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## Comparison of radiological and clinical assessments patellar resurfacing with retention for late stages of knee osteoarthritis performed total knee arthroplasty

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*Introduction: the purpose of this prospective study was to compare radiological and clinical outcomes after total knee arthroplasty (TKA) with or without patellar resurfacing in patients with grade IV osteoarthritis on patellofemoral joint. Materials and Methods: 123 cases with Kellgren-Lawrence grade IV osteoarthritis on patellofemoral joint were enrolled for this study. At the operating room they were randomly assigned to undergo patella resurfacing (62 cases) or patella retention (61 cases). Among them, 114 cases that could be followed for more than 2 years were included in this study (resurfacing group; 59 cases, retention group; 55 cases). Preoperative and postoperative radiological and clinical outcomes (mechanical femorotibial angles, patellar tilt, congruence angle, WOMAC score and ROM) were evaluated and compared between two groups. Results: preoperative radiological measures show insignificant difference between patellar tilt ( $P = 0.13$ ), mechanical femorotibial angles ( $P = 0.62$ ) and congruence angle ( $P = 0.37$ ). Despite the difference performed methods of surgery, postoperative radiological assessment outcomes between two groups were almost identical Patellar tilt ( $P = 0.47$ ), mechanical femorotibial angles ( $P = 0.34$ ) and congruence angle ( $P > 0.05$ ). WOMAC score after surgery was  $31.7 \pm 6.4$  point in resurfacing group,  $29.2 \pm 6.9$  point was in retention group without significant intergroup difference. And there was no significant difference ROM in both groups respectively. There was no significant difference between two groups in mechanical axis of the lower limb and patella tilt, patella congruence. Conclusion: obtained almost the same satisfactory radiological and clinical outcomes after patella resurfacing and retention groups after TKR allows us to conclude that, primary TKA without patellar resurfacing is a good treatment option in patients with high grade osteoarthritis of the patellofemoral joint. Key words: knee osteoarthritis, total knee arthroplasty, patella resurfacing, radiological assessment, clinical outcomes.*

*Цель исследования: сравнить радиологические и клинические результаты тотального эндопротезирования коленного сустава со шлифовкой надколенника или без нее у пациентов с остеоартрозом (ОА) пателлофemorального сустава IV стадии. Методы: в исследование включены 123 случая с ОА пателлофemorального сустава IV стадии по Kellgren-Lawrence. Больных случайным образом распределили на две группы: шлифовка надколенника — 62 случая, его сохранение — 61. Результаты в динамике на протяжении более 2 лет после операции оценены у 114 пациентов (со шлифовкой — 59, без шлифовки — 55). Проведена пред- и послеоперационная сравнительная оценка в группах с использованием рентгенологических и клинических параметров (механические бедренно-большеберцовые углы, угол наклона надколенника, конгруэнтности, оценка по шкале WOMAC и объема движений). Результаты: предоперационные рентгенологические измерения не показали существенной разницы в величине угла наклона надколенника ( $p = 0,13$ ), механических бедренно-большеберцовых углов ( $p = 0,62$ ) и угла конгруэнтности ( $p = 0,37$ ). Несмотря на разницу в примененных методах хирургического вмешательства, послеоперационная оценка результатов выявила почти идентичные показатели в обеих группах. По шкале WOMAC после операции не выявлено значительных различий между группами: со шлифовкой —  $(31,7 \pm 6,4)$  пунктов, с сохранением надколенника —  $(29 \pm 6,9)$ . Также не обнаружено существенной разницы между группами при анализе объема движений, механической оси нижней конечности, наклона и конгруэнтности надколенника. Заключение: получены практически идентичные удовлетворительные результаты для групп со шлифовкой надколенника и его сохранением, что свидетельствует о возможности выбора этих методов при первичном тотальном эндопротезировании коленного сустава у пациентов с выраженным ОА пателлофemorального сустава. Ключевые слова: остеоартроз коленного сустава, тотальное эндопротезирование, шлифовка надколенника, рентгенологическая оценка, клинические результаты.*

**Key words:** knee osteoarthritis, total knee arthroplasty, patella resurfacing, radiological assessment, clinical outcomes

## Introduction

Total knee arthroplasty (TKA) has been widely used for several years in patients with knee osteoarthritis because destruction and degree of deterioration of the articular surface cartilage were more common [1, 2].

