The impact of joint line restoration on functional results after hinged knee prosthesis

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ABSTRACT

Background: Hinged knee prosthesis is an effective treatment method as a salvage procedure in marked ligamentous insufficiency and severe bone defects. Joint line determination and restoration are difficult due to large bone defects and distorted anatomy. We evaluated the impact of joint line alteration on the outcome in rotating hinge knee arthroplasty (RHKA).

Materials and Methods: 35 patients who had rotating hinged knee prosthesis applied between 2008 and 2013 were evaluated in this retrospective study. The patients were studied radiologically and clinically. Five patients were lost to followup and two patients died, leaving a total of 28 (7 male, 21 female) patients for final evaluation. The average age of the patients was 66.19 ± 8.35 years (range 52–83 years). The patients were evaluated clinically with Knee Society knee and functional score and patellar score. The joint line positions were evaluated radiographically with femoral epicondylar ratio method. The outcomes were also evaluated according to age, body weight and gender. Student’s t-test, independent t-test, and the Wilcoxon signed rank test were used in the statistical analysis.

Results: The mean Knee Society knee and functional score significantly improved from preoperative 19.52 ± 11.77 and 12.5 ± 15.66 respectively to 72.46 ± 14.01 and 70.36 ± 9.22 respectively postoperatively (P < 0.001). The mean range of motion of the knee improved from 55.95° ± 25.08° preoperatively to 92.14° ± 13.47° postoperatively (P < 0.001). Joint line position was restored in 20 patients (71.4%). Joint line alteration did not affect Knee Society Scores (KSSs) in contrast to patellar scores. Additionally, KSS was better in the patients with body mass index ≤30 at followup (P = 0.022 and P = 0.045).

Conclusion: RHKA is an effective salvage procedure for serious instability and large bone defects. Restoration of the joint line improves the patellar score although it had no effect on the clinical outcome.

Key words: Arthroplasty, epicondyle, joint line, knee

MeSH terms: Knee replacement, total, osteoarthritis, knee, knee prosthesis

INTRODUCTION

Total knee arthroplasty (TKA) is an effective treatment method in patients complaining of pain due to degenerative knee arthritis.1 Correct knee alignment and ligamentous balance are essential for better results after TKA.2 In cases where soft tissue balance cannot be maintained such as those with severe deformities in primary arthroplasty or revision cases with serious bone defects or marked ligamentous insufficiency, conventional knee prosthesis will fail in a short period of time.3 A constrained type knee prosthesis may be used as a salvage procedure in these situations.4,5

Changes in the knee joint line have adverse effects on knee arthroplasty.6–9 However, the determination of the correct joint line in revision knee arthroplasty is difficult because of large bone defects.10 The elevation of the joint line is associated with inferior clinical results and may lead to patellar impingement, decreased range of motion (ROM), mid-flexion instability, quadriceps weakness and increased patellofemoral contact forces with the resulting in anterior...
knee pain, increased component wear and extensor mechanism failure. Better functional scores have been reported with knee arthroplasty within <5 mm or 8 mm of joint line elevation.

Hinged knee prosthesis was developed to overcome uncorrectable ligamentous imbalance, large bone defects, severe deformities, and revision surgery where soft tissue balance cannot be maintained because of bone defects or ligamentous insufficiency. The joint line determination and restoration are difficult in hinged knee prosthesis because of large bone defects. This may be a factor contributing to the low functional scores in hinged knee prosthesis. Although joint line alteration has been related to anterior knee pain, to the best of our knowledge, there has been no study of the impact of joint line alteration on the functional scores after hinged knee arthroplasty. In this study, the clinical and radiographic results and the impact of joint line restoration on functional outcome and anterior knee pain were evaluated after surgery with rotating hinge knee arthroplasty (RHKA).

**Materials and Methods**

35 patients who had rotating hinged knee prosthesis applied between 2008 and 2013. Five patients were lost to followup and two patients died, leaving a total of 28 (7 male, 21 female) patients for final evaluation. The average age of the patients was 66.19 ± 8.35 years (range 52–83 years). The study was approved by the Institutional Review Board. Informed consent was obtained from all the study participants. Preoperative and postoperative radiographs, demographic information and the operation data were obtained from patient files. Paraplegic or bedridden patients, patients with mental retardation or dementia for whom evaluation of the functional state would be meaningless and those with active prosthetic infections were excluded from the study. The patients were called for a final followup examination. RHKA primary surgery was applied to 4 patients and revision surgery to 24 patients. The primary arthroplasties were performed because of severe varus deformity (28–22° varus deformities) in 3 patients and knee dislocation associated with degenerative arthritis in one patient. The revision surgeries were performed for septic loosening in 8 patients as a second stage procedure, aseptic loosening in 10 patients, knee dislocation after total knee prosthesis in 3 patients, ligamentous instability in 2 patients (medial collateral ligament over anterior cruciate ligament and posterior cruciate ligament insufficiency) and periprosthetic femoral fracture in one patient (Table 1).

