük çoğunluğunda tanı osteoartrit (n=100, %80) veya romatoid artrit (n=22, %17.6) idi. İki taraflı tutulumu olan 39 olguda ameliyatlar eşzamanlı (n=20) veya basamaklı (n=19) olarak yapıldı. Dizlerin 108'inde arka çapraz bağı kesen tipte, 17'sinde bağı koruyan tipte artroplastisi uygulandı. Ameliyat öncesi ve ameliyat sonrası değerlendirmelerde Diz Derneği'nin skorlama sistemleri kullanıldı. Ortalama izlem süresi 53 ay (dağılım 24-96 ay) idi.

**Sonuçlar:** Dizlerin %80.2'sinde sonuçlar iyi veya çok iyi olarak değerlendirildi. Dokuz dizde (%7.2) revizyon cerrahisi gerekti. Bunların beşinde ameliyat öncesi tanı romatoid artrit idi. Revizyon nedenleri enfeksiyona bağlı sorunlar (n=5), aseptik gevşeme (n=3) ve periprotetik kırık (n=1) idi. Ameliyat öncesine göre, olguların diz puanı ortalama 60.9 (26.2'den 87.1'e), fonksiyonel puanı 42.6 (33.2'den 75.8'e) puan artış gösterdi (p<0.05). Son takiplerde dizlerin eklem hareket genişliği ortalama 93.2° ölçüldü. Ameliyat öncesinde ortalama dizilim açısı 17.8° varus iken, ameliyat sonrasında 4.1° valgus (dağılım 0°-6°) idi. Ameliyat öncesinde 68 dizde bulunan fleksiyon kontraktürü (ort. 28.8°) ameliyat sonrasında sekiz dizde (ort. 8.4°) görüldü; bunların tümünde kontraktür açısı 10 derecenin altındaydı.

**Çıkarımlar:** İleri derecede deformiteye yol açan dejeneratif diz hastalıklarında total diz artroplastisi olguların yakınmalarını ve fonksiyonel sonuçlarını anlamlı derecede iyileştirmektedir.

**Anahtar sözcükler:** Artrit, romatoid; artroplastisi, replasman, diz; diz eklemi/cerrahi; diz protezi; osteoartrit, diz.

**Objectives:** We evaluated the midterm results of total knee arthroplasty in degenerative knee joint diseases with severe deformity.

**Methods:** Total knee arthroplasty was performed in 125 knees of 86 patients (75 women, 11 men; mean age 69 years; range 39 to 85 years) with degenerative knee joint diseases accompanied by severe deformity. Almost all the patients had osteoarthritis (100 knees, 80%) or rheumatoid arthritis (22 knees, 17.6%). Thirty-nine patients with bilateral involvement underwent single-stage (n=20) or two-stage (n=19) surgery. During surgery, the posterior cruciate ligament was sacrificed in 108 knees and retained in 17 knees. Pre- and postoperative assessments were made according to the Knee Society clinical scoring system. The mean follow-up was 53 months (range 24 to 96 months).

**Results:** The results were excellent or good in 80.2% of the knees. Nine knees (7.2%) required revision surgery, of which preoperative diagnosis was rheumatoid arthritis in five. The reasons for revision were infection-related problems (n=5), aseptic loosening (n=3), and periprotetic fracture (n=1). Compared with preoperative values, the mean knee score increased by 60.9 (from 26.2 to 87.1), and the mean functional score increased by 42.6 (from 33.2 to 75.8) (p<0.05), with a mean range of knee joint motion of 93.2°. The mean preoperative and postoperative alignments were 17.8° of varus and 4.1° of valgus (range 0° to 6°), respectively. The number of knees with a flexion contracture decreased from 68 (mean 28.8°) to 8 (mean 8.4°), all of which had a flexion contracture angle below 10°.

**Conclusion:** Total knee arthroplasty performed in degenerative knee joint diseases with severe deformity significantly improves patients' complaints and functional results.

**Key words:** Arthritis, rheumatoid; arthroplasty, replacement, knee; knee joint/surgery; knee prosthesis; osteoarthritis, knee.

Poster presentation on the VIIIth. Turkish sport injuries, arthroscopy and knee surgery congress (10-14 October 2006, Kusadasi, Turkey).