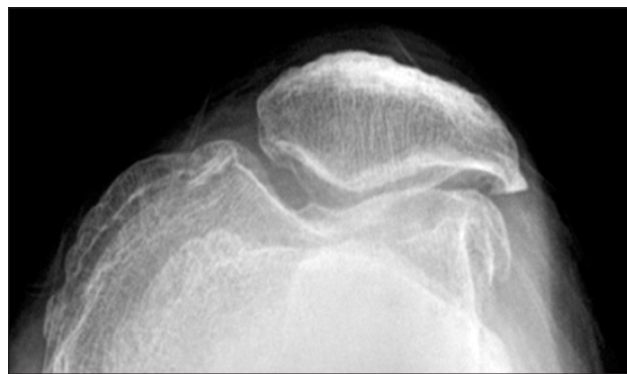
Equipment technologies, surgery techniques, results of treatment knee osteoarthritis improved during the last decade and reached excellent clinical success of TKR but controversy remains concerning whether or not to resurface the patella [3–5].

Many authors conducted number of randomized controlled trials and clinical studies [4, 6]. Randomized controlled trials constitute the most reliable source of evidence for the evaluation of the efficacy of a potential intervention. But most of these studies include all degree of osteoarthritis of the patellofemoral joint [6]. And on the other hand numerous research were conducted to certain solves of the questions resurfacing or retention patellofemoral joint [7–10]. Despite radiological measures has higher informative value for TKR [11], not many authors were published materials studying patellar resurfacing problems in high degree osteoarthritis performing TKR.

*The purpose* of this prospective study was to compare radiological outcomes after TKA with or without patellar resurfacing in patients with grade IV osteoarthritis on patellofemoral joint. We enrolled only patients with Kellgren-Lawrence grade IV or ICRS grade IV osteoarthritis on patellofemoral joint performed primary TKA.

## Material and methods

To study our goal we gathered all the materials of the patients with osteoarthritis grade IV on patellofemoral joint (Fig. 1), undergoing TKA in Chonnam National University Hospital during the 2004–2013 years (123 cases). The patients assessed radiological outcomes were divided into two groups, 62 cases of patellar resurfacing and 61 cases of patella retention group. Among them, 114 cases that could be followed for more than 2 years were included in this study, 59 cases of resurfacing group and 55 cases of retention group.

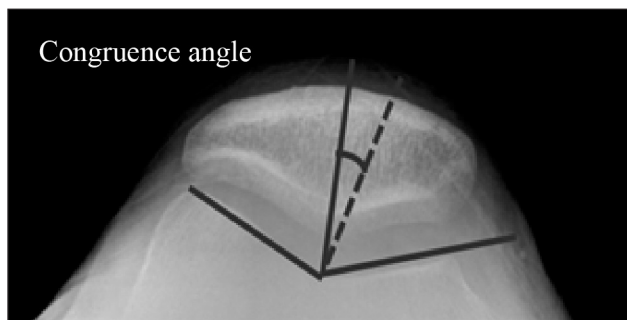
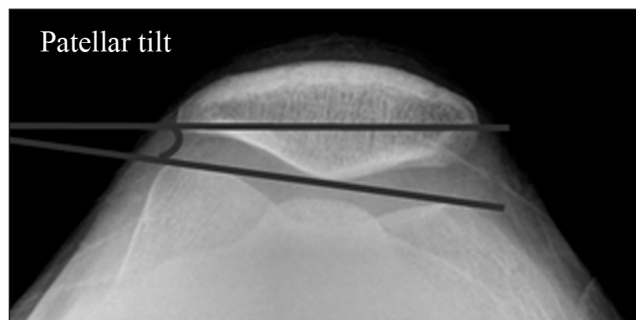


**Fig. 1.** Preoperative radiological picture patellofemoral osteoarthritis grade IV

In patellar resurfacing group were 59 knees of 42 patients which average age equal 66.3 year and in retention group 55 knees of 49 patients with average age were 65.6 year. For comparison of preoperative radiological state of the patient we evaluated and compared outcomes regarding the mechanical femorotibial angles; ( $^{\circ}$ , valgus), patellar tilt ( $^{\circ}$ ) and congruence angle ( $^{\circ}$ ) in both of group of patient (Fig. 2). Intraoperatively individually was measured patellar thickness for determination implant size. In patients almost were used patellar implants with 8.0–9.0 mm thickness.

All our patients were performed cemented primary TKA with a medial parapatellar approach, Total 54 knees were operated using computer navigation E-motion technics. TKA accomplished with patellar resurfacing in the first group and patellar retention in second groups. When patellar retention was performed, osteophytes of the patella were removed and marginal electrocauterization was carried out. In 23 patients were performed TKA in both knees and 68 cases were only in one side. When surgery was performed on one of knees- 38 cases were on right and 30 were on left side.