**Operative procedure**

All patients were operated with cemented Endo-Model rotating hinged knee prosthesis (Waldemar Link GMBH and Co., Hamburg, Germany) and surgery was performed through a medial parapatellar arthrotomy and under tourniquet control. In cases of septic loosening, two staged exchange arthroplasty was applied with hand made spacer made up of antibiotic loaded cement. The time interval between the spacer application and the final prosthesis with RHKA was 5.2 months (range 3–9 month). Structural bone allografts were not used to fill the defects. Metal augments and cement were used to fill the defects instead of structural bone grafts. The joint line determination was made intraoperatively according to the tibial tubercle, epicondyles and the fibular head position, such as at a point 1.5 cm to 2 cm proximal to the fibular head, 2.2 cm proximal to the tibial tuberosity, 2 cm to 2.5 cm distal to the lateral femoral epicondyle or 2.5 cm to 3 cm distal to the medial femoral epicondyle. It was attempted to restore the joint line via block augments. The patella was replaced in 5 patients. Prophylactic first generation cephalosporin was used preoperatively and for 48 h after the surgery. A suction drain was retained until the second postoperative day.

**Postoperative management**

The postoperative management was similar for all patients and isometric quadriceps exercises were started on the day of surgery. Passive and active knee flexion exercises were started with the aid of a physiotherapist on the postoperative day one. Continuous passive motion application was started on the postoperative 2nd day to facilitate ROM exercises. Postoperatively, the patients were encouraged to walk with the aid of a walker with weight-bearing as tolerated.

**Outcome assessments**

The patients were evaluated clinically and radiographically. Knee Society knee score and Knee Society function score were measured and compared preoperatively taken from the patient files and at the final followup. The patellar score was also measured at the final followup. Age of the patients and body mass index (BMI) were recorded from the patient files. We grouped the patients into ≤65 years and over 65 years and BMI of ≤30 and over 30 and investigated the influence of the age and BMI on the outcomes. ROM of the patient’s knee was measured manually with a goniometer and compared preoperatively and postoperatively. The radiographs included an anteroposterior and true lateral view and the measurements were taken by one of the authors on scaled digital radiographs.

The joint line positions were evaluated with the femoral epicondylar ratio method. In this method, the medial and the lateral epicondyles were identified and the transepicondylar distance (TeD) was measured from the anteroposterior radiograph. The joint line was defined...
Table 1: Clinical details of patients