**Correspondence / Yazışma adresi:** Dr. Berk Guclu, Ufuk University Department of Orthopaedics and Traumatology, 06520 Balgat, Ankara. Phone:+90312 - 204 41 26 Fax:+90312 - 287 23 90 e-mail: gucluberk@yahoo.com

**Submitted / Başburu tarihi:** 08.05.2007 **Accepted / Kabul tarihi:** 07.01.2008

©2008 Türk Ortopedi ve Travmatoloji Derneği / ©2008 Turkish Association of Orthopaedics and Traumatology

Primary knee arthroplasty is applied frequently for many reasons especially for degenerative and inflammatory arthritis. The complaints of the patients who have been diagnosed with the indications of arthroplasty are pain, loss of functionality with restrain in motion and deformity. The most often deformity seen in knee osteoarthritis developed in the degenerated surface is varus whereas it is seen as valgus in rheumatoid arthritis which is developed on the similar surface. Flexion contracture mostly accompanies these deformities.<sup>[1]</sup> Varus deformation over 100, valgus deformation over 150, flexion contracture over 100 or patella position deformities at knee joint are included in the definition of severe deformity. Generally some of these are present together.<sup>[2-4]</sup> The varus deformity on knee in coronal plane is generally developed with the contracture of medial collateral ligaments, posteromedial capsule, pes anserinus and semimembranous muscle with the bone loss in the medial of the tibia. The lateral collateral ligament is at relaxed position. There may be bone loss in the medial condyle of the femur but it is generally minimal. The relaxation should be done till the posteromedial edge, and in more severe deformities the semimembranous muscle should be peeled off from its attachment. If the deformity isn't improved, the posterior cruciate ligament should be sacrificed. If there is any bone defect in the tibia, in order to heal the deformity, a restoration is necessary.<sup>[5]</sup>

Valgus which is the other deformity on coronal plane is developed especially because of the hypoplasia of the lateral femoral condyle on rheumatoid arthritis. Occasionally it is accompanied with the flexion and external rotation contracture.<sup>[6]</sup> The main rule of relaxation in valgus knees is to elongate the lateral structures which are more contracted compared to medial structures. Unlike the varus knees that are relaxed from the tibia, the lateral capsules and ligamentous structures are relaxed mostly from femur.<sup>[7]</sup>

The posterior structures that are diminished in the flexion contracture prevent the knees for full extension. The first procedure to do should be to relaxate the posterior capsule. This procedure is done most easily after cutting the posteromedial and lateral femoral condyles. Posterior osteophytes and meniscus residuals should be cleaned. Another procedure that is used to overcome flexion contracture is to widen the extension interval by making an additional distal femoral sacrifice.<sup>[8]</sup>

In this study the mid term results of the total knee arthroplasty which have been performed in degenerative knees with severe deformity have been evaluated.

## Patients and methods

Between January 1995 and March 2005, total knee arthroplasty was performed in 125 knees of 86 patients (75 women, 11 men; mean age 69; range 39-85 years of age) with the diagnosis of degenerated knee with severe deformity. The diagnosis distribution has been plotted on Table 1. A total of 39 bilateral total knee arthroplasties have been performed as single stage in 20 patients and as two stages in 19 patients. In 108 of the knees, ligament sacrificing prosthesis was used whereas in 17 of the knees a retaining one was used.

Eighty mm tibial stem elongation (Protek-Sulzer Orthopaedics AG, Bern Switzerland) was used in Freeman-Samuelson type prosthesis in 14 knees. A rectangular shaped 5mm support metal block medial Osteonics Scorpio (Stryker – Howmedica, Mahwah, NJ, USA) was applied in 6 knees. The defects which were smaller than 5mm and beside the tibia medial plain were filled with cement on 12 patients. 13 patients had side defects of 5mm which was a matter of the 30% of the tibia medial hemi plain. Twelve of these were applied block allograft and screw osteosynthesis and one of them was fixated with iliac autograft. Patellar surface refinement was applied for 10 knees of 8 patients.