Postoperatively during the following two years roentgenography was taken of the operating knees and re-defined radiological outcomes (the mechanical femorotibial angles, patellar tilt and congruence angle) in both groups of patients (Fig. 3).



**Fig. 2.** Radiological assessment methods before surgery

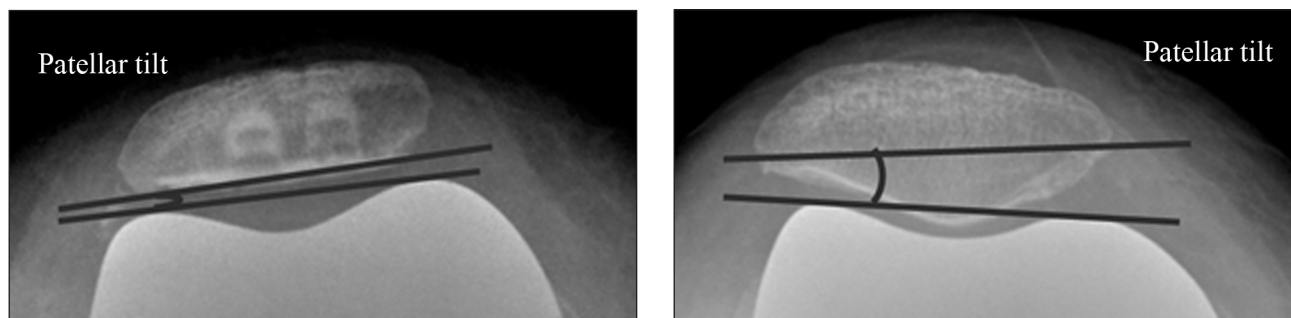


Fig. 3. Patellar tilt assessments after surgery in resurfacing and retention patellofemoral joint

For the comparison of preoperative state of the patient and clinical outcomes, we evaluated and compared WOMAC score, and range of motion (ROM) before and after surgery in both groups.

Research data were summarized with expositive statistics (mean, standard deviation, etc.). The statistical scale significance was predetermined as  $p < 0.05$ . The SPSS software package for Windows (Statistical Package for Social Sciences, version 17.0, SPSS Inc., Chicago, IL, USA) was used for all analyses. Our authors objectively and widely researched each question installed on separately parts, each issues were discussed in comprehensive approaches. For a visual processing and demonstrate our research work we used Microsoft Word and Microsoft Excel 2010.

### Results and discussion

Radiological finds of our study have two important features, variation preoperative indications to postoperative outcomes and opportunity to assess difference between resurfacing and retention group patellofemoral joint.

Measures before surgery show not significant difference patellar tilt of  $5^\circ$  ( $P = 0.13$ ), mechanical femorotibial angles ( $P = 0.62$ ) and congruence angle ( $P = 0.37$ ) between patellar resurfacing and not resurfacing groups (table 1). Despite the difference performed methods of surgery, postoperative radiological assessment outcomes indicated to receiving good results within two groups and almost were identical for both of groups patient (Patellar tilt ( $P = 0.47$ ), mechanical femorotibial angles ( $P = 0.34$ ) and congruence angle ( $P > 0.05$ )). However the preoperative femorotibial mechanical angle of patents in resurfacing group ranged from  $3.64^\circ$  to  $18.02^\circ$  and from  $1.98^\circ$  to  $19.36^\circ$  in retention group,

postoperative results shows good result in both groups, and the mechanical angle average mean after surgery for both group was  $0.69$  degree.

Second finding of our study results was definition of not significant difference postoperative radiological outcomes assessment between patellar resurfacing and retention groups. Preoperative measures of patellar tilt indicated that development of osteophytes and deformation of the patellar surface led to change this radiological mark, average patellar tilt angle for both group was  $(11.4 \pm 6.6)$  degree. However postoperatively were obtained satisfied results in both group of patients, ( $1.75 \pm 1.12$  in resurfacing group and  $2.68 \pm 1.34$  in retention group,  $P$ -value =  $0.47$ ). During the assessment preoperative congruence angle in both groups were identified large ranges of sulcus angle difference between patients ( $141.3^\circ \pm 3.8^\circ$ ). Despite deepened patellar groove in prosthesis which we used the postoperative congruence angle assessment results in resurfacing group and in retention group was almost equal. Postoperative radiological assessment mechanical femorotibial angle ( $^\circ$ , varus) difference within researched groups was not significant ( $P$ -value =  $0.34$ ), in resurfacing group- $0.81 \pm 3.27$  and  $0.12 \pm 3.58$  in retention group.