| Patient | Age (years) | Gender | BMI | Underlying pathologies                                                                 | Followup (months) | OR time (min) | Complications                                                                 | Outcome score | Outcome score | Patellar score |
|---------|-------------|--------|-----|----------------------------------------------------------------------------------------|-------------------|---------------|--------------------------------------------------------------------------------|---------------|---------------|----------------|
| 1       | 68          | Female | 33.2| Aseptic loosening (posteromedial femoral condyle and tibial defect)                    | 27                | 110           | Superficial infection (no pathogen)                                             | 30            | 59            | 25 65 12       |
| 2       | 74          | Female | 21.6| Knee dislocation                                                                       | 34                | 90            | -                                                                              | 0             | 57            | 0 65 12       |
| 3       | 72          | Male   | 25.6| Instability                                                                             | 16                | 140           | -                                                                              | 27            | 82            | 5 75 12       |
| 4       | 56          | Female | 31.3| Severe varus deformity                                                                  | 19                | 130           | -                                                                              | 38            | 85            | 35 85 15      |
| 5       | 58          | Female | 35.6| Septic loosening (medial femoral condyle large defect)                                  | 21                | 180           | Limited knee ROM, arthroscopic release applied                                  | 8             | 56            | 0 65 20       |
| 6       | 80          | Male   | 34.2| Aseptic loosening (distal irregular defect on both femoral condyle)                    | 31                | 110           | -                                                                              | 22            | 69            | 0 75 23       |
| 7       | 59          | Female | 34.7| Instability                                                                             | 39                | 150           | -                                                                              | 22            | 78            | 25 85 15      |
| 8       | 70          | Female | 36.5| Aseptic loosening (lateral femoral condyle and anterior part of large tibial defect)   | 32                | 130           | Superficial infection (staph epidermis)                                         | 21            | 76            | 5 65 12       |
| 9       | 52          | Female | 35.4| Septic loosening (both femoral condyle large defect)                                   | 16                | 160           | -                                                                              | 17            | 66            | 15 65 11      |
| 10      | 56          | Male   | 26.4| Aseptic loosening (lateral femoral condyle defect)                                     | 29                | 80            | -                                                                              | 17            | 82            | 0 75 15       |
| 11      | 68          | Female | 32.6| Knee dislocation after TKR (both femoral condyle defect)                               | 29                | 130           | -                                                                              | 0             | 49            | 0 55 14       |
| 12      | 71          | Female | 31.1| Periprosthetic fracture                                                                 | 34                | 100           | Superficial infection (no pathogen)                                             | 0             | 57            | 0 65 20       |
| 13      | 59          | Male   | 24.8| Aseptic loosening (medial femoral condyle defect)                                      | 37                | 120           | -                                                                              | 43            | 90            | 55 85 23      |
| 14      | 71          | Female | 28.7| Septic loosening (both femoral condyle large defect)                                   | 30                | 120           | -                                                                              | 16            | 75            | 15 75 26      |
| 15      | 60          | Female | 32.6| Aseptic loosening (tibial defect)                                                       | 41                | 130           | -                                                                              | 24            | 83            | 5 65 11       |
| 16      | 72          | Female | 34.5| Septic loosening (medial femoral condyle and medial tibia defect)                      | 36                | 150           | -                                                                              | 16            | 76            | 0 75 23       |
| 17      | 76          | Male   | 28.7| Severe varus deformity                                                                  | 41                | 100           | Limited knee ROM, arthroscopic release applied                                  | 22            | 75            | 15 65 17      |
| 18      | 74          | Female | 30.6| Knee dislocation after TKR (both femoral condyle and tibial defect)                    | 30                | 120           | -                                                                              | 0             | 47            | 0 65 9        |
| 19      | 76          | Female | 30.1| Aseptic loosening (lateral femoral condyle large defect)                               | 27                | 180           | Superficial infection (Acinetobacter)                                          | 22            | 84            | 0 75 16       |
| 20      | 83          | Male   | 26.6| Aseptic loosening (both femoral condyle defect)                                        | 34                | 120           | Superficial infection (Acinetobacter)                                          | 41            | 85            | 35 75 15      |

Contd...
as the most distal part of the femoral component. The epicondylar ratio was calculated as the distance between one of the epicondyles and the joint line in relation to the TeD on the AP view [Figure 1]. Thus a medial (medial epicondyle–joint line distance [MeJL]/TeD) and a lateral (lateral epicondyle–joint line distance [LeJL]/TeD) ratio were calculated. The intended joint line was defined with MeJL/TeD assumed as 0.34 (0.28–0.42) and the LeJL/TeD as 0.28 (0.23–0.34) according to the method described by Servien et al.15

Implant loosening, tibiofemoral alignment and the bone loss were also evaluated on the followup radiographs.

Statistical analysis
Changes in the Knee society scores (KSSs) and ROM were evaluated via the Student’s t-test. Independent t-test was used to compare outcomes according to age, BMI, and gender. The Wilcoxon signed rank test was used to analyze the influence of the joint line reconstruction on the postoperative clinical results. A value of $P \leq 0.05$ was considered as statistically significant.

Results
The mean followup period was 28.95 ± 7.59 months (range 14–41 months). The mean Knee Society knee score improved significantly from 19.52 ± 11.77 (range 0–43) preoperatively to 72.46 ± 14.01 (range 47–91) postoperatively ($P < 0.001$). The mean Knee Society function score improved from 12.5 ± 15.66 (range 0–55) preoperatively to 70.36 ± 9.22 (range 55–85) ($P < 0.001$). The mean ROM of the knee was improved from 55.95 ± 25.08° (range 0°–90°) preoperatively to 92.14 ± 13.47° (range 70–110°) postoperatively ($P < 0.001$). Patellar scores did not differ according to age, BMI and gender ($P > 0.05$). However, KSS was better in the patients with BMI ≤30 at followup ($P = 0.022$ and $P = 0.045$) [Table 2]. Additionally, Knee Society knee scores were better in the male patients at followup ($P = 0.003$).