Two units of erythrocyte suspension transfusion was given to the patients which have been operated unilaterally and 4 units to the ones operated bilaterally. All the arthroplasty procedures were done with cement and under tourniquet, with mid line longitudinal skin incision and medial parapatellar initiative. Aspirate drain (Hemovac) and pressurized dressing bandage (Robert Jones Bandage) was applied as a

**Table 1.** Diagnosis distribution before surgery

	Patients (n=86)		Knee (n=125)	
	Number	%	Number	%
Osteoarthritis	68	79.1	100	80.0
Rheumatoid arthritis	15	17.4	22	17.6
Osteonecrosis	1	1.2	1	0.8
Arthritis as a result of trauma	2	2.3	2	1.6

routine. The drains were cut off before 24 hours. For antibiotic prophylaxis, intravenous 1-2gr first generation Cephalosporin was started to be given an hour before skin incision and it was applied for 24 hours postoperatively as 1 gr every 6 hours. For deep vein thrombosis prophylaxy 30 patients were applied dalteparine 2500IU and 56 patients 30mg enoxaparine as single dose for every day post operatively for 10 days as a routine.

### Clinic evaluation

The patients were subject to physical examination, evaluation of the front-back and side X-ray graphy of the knee under load and standard monitoring forms were filled out other than routine pre-operative tests. The patients were followed at 6 weeks, 3 months, 6 months, 12 months and yearly post-operatively by standard monitoring forms and loaded x-ray graphy. The knee and functional scoring system of "the Knee Society" have been used in the evaluations. According to this system 100-90 points was evaluated as very good, 89-80 as good, 79-70 as medium, 69 and below as bad results. The average follow-up time was 53 months (range 24-96 months).

### Radiographic evaluation

The pre-operative findings were evaluated according to Fairbank Criterias.<sup>[9]</sup> The post operative evaluation have been made according to the A\_P x-ray anterior posterior x-ray graphies of the knee under load taken during the follow-up and the scoring and evaluation system of The Knee Society for the total arthritis radiography.<sup>[10]</sup> The radiolucent intervals between the bone and cement were evaluated according to identified intervals.<sup>[10]</sup>

In the statistical evaluation, the knee and function scoring of post and pre operation were compared with dual t-test.

**Table 2.** The distribution of post and preoperative knee and functional scoring of patients with osteoarthritis and rheumatoid arthritis according to The Knee Society.

	Osteoarthritis (n=68)		Rheumatoid arthritis (n=15)	
	Post-op	Pre-op	Post-op	Pre-op
Knee score	24.6	88.3	24.4	81.0
Function score	32.6	78.4	35.0	65.0

## Results

### Clinic evaluation

According to The Knee Society's scoring system the preoperative average knee score was 26.2 and the function score was 33.2. Postoperative pain ,stability/ and knee score average reached 87.1; functional score average 75.8. Increase in both of the scorings after the operation (60.9 and 42.6) were meaningful ( $p<0.05$ ). according to The Knee Socociety's scoring system 36 knees (28.8%) got "very good", 65 knees (52%) "good", 21 knees (16.8%) "medium" and 3 knees (2.4%) got "bad" result. The distribution of these results in patients with osteoarthritis and rheumatoid arthritis were shown in Table 2 and Table 3.

The range of the joint motion of the knees were measured as 93.2 at the last follow-up. The lower extremity arrangement which was found as 17.8 varus in the preoperative period was found to be 4.1 valgus in the postoperative period (distribution 0 -6). (Photo 1,2) The flexion contracture found in 68 knees (average 28.8) in the preoperative period was found in 8 knees (average 8.4) in the post operative last controls. In all of these patients the contracture angle was below 10.

### Radiographic evaluation

According to The Knee Society's scoring system the mediofemoral angle postoperative value was found as ( $\alpha$  angle: the valgus angle of the femoral component) average 94.7°, mediotibial angle as ( $\beta$  angle: varus angle of the tibial component) average 92.3°, posterotibial angle as ( $\delta$  angle: the posterior angle of the tibial component at lateral plain) average 87.6°. The coverage of the tibial component on the tibia was average 97% for all knees. Less than 2mm radiolucent lines were observed in zone 1 and zone 4 in 6 of the patients' front-back X-ray graphies that

**Table 3.** The distribution of knee and functional scoring of knees with osteoarthritis and rheumatoid arthritis according to The Knee Societyat their last monitoring .