WOMAC score after surgery was  $31.7 \pm 6.4$  point in resurfacing group,  $29.2 \pm 6.9$  point was in retention group, without significant intergroup difference (table 2). And there was no significant difference ROM in both group respectively ( $P$  value —  $0.42$ ) (table 3).

Despite excellent clinical success of total knee arthroplasty (TKA), controversy remains concerning whether or not to resurface the patella [2, 14]. Jack Farr et all finds shows that patients with not resurfaced knees had slightly better satisfaction than patellar resurfaced

Table 1

#### Preoperative radiological assessment

Indicies	Resurfacing G	Retention	P-valye
Mechanical femorotibial angle ( $^\circ$ , varus)	$10.83 \pm 7.19$	$10.67 \pm 8.69$	0.62
Patellar tilt ( $^\circ$ )	$10.68 \pm 6.21$	$12.12 \pm 6.98$	0.13
Congruence angle ( $^\circ$ )	$18.9 \pm 11.41$	$22.4 \pm 10.84$	0.37

Table 2

## WOMAC score

Groups	Preoperative	Postoperative
Resurfacing group	55.4 ± 8.5	31.7 ± 6.4
Retention group	52.8 ± 9.2	29.2 ± 6.9
(P-value : 0.26)		

patients [9] and with correctly execution TKA, resurfacing patella is unnecessary [10, 13]. But after obtaining good clinical outcomes and because of the possibility of a subsequent deterioration of the patella with osteoarthritis in long-term follow-up, other group of researches consider that resurfacing of the patella during primary total knee arthroplasty is one of the best solution [12, 16]. When osteoarthritis has not severe pain even if there are many changes in the cartilage, treatment knee arthritis manage without patellofemoral arthroplasty. In TKA performed without resurfacing, the patella contact force does not significantly increase and cartilage contact stress doesn't increase and this lead to prevent most expected complications. Nevertheless the risk of postoperative complications is highest in patellar resurfacing group than not resurfacing group [3]. To choose a solution resurfacing or retention patellar surface we must pay attention to a lot of criteria but preoperative radiological diagnostic measures and checking postoperative radiological results of the treatment are indispensable and important for all TKA.

Assessment of the patellar cartilage intraoperative and make decision on patellar resurfacing are trustworthy in patient undergoing TKR after osteoarthritis, however, despite the patellar cartilage was damaged, only the status of the patellar articular cannot be determining main factor for patellar resurfacing [4]. Most of patients with pathology of the knee osteoarthritis radiologically determined patellofemoral osteoarthritis with severe of grade [16, 17]. However we include in our study only the high degree of patellofemoral osteoarthritis. Determination of the grade of osteoarthritis using with Kellgren-Lawrence grade widely used by many researchers [18, 19]. Based on these decisions we enrolled only patients with Kellgren-Lawrence grade IV or ICRS grade IV osteoarthritis on patellofemoral joint performed primary TKA.

Definition and study patellofemoral congruence angle in patient widely used for diagnosis and measure clinical outcomes of the surgery [15]. Because this method has some limits the researchers need another technique for achieve their purpose [20]. Scrutiny patellar tilt and mechanical femorotibial angles are one of the informative methods for study indications and outcomes of TKA [11, 21]. To get more detailed radiological results, we used once preoperative and postop-

Table 3

## ROM

Groups	Preoperative	Postoperative
Resurfacing group	116.0 ± 8.8	128.0 ± 7.5
Retention group	114.0 ± 12.3	126.0 ± 8.5
(P-value : 0.26)		

erative determination difference between patellar tilt, mechanical femorotibial angles and congruence angle.

In our small study we explored difference between only some roentgenologic methods with osteoarthritis grade IV in patients performing primary TKA. We could not add to our study of MRI, CT and other radiological methods of investigation. However these methods also frequently used in practice today and our study limitation caused leave these aspects remain open.

### Conclusion

Obtained almost the same satisfactory radiological outcomes after patella resurfacing and retention groups after TKR allows us to conclude that, primary TKA without patellar resurfacing is a good treatment option in patients with high grade osteoarthritis of the patellofemoral joint.

**Conflict of interest.** The authors declare the absence of conflict of interest.

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## СРАВНЕНИЕ РЕЗУЛЬТАТОВ РЕНТГЕНОЛОГИЧЕСКОЙ И КЛИНИЧЕСКОЙ ОЦЕНКИ ИСХОДОВ ЭНДОПРОТЕЗИРОВАНИЯ С ШЛИФОВКОЙ НАДКОЛЕННИКА И БЕЗ НЕЕ ПРИ ПОЗДНИХ СТАДИЯХ ОСТЕОАРТРОЗА КОЛЕННОГО СУСТАВА

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