The tibiofemoral alignment of all knees was corrected at surgery to the built-in prosthetic angle of 6° of valgus and there was no evidence of any change in this alignment over...
No migration or progressive loosening was evident on the final radiographs. Nonprogressive radiolucent lines were seen in 3 cases and these were <2 mm in thickness. Joint line position was restored in 20 patients (71.4%) according to the epicondylar ratio method. The patient’s KSSs and patellar scores were also evaluated according to joint line restoration [Table 3].

Two patients had arthroscopic release to improve ROM postoperatively. One of these patients had 40° and the other patient had 30° ROM for knee flexion and needed arthroscopic release 2 months after the operation. We released the adhesions of the quadriceps tendon arthroscopically in these patients and gained 110° knee flexion intraoperatively. There was no evidence of postoperative tibiofemoral instability in any of the patients. Five patients had a superficial infection that responded to local care. One patient had deep infection and was treated with two stage exchange arthroplasty. This patient had wound dehiscence after the previous operation and the wound was closed with a skin flap. This patient had the worst functional outcome (KSS knee and functional scores were 42 and 45 respectively, ROM was 70°).

Table 2: The evaluation of outcomes according to age, BMI and gender

| Demographic properties | KSS knee | KSS function | Patellar score |
|------------------------|----------|--------------|---------------|
|                        | Preoperative | Followup | Preoperative | Followup | Preoperative | Followup | Preoperative | Followup | Preoperative | Followup |
| Age                    |            |            |            |            |              |            |              |            |              |
| ≤65 years (n=13)       | 23.61±9.78 | 0.085     | 76.15±13.69 | 0.200     | 15.77±16.81 | 0.313     | 71.92±11.09 | 0.413     | 16.15±4.39 | 0.536    |
| Over 65 years (n=15)   | 15.93±12.48 | 0.341     | 69.27±13.94 | 0.022     | 9.67±14.57  | 0.133     | 69±7.37     | 0.045     | 17±5.88    | 0.303    |
| BMI                    |            |            |            |            |              |            |              |            |              |
| ≤30 (n=10)             | 22.4±12.5 | 0.341     | 80.4±9.75  | 0.022     | 18.5±19.87 | 0.133     | 75±6.78     | 0.045     | 18.2±6.07 | 0.303    |
| Over 30 (n=18)         | 17.89±11.33 | 0.060     | 68.06±14.28 | 0.003     | 9.17±12.16 | 0.058     | 67.78±9.58 | 0.126     | 19±5.75    | 0.205    |
| Gender                 |            |            |            |            |              |            |              |            |              |
| Male (n=7)             | 26.71±11.15 | 0.060    | 82±7.87     | 0.003     | 22.14±22.7 | 0.058     | 75±8.16     | 0.126     | 19±5.75    | 0.205    |
| Female (n=21)          | 17.09±11.19 | 0.060     | 69.29±14.28 | 0.003     | 9.29±11.54 | 0.058     | 68.81±9.21 | 0.126     | 16.09±4.92 | 0.205    |

BMI=Body mass index, KSS=Knee Society Score


**Discussion**

Although the older generation of hinge knee prosthesis had early failures, the newer designs of this prosthesis provide stability and functional improvement. It can be a salvage procedure when there is huge bone loss or joint line alteration did not affect the KSSs, patellar scores were affected.

This study demonstrated that RHKA is a good solution in cases of large bone defects or marked ligamentous insufficiency. All the patients improved clinically. No loosening was detected at the final followup. Although the functional demand was low, especially in revision cases and where there were difficulties due to large bone defects, RHKA offers the surgeon the advantage of easy application despite the distorted anatomy [Figure 2].