	Osteoarthritis (n=100)		Rheumatoid arthritis (n=22)	
	Number	%	Number	%
Very good	30	30.0	5	22.7
Good	54	54.0	10	45.5
Medium	15	15.0	5	22.7
Bad	1	1.0	2	9.1



**Figure 1.** (a) The degenerated varus (Osteoarthritis) on the left knee graphy of the 70 year old women patient before operation. (b) the front-rear x-ray graphy that was taken on the first day after medial autogref and screw fixation and total knee athroplasty with cement performed.

have been taken in the early stages of the postoperative period. There was no observation for change for worse in these patients' X-ray graphies that were taken in the proceeding checks. In 3 of the patients

the radiolucent line passed 5mm in zone 1 and 4. In the control x-ray graphies of these patients the radiolucent line seemed to increase and after 18 months of follow-up, a revision surgery was done because of mechanical relaxation.



**Figure 2.** (a) Preoperative valgus knee of a 41 year old women patient. (b) 48th month fornt-rear loaded knee x-ray graphy of a knee which total knee arthroplasty has been performed with rheumatoid arthritis diagnosis.

In evaluating the femoral component, a radiolucent line of 2 mm was observed in the early stages of 8 patients in zone 1 and 4. Since there was no change in the control x-ray graphies, no surgical intervention was done.

In 5 patients who developed an infection, there was a 5mm radiolucent line in both the tibial and femoral zones and revision was made for these patients.

### Complications

Deep infection developed in 5 knees (4%). One of these 5 knees preoperative diagnosis was (1.5%, 1/68) osteoarthritis and the remaining 4 were (26%7, 4/15) rheumatoid arthritis. Parenteral antibiotic treatment was applied for 3 weeks because of the advancing radiolucent line in the x-ray graphies of these patients. Since there was no response to the treatment, surgical



**Figure 3.** (a) degenerative osteoarthritis in 55 year old woman patient. Pre operative left knee front-rear graphy. (b, c) front-rear and side knee graphy taken after deep infection developed in proceeding total knee arthroplasty and instability. (d, e) the circular external fixator applied after getting no response to antibiotic treatment and the left knee front-rear and side knee graphy taken after arthrodesis. (f) the rear graphy of both lower extremity taken 12th week post operative. Solid knitting observed on left knee after arthrodesis; additional, left femur diaphysis extension osteotomy is knitted. .

debridement and joint lavage was applied. There was no response to the antibiotic treatment applied for 6 weeks in relevance to the culture and microbial sensitivity that was spotted in the samples taken. Surgical debridement and joint lavage was applied and an antibiomatic spacer was put after taking off the implants. The second 6-week period following the first one, it was switched to parental antibiotic treatment according to the culture and antibiogram results. Three of these 5 patients responded to the antibiotic treatment whereas 2 patients did not and arthrodesis was performed with external fixator (photo3). Sufficient fusion was attained after 3 months. A revision type prosthetic was applied in the second operation to the 3 patients responding to the treatment. No problem occurred in the proceeding follow-up of these patients. A single step revision was performed in 3 patients as a result of aseptic relaxation. An increase in the serous drainage time was observed in 6 patients in the postoperative period. These patients recovered fully in a month with daily sore treatment. Surface skin necrosis developed in 2 patients. These recovered fully with debridement and with daily sore treatment in a month. In the first postoperative week 3 patients developed deep vein thrombosis on the operated side. Diagnosis was made with clinic examination and venous colored Doppler ultrasound.

The enoxaparine na 1x 0.6IU and 5mg warfarine po treatment started on these patients continued with INR (INR as 2.5) follow-ups. Since there was no pathology found in the venous Doppler ultrasound controls carried out on the 4th week, the treatment continued for another 6 weeks with 300mg aspirin. No problem occurred in the proceeding follow-up of these patients. While trying the femoral component on a patient, a longitudinal fracture occurred on the femur supracondylar zone and with no necessity to change the prosthesis choice a osteosynthesis was applied with a screw. In the follow up of this patient the fracture seemed to knit and no problem occurred on the joint motion range. In 3 patients with more than 70 months follow up, because of front knee aches motion restrain was observed; the complaints of these patients were reduced with physical therapy. One knee (0.8%) which developed per prosthetic fracture on its 45th month was treated with circular external fixator. No problem was observed other than minimal motion restrain at joint of this patients at the postoperative

63rd month follow-up of the first operation and postoperative 18th month follow-up of the second operation. When all the knees were taken into account, the complication rate was 16.2% (21 knees). Knees that were operated for a second time for any reason was 9 (7.2%). Five of these had a preoperative diagnosis of rheumatoid arthritis.