Different results have been reported with the hinged knee prosthesis in the literature [Table 4] and the overall results were low for fixed hinged knee prosthesis. Although the results of rotating type hinge knee prosthesis were better, the followup periods were short and the design of the prosthesis was different. Böh m and Holly evaluated 422 knees of 330 patients who had primary RHKA surgery at a mean of 6 years. The survival rates varied from 86.8% to 96.0% depending on the end points at 20 years. Although the results were encouraging, the functional state was not reported, and success was reported as revision surgery as an end point. Barrack reported satisfactory clinical results in 23 knees of 22 patients comparable to revision knee arthroplasty with hinged TKAs evaluated at 2–9 year followup. Joshi and Navarro-Quilis reviewed the results of 78 revision TKAs using a rotating hinge device in patients requiring revision arthroplasty due to aseptic loosening. Excellent results were determined in 57 patients with ROM of 104° in flexion and complete extension. However, Pour et al. reported that RHKA should be reserved primarily for sedentary and elderly patients. The rate of prosthetic survival was 79.6% at 1 year and 68.2% at 5 years with revision or reoperation as the end point of 44 patients in their study. In the current study, the average ROM of the knee (92.14 ± 13.47°) was slightly low compared with the literature (93.6–104°). The most important determinant of postoperative ROM was the preoperative ROM of the patient, thus the patients in our study had multiple operations formerly and the soft tissue of the knee of these patients were deteriorated and this leads to lower ROM values in our study population. However, the outcome in our series was comparable with the literature so that the relatively lower ROM did not affect the functional state. Additionally, if the patient who had the worst result in our study was excluded, the average ROM in our series was improved to 94.52 ± 11.82° that comparable with the literature.

Although contradictory findings were reported in the literature, patients with BMI ≥ 40, > 80 years and female gender had more activity limitation after revision knee arthroplasty. Our study group in this study was small so that we grouped the patients into ≤ 65 years and over and found no significant difference between defined age groups. However, we found better KSS in patients with BMI ≤ 30 in this study. Although patellar scores were dependent with body weight, we did not find any significant difference according to BMI (P = 0.303). Additionally, women had worse KSS knee scores both preoperatively and postoperatively. The male gender patients with ≤ 65 years and BMI ≤ 30 had better outcome after RHKA in our study.

Joint line restoration of the knee in revision arthroplasty is difficult. Femoral and tibial defects lead to joint line elevation if the bone lost from the distal femur is not reconstructed and the defect is addressed by thickening the tibial insert. The restoration of the joint line has a positive

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**Table 3: Patient’s outcomes according to joint line restoration**

| Outcome assessment | Joint line restored | Joint line altered | P  |
|--------------------|---------------------|--------------------|----|
| Knee Society knee score | 63.38±16.13         | 74.25±15.9         | 0.138 |
| Knee Society functional score | 70±9.26             | 65±9.26           | 0.227 |
| Patellar score | 17.63±4.1           | 12.25±1.83        | 0.009 |

**Figure 2:** (a) Preoperative radiograph of the knee joint showing the detachment of the medial tibial component associated with infection. (b and c) After two stage exchange arthroplasty, the patient was treated with hinged knee prosthesis. Due to the medial bone loss, metal augment was applied to the medial tibial component. (d and e) Clinical photograph of the patient after 3 years showing range of motion.
Table 4: Previous reports about rotating hinge knee arthroplasty in the literature