## Discussion

Total knee arthroplasty procedure is being widely used today. The increase in the life time and expectations of the world population, better understanding of the mechanics of knee arthroplasty, progress in surgical techniques, finding solutions to problems and probable problems that may occur and gaining more information everyday resulted in extending the total knee arthroplasty indications to cover a younger and a wider group. Overcoming the aches, repairing the deformity, giving motion to the patient and achieving successful results through follow-ups have been possible. The results in 80.8% of the knees were evaluated as "very good" or "good" in our study.

A revision was necessary on a total of 9 knees that arthroplasty was performed with the diagnosis of degenerated knee with severe deformity. In 5 of these the reason was infection and problems that occurred related to this; in one, per prosthetic fracture; and in three the reason was aseptic relaxation. The deep infection rate encountered in total knee arthroplasty may be less than 1% in some cases and may reach up to 23% in other.<sup>[11-13]</sup> The infection rate increases with prosthetic with hinge and with the presence of disease and risk factors (smoking, diabetes, chronic kidney failure, rheumatoid arthritis, systemic lupus eritematosus, immune failure). The usage of prophylactic preoperative antibiotics reduces the infection rates.<sup>[14-15]</sup> There are studies which have reported the infection rate as 1-2%.<sup>[16-18]</sup> The infection rates in 18749 patients in Mayo Clinic were reported as 2.5%<sup>[19]</sup>, in 12118 patients of Bergston & Friends were 2.9%.<sup>[20]</sup> The main operative indication in our patients were pain; with the evaluation which was made taking the pain scoring as essential, our patients reached their optimum condition in the postoperative 6th month and have lived their proceeding 5 years with no major change. After the 5 year period, a decrease in pain scoring is observed. In patients with osteoarthritis and rheumatoid arthritis, the pain scoring is shown to have reduced to its minimum in the first year and draws a plain

until the 5th year.<sup>[21]</sup> When the patients are analyzed according to their preoperative diagnosis, the main reason of the drop of pain scoring realized till the 5th year was seemed to be the group with rheumatoid arthritis. In the group of osteoarthritis, there has been an increase from 12.5 to 44.4 in the pain scoring when compared to preoperative condition, and in rheumatoid arthritis, an increase from 9.5 to 41. In both of the groups, the loss observed in 5-10 year follow-up was 5% and 20%. The “very good” and “good” result rate of 68.2% achieved with the patients that were diagnosed with rheumatoid arthritis fits with this situation. In the long term follow-up of the patients with rheumatoid arthritis, 75% of these patients were reported to have “very good” or “good” result.<sup>[21]</sup> The main factor effecting this was the drop of bone quality as a result of the invasion of the subchondral bone with rheumatoid granulation tissue, the catabolic effect of chronic steroid usage and the over generating of prostaglandin in the rheumatoid synovial membrane.<sup>[22,23]</sup>

Because of this, in patients with rheumatoid arthritis, complications have been observed frequently and success rate have been dropped due to descent and relaxation during long term follow-up. While the results being “very good” and “good” during the first three year follow-up, the drop of success rate to 68.2% in the long term follow-up is a result of the high rate of complications. In our study the complication rate in our patients with rheumatoid arthritis was 41% whereas this rate was 17% with the patients with osteoarthritis, which compose the greater portion of the group.

We encounter a similar result when we focus on total knee scoring. While achieving the highest value in the first year, the pain score tends to dropping in the 5th year follow-up in rheumatoid arthritis patients. In osteoarthritis patients, the pain score reaches it maximum in the first 6 months period and tends to draw a plain in the following time period that exceeds 5 year. The pain scoring constituting 50% of the total knee scoring, highly effects the knee scoring. As with function scoring, the score increase was 86% in rheumatoid arthritis patients whereas 140% in osteoarthritis patients. The main reason for this was although having multiple joint involvement with rheumatoid arthritis patients who went under single joint surgery, the complaints of other knees and joints contributed

to the function restrain. A knee flexion of at least 105° was necessary for rheumatoid arthritis patients that have multiple joint involvement in order to perform daily motions like standing up from sit position or lying down position.<sup>[24]</sup> In our study, the joint motion range of patients with rheumatoid arthritis increased from preoperative 75.5° to 95.5°; this result being better than the mid and long term results of the similar studies.<sup>[23,25]</sup> reported, was still below 105° limit. When patients that were operated from both knees were evaluated, 20 out of 39 patients were operated in single step whereas 19 were operated in two steps. In rheumatoid arthritis group the increase in function score of 6 patients operated in single step was 160%, from 30 to 83.3 points whereas in one patient who was operated in two steps the increase remained in 45%, from 35 to 48 points. No evident difference in such points were observed for osteoarthritis group.

Patellar reconstruction was applied to 10 knees (8%) and 3 of these (2.4%) developed complications related to extensor mechanism. Patellar relaxation have been realized when necessary and osteophytes have been cleaned. Since posterior cruciate ligament allows the femur to roll to the back with the flexion of the knee, it prevents tibiofemoral compression and allows the flexion beyond 90°-100°. In prosthesis which posterior cruciate ligament is sacrificed, the motion range is limited below 100°, which difficulties occur in motions such as climbing down a steps, standing up.<sup>[4]</sup> This problem was overcome by adding a central notch to the tibial component to create a joint with the femur in the advanced stages of flexion and stabilizing the prosthetic to the posterior by producing the posterior parts of the tibial component more flat. A flexion of 110° was achieved with these prosthetics. The femoral roll-back was also achieved with the same design. In the analysis of studies including walking and climbing steps up and down, a close result to normal knees have been observed with prosthetics which posterior cruciate ligament was retained meanwhile it was observed that with the prosthetics that sacrificed posterior cruciate ligament, the patients tend to lean forward while climbing the steps to reduce knee flexion. Also the dynamic EMG studies reveal that with knees that the cruciate ligament have been sacrificed, the function is realized by extra contraction of quadriceps, medial hamstring and soleus muscle.<sup>[26-28]</sup>

Those who suggest the posterior cruciate ligament to be sacrificed as a routine adventure the opinion that by this, the surgical technique will be eased, that technically the sacrifice of cruciate ligament is a must in fixing severe deformities, a rigid posterior cruciate ligament will restrain the flexion whenever the tension in cruciate ligament cannot be fixed properly or whenever it is relaxed subluxation may occur. Moreover, the back and forth motion of the femoral component may cause some relaxation by some seesaw mechanism with the effect of posterior cruciate ligament on tibial component and in those cases where posterior cruciate ligament has been retained, abrasion may occur as a results of extreme stresses on the contact surface of the surface geometries with low adaptation. Since the angle on tibia surface being low will reduce the contact surface, this will increase the contact stress and abrasion on the polyethylene.<sup>[29]</sup>

There is no issue that the prosthetics that sacrifice or retain the posterior cruciate ligament overcome one another when the results of these prosthetics are examined. The results are similar clinically and radiographically. Our clinic approach is posterior cruciate ligament sacrificing type prosthetics is to be used in knees with sever deformity. In our study, 17 ligament retaining and 108 ligament sacrificing prosthetics have been used. The fixation method of the prosthetics in total knee arthroplasty is another subject that is highly asserted. With the usage of the total knee prosthetics in younger patients, a trend towards applications without cement have started and different type of prosthetics where fixation has been procured by press-fit and bone in-growth principles have been developed. The advantages and disadvantages of both biological fixation and fixation with cement. In order to achieve full contact of prosthetics and bone in non-cement prosthetics, the osteotomy should be done very accurately. It has been shown that even a 150 micron movement is capable of preventing osteointegration. Therefore the primary stability should be secured during operation. The surgery on cement prosthetics is easier however. Moreover, with the prosthetics produced with bone cement, a immediate and full loading can be done. This very important in patients that is desired to walk soon. However in non-cement prosthetics, after procuring primary stability, preventing full loading and waiting for the bone to integrate to the prosthetics is necessary. The hybrid prosthetics applications where femoral component being non-