| Study                        | Number of patients | Mean age (years) | Male/female ratio | Complications                                                                 | Followup                        | Main findings                                                                 |
|------------------------------|--------------------|------------------|-------------------|-------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------|
| Hernández-Vaquero and Sandoval-Garcia, 2010<sup>5</sup> | 26                 | 77               | 5/21              | 5 patients had medical complications 3 required revision 5 patients had patella and extensor mechanism complications | 46 months (24-107 months)      | KSS improved from 40 to 77 KSS functional score improved from 36 to 51 23 mobilized with 1 crutch, 3 with 2 crutches It is last resort in the presence of a ligamentous instability |
| Bistolfi et al., 2012<sup>22</sup> | 29                 | 72.8             | 5/24              | 3 patients had medical complications 7 failures (2 aseptic loosening, 2 septic loosening, 3 clinical failures) | 60.3 months (32-100 months)    | HSS knee score improved from 65.5 to 88.4 ROM improved from 90.9° to 124.4° RHKA still the implant of choice for revision knee surgery in ligamentous instability |
| Smith et al., 2013<sup>23</sup> | 271                | 68.1             | 84/187            | 51 patients had complication in 111 patients that can be evaluated (29 medical complications, 22 mechanical complications) | 6.9 years/4.1 years             | Infection was the leading cause of failure and nonmechanical failures account for more than half of the failures |
| Fuchs et al., 2004<sup>24</sup> | 26 (10 hinged knee arthroplasty) | 68.5             | Not given         | Not given                                                                      | 20.4 months                     | HSS, KSS,VAS, Tegner activity score, patella score did not differ Patients with a hinged implant had significant better scores in the mental components of the SF36 quality-of-life assessment |
| Baker et al., 2014<sup>25</sup> | 964                | 73               | 278/686           | 20 revision (8 infection, 4 periprosthetic fracture, 3 aseptic loosening)      | Max 7 years                     | The 5-year survival rate was 96.8% Hinged knee replacement is a viable alternative in the primary setting and should be considered in complex cases in instability |
| Pradhan et al., 2004<sup>26</sup> | 50 (51 knees)      | 70.25            | 21/29             | 7 patients requiring plastic surgery for soft tissue cover 7 patients requiring a tibial osteotomy for adequate exposure of the joint | 4 (2-6) years                   | HSS improved from 35.9 to 72.1 44 (86%) patients were satisfied with the outcome of the revision surgery, 3 (6%) noncommittal and 4 (8%) disappointed 10 patients died from unrelated causes The median (best case) survival for the whole group was 90% (95% CI: 86-94), and worse case was 58% (42-74) at 5 years |
| Deehan et al., 2008<sup>27</sup> | 64 (72 knees)      | 69               | 19/45             | 23 patients (10 persistent pain, 5 extensor dysfunction, 5 infection, 3 periprosthetic fracture, 2 skin problems, 1 aseptic loosening) | 10 (3-18) years                 | KSS improved from 41 to 131 ROM improved from 78° to 93° Knee alignment 7° valgus |
| Barrack et al., 2000<sup>28</sup> | 13 (14 knees)      | 69               | 8/6               | 1 intraoperative femoral fracture, 1 patellar subluxation, 1 axle of prosthesis back-up, 1 partial peroneal palsy and soft tissue defect | 51 months (2-6 years)           | Continued...                                                                      |
influence on the clinical results and long term survival rates. It has been reported in literature that clinical results deteriorate with 5–8 mm joint line elevation. Contrary to expectations in the current study, it was found that the joint line alteration did not affect the outcomes in RHKA except in respect of patellar scores. The constrained system eliminates the need to provide ligamentous balance. The successful results after arthroplasty are associated with ligamentous balance and correlated with joint line restoration, but the outcomes after RHKA were not affected by the joint line regardless of ligamentous balance. However, the patellar score was affected by the joint line alteration because of the uncoupling of the patella and the constrained system.

Although there is no consensus on measurement methods of the joint line position in revision knee surgeries, large bone defects and previous surgeries make it complicated and challenging to define the joint line position. The femoral epicondyles, the adductor tubercle, the fibular head, the tibial tubercle, and the inferior patella pole have frequently been used for measurement. Soft tissue landmarks are inherently inaccurate as they are usually distorted from previous surgeries. Bony landmarks provide more reliable guides in revision surgeries, although the fibular head is not a reliable guide for the joint line in revision surgery because of wide variation independent of patient size. Although the tibial tubercle also provides a reliable method, its use is limited due to the need for preimplant radiography or contralateral radiography of the knee to determine the native joint line. Furthermore, the standard value of the distance between the tibial tubercle to the joint line as...
radiographs are available. Therefore, strict decisions cannot be made about the functional state according to joint line position.

**Conclusion**

Rotating hinge knee arthroplasty is an effective salvage procedure for serious instability and large bone defects. Restoration of the joint line improves the patellar score even though the clinical outcome was not affected.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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**Figure 4:**
(a and b) X-rays knee joint anteroposterior and lateral views showing severe varus deformity associated with degenerative arthritis.
(c) The clinical photograph of the same patient showing the severe varus deformity.
(d and e) X-rays of knee joint anteroposterior and lateral views showing hinged knee arthroplasty as a primary surgery.

An altered joint line after arthroplasty results in a change in the patellar contact area. Joint line elevation may result in patella baja with impingement of the patella on the tibial component during knee flexion and increased patellofemoral contact forces leading to anterior knee pain, increased component wear or extensor mechanism failure. Anterior knee pain and patellar scores for functions such as rising from a chair and stair climbing were lower in patients with an altered joint line after RHKA in the current study.

Some limitations were identified in this study. First, the relatively small patient population means that a general conclusion cannot be made. Furthermore, our study is a retrospective study and control group was not found. In addition, the followup period was not long enough to make a decision about the long term survival in RHKA. Although the joint line measurement was reliable, the native joint line cannot be determined unless the preimplant or contralateral...
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