cement, patellar and tibial component being cement prosthetics is also among suggested alternatives. It has been observed that no evident clinic or radiographic difference is present between studies that are done with both cement and non-cement prosthetics. By these results some groups prefer non-cement prosthetics because the operation time being lower, no presence of the risk of relaxation depending on cement and in case of revision, the presence of a better bone stock. Moreover the application of non-cement prosthetics are suggested in male patients, active and fat patients where the chance of relaxation due to cement is present. Still, more descent occurrence in tibial components with non-cement compared to tibial components with cement prosthetics and the presence of very good results observed in 10-15 years with the cement prosthetics leads to suspicion for presence of other fixations.<sup>[30]</sup> In all of our patients, cement fixation is preferred. The cement prosthetics usage seems wiser when considering having achieved better performance clinically and radiographically and also taking into account the economical facts of the country. In total knee arthroplasty especially if sever deformity is subject, the expectations of the surgeon and the patient should be realistic. Even the most aware patient will be in a expectation of a normal knee after a knee arthroplasty. However the surgeon should explain the target of the operation as to reduce pain and increase the motions to some extent. Achieving a postoperative knee with 70°-80° painless motion range from a preoperative knee of 50° motion range should be accepted as a successful result.

There is a similar surgical order in all of the severe deformities. First soft tissue relaxation should be done. During relaxation, in each step it should be checked whether it is sufficient or not. Extreme fixing and unwanted instability should be avoided. The next step is the cutting of the bones. The bone cutting should be done flawlessly and the relaxations should be check again. If present the bone defects should be eliminated. Since the posterior cruciate ligament will be contracted in all the knees with severe deformity and it would prevent fixing, posterior cruciate ligament sacrificing prosthetics should be used. Another subject which draws attention is that even though the early results of patients with rheumatoid arthritis are very good, especially after the 5th year a quick deterioration is observed. There is the effect of patients being more sensitive to complications as well as the



negative affect of the multiple involvement in function restrain. Therefore operating both knee joints of these patients makes the rehabilitation more beneficial as well as increases the functional capacity. Instead of using a routine prosthetics type and a surgical technique, a better result will be achieved by using featured prosthetics in chosen knees and suitable soft tissue relaxation on knees with deformity.

## References

1. Windsor RE, Scuderi GR, Moran MC, Insall JN. Mechanisms of failure of the femoral and tibial components in total knee arthroplasty. *Clin Orthop Relat Res* 1989;(248):15-9.
2. Keblish PA. The lateral approach to the valgus knee. Surgical technique and analysis of 53 cases with over two-year follow-up evaluation. *Clin Orthop Relat Res* 1991;(271):52-62.
3. Kumar PJ, Dorr LD. Severe malalignment and soft-tissue imbalance in total knee arthroplasty. *Am J Knee Surg* 1997;10:36-41.
4. Krackow KA, Jones MM, Teeny SM, Hungerford DS. Primary total knee arthroplasty in patients with fixed valgus deformity. *Clin Orthop Relat Res* 1991;(273):9-18.
5. Colizza WA, Insall JN, Scuderi GR. The posterior stabilized total knee prosthesis. Assessment of polyethylene damage and osteolysis after a ten-year-minimum follow-up. *J Bone Joint Surg [Am]* 1995;77:1713-20.
6. Erdemli B, Bayrakçı K, Güzel B, Çetin İ. Valgus deformiteli dizlerde total diz protezi uygulamalarımız. *Fiziksel Tıp ve Rehabilitasyon Bilimleri Dergisi* 1998;1:13-17.
7. Easley ME, Insall JN, Scuderi GR, Bullek DD. Primary constrained condylar knee arthroplasty for the arthritic valgus knee. *Clin Orthop Relat Res* 2000;(380):58-64.
8. Erdemli B, Güzel B, Çetin İ. Total diz artroplastisinde deformitenin düzeltilmesi ve yumuşak doku dengesinin sağlanması. *TOTBİD Dergisi* 2003;2:87-93.
9. Fairbank TJ. Knee joint changes after meniscectomy. *J Bone Joint Surg [Br]* 1948;30:664-70. Free access to and available from: <http://www.jbjs.org.uk/cgi/reprint/30-B/4/664>.
10. Ewald FC. The Knee Society total knee arthroplasty roentgenographic evaluation and scoring system. *Clin Orthop Relat Res* 1989;(248):9-12.
11. Gunston FH. Polycentric knee arthroplasty. Prosthetic simulation of normal knee movement. *J Bone Joint Surg [Br]* 1971;53:272-7.
12. Insall JN. Infection of total knee arthroplasty. *Instr Course Lect* 1986;35:319-24.
13. Rand JA, Chao EY, Stauffer RN. Kinematic rotating-hinge total knee arthroplasty. *J Bone Joint Surg [Am]* 1987;69:489-97.
14. Fitzgerald RH Jr. Total hip arthroplasty sepsis. Prevention and diagnosis. *Orthop Clin North Am* 1992;23:259-64.
15. Williams DN, Gustilo RB. The use of preventive antibiotics in orthopaedic surgery. *Clin Orthop Relat Res* 1984;(190):83-8.
16. Rorabeck CH. Session IV: Salvage of the infected total knee replacement. Infection: the problem. *Clin Orthop Relat Res* 2002;(404):113-5.
17. Spangehl MJ, Hanssen AD. Management of the infected total knee replacement. *Curr Opin Orthop* 2002;13:23-9.
18. Wilson MG, Kelley K, Thornhill TS. Infection as a complication of total knee-replacement arthroplasty. Risk factors and treatment in sixty-seven cases. *J Bone Joint Surg [Am]* 1990;72:878-83.
19. Hanssen AD, Rand JA. Evaluation and treatment of infection at the site of a total hip or knee arthroplasty. *Instr Course Lect* 1999;48:111-22.
20. Bengtson S, Knutson K. The infected knee arthroplasty. A 6-year follow-up of 357 cases. *Acta Orthop Scand* 1991;62:301-11.
21. Ranawat CS, Flynn WF Jr, Saddler S, Hansraj KK, Maynard MJ. Long-term results of the total condylar knee arthroplasty. A 15-year survivorship study. *Clin Orthop Relat Res* 1993;(286):94-102.
22. Blasler RB, Matthews LS. Complications of prosthetic knee arthroplasty. In: Epps CH Jr, editor. *Complications in orthopaedic surgery*. 3rd ed. Philadelphia: J. B. Lippincott; 1994. p. 1057-87.
23. Stuart MJ, Rand JA. Total knee arthroplasty in young adults who have rheumatoid arthritis. *J Bone Joint Surg [Am]* 1988;70:84-7.
24. Laskin RS. Total condylar knee replacement in patients who have rheumatoid arthritis. A ten-year follow-up study. *J Bone Joint Surg [Am]* 1990;72:529-35.
25. Johnson DP, Eastwood DM. Lateral patellar release in knee arthroplasty. Effect on wound healing. *J Arthroplasty* 1992;7 Suppl:427-31.
26. Andriacchi TP, Galante JO, Fermier RW. The influence of total knee-replacement design on walking and stair-climbing. *J Bone Joint Surg [Am]* 1982;64:1328-35.
27. Dorr LD, Ochsner JL, Gronley J, Perry J. Functional comparison of posterior cruciate-retained versus cruciate-sacrificed total knee arthroplasty. *Clin Orthop Relat Res* 1988;(236):36-43.
28. Kelman GJ, Bideen EN, Wyatt MP, Ritter MA, Colwell CW Jr. Gait laboratory analysis of a posterior cruciate-sparing total knee arthroplasty in stair ascent and descent. *Clin Orthop Relat Res* 1989;(248):21-5.
29. Insall JN. Historical development, classification and characteristics of knee prostheses. In: Insall JN, Windsor RE, Scott WN, Kelly MA, Aglietti P, editors. *Surgery of the knee*. 2nd ed. New York: Churchill Livingstone; 1993. p. 677-717.
30. Watanabe H, Akizuki S, Takizawa T. Survival analysis of a cementless, cruciate-retaining total knee arthroplasty. Clinical and radiographic assessment 10 to 13 years after surgery. *J Bone Joint Surg [Br]* 2004;86:824-9.