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Bo-Hyun Hwang, MD  
*Himchan Hospital, Seoul Korea*

Chang-Hyun Nam, MD  
*Himchan Hospital, Seoul Korea*

Kwang-Am Jung, MD  
*Himchan Hospital, Seoul Korea*

Alvin Ong, MD  
*Thomas Jefferson University; The Rothman Institute*

Su-Chan Lee, MD  
*Himchan Hospital, Seoul Korea*

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# Is Further Treatment Necessary for Patellar Crepitus After Total Knee Arthroplasty?

Bo-Hyun Hwang, M.D.<sup>1,2</sup>, Chang-Hyun Nam, M.D.<sup>1</sup>, Kwang-Am Jung, M.D.<sup>1</sup>, Alvin Ong M.D.<sup>3</sup>, Su-Chan Lee, M.D.<sup>1</sup>

<sup>1</sup>Joint & Arthritis Research, Himchan Hospital, Seoul, Korea

<sup>2</sup>Department of Orthopaedic Surgery, Yonsei University College of Medicine, Seoul, Korea

<sup>3</sup>Rothman Institute of Orthopedics, Thomas Jefferson University Hospital, Philadelphia, PA, USA



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## INTRODUCTION

•Posterior-stabilized (PS) TKA that sacrifice the cruciate ligaments improves pain and function in patients with advanced osteoarthritis.

•Patellar crepitus appears to be due to a spectrum of peripatellar fibrosynovial formations and is usually encountered after PS-TKA, which uniquely has an intercondylar box to accept the tibial post.

•Symptoms of patellar crepitus occur most commonly during terminal knee extension and occur usually from 3 to 9 months after primary PS-TKA, and in some cases, this phenomenon is symptomatic enough to warrant an arthroscopic procedure or open arthrotomy.

•The development of patellar crepitus after PS-TKA appears related to many factors such as femoral component design, surgical errors, increased postoperative knee flexion, and postoperative patellar baja, which are also responsible for patellar clunk syndrome.

## PURPOSE

•To determine (1) the frequency of crepitus; (2) which factors predicted the occurrence of crepitus; and (3) whether crepitus influenced pain and function.

## METHODS AND MATERIALS

### 1. Patient Characteristics

- PS-TKAs using the Vanguard Complete Knee (Biomet Orthopedics, Warsaw, IN, USA) 2007 and 2008.
- 666 knees (529 patients) included in the study.
- Patellar crepitus was defined as a palpable, crunching, grinding sensation in the region of the distal quadriceps tendon or over the patella when the knee was brought from flexion to extension.

- Of 57 knees (44 patients) with patellar crepitus, 54 knees (41 patients) with postoperative patellar crepitus (the PC group) were available for clinical and radiographic assessment for at least 2 years (mean, 2.8 years; range, 2-4.5 years) after primary TKA.
- These patients were compared with 73 age-, sex-, and body mass index-matched control patients (94 knees) who underwent the same type of TKA (Table 1). Of the patients, 17 had bilateral TKA and developed patellar crepitus in one side only and thus, the 17 well-functioning contralateral knees were used as their own controls.
- Minimum follow-up was 2 years (mean, 2.8 years; range, 2-4 years) in the control group.

### 2. Surgical Procedures

- All TKAs were performed by one of three senior surgeons.
- The degree of deterioration of the patellar articular cartilage was graded as described by Outerbridge during index TKA.
- The patella was left unresurfaced in all knees except in knees with severe patellar deformity or patellofemoral instability.
- Patelloplasty was performed to enhance patellofemoral alignment and allow better seating of the patella on the femoral trochlea in all cases. This procedure consisted of excision of marginal osteophytes, smoothing of torn cartilage, soft tissue release, and cauterization of the patellar rim.

### 3. Clinical Assessment

- Postoperative clinical outcomes were based on the Knee Society score and the WOMAC score.
- Pre-operative predictors related to clinical outcomes were identified.
- Patients were examined before surgery and at 6 weeks, 6 months, and 1 year after surgery and yearly, thereafter.

### 4. Radiological Assessment

- AP and lateral fluoroscopically-assisted radiographs and a skyline patellar radiograph.
- Patellar tilt and lateral displacement as described by Gomes et al.
- To determine the presence of radiolucent lines at the bone-cement interface and osteolysis according to the method of the Knee Society.
- Level of the joint line, modified Insall-Salvati ratio, patellar tendon length, patellar height, posterior femoral condylar offset, and posterior tibial tray offset.

## RESULTS

### 1. Clinical Results

•Five (9.3%) of 54 knees with patellar crepitus were accompanied by peripatellar pain (VAS, 2-4), which occurred during active flexion, squatting, or stairclimbing.

•Patellar crepitus had a mean onset of 4.3 months (range, 1-10.5 months) after PS-TKA.

•All patients in the PC group had medications, quadriceps strengthening exercise, injection, or activity modification and all achieved symptom relief within 1 year of onset without additional surgical treatment.

•No knee required secondary patellar resurfacing due to patellofemoral problems after PS-TKA (Fig. 1).

•Both groups demonstrated improvements (p < 0.001 for all) in Feller's patellar score, Knee Society score, and WOMAC score at last followup.

•Postoperative scores similar (p > 0.05 for all comparisons) in the two groups at last follow-up.

•No knees had radiolucent lines of width > 2 mm or probable loosening on any prosthetic components.

•Of 17 patients in the PC group who underwent bilateral TKA with postoperative patellar crepitus on one side, no major difference was observed between knees in terms of clinical scores, functional abilities, or radiographic factors.

### 2. Predictors of the development of patellar crepitus

•The major predictors of the development of patellar crepitus were a patellar cartilage of Outerbridge Grade IV (odds ratio [OR], 11.9; 95% confidence interval [CI], 2.2-65.3) and joint line elevation (OR, 5.1; 95% CI, 1.9-8.6) (Table 2,3).

TABLE 1: Demographics Data

Demographic	PC group	Control group	p value
Patients (number)	41	73	
Knees (number)	54	94	
Age <sup>a</sup> (years)	71 (54-86)	70 (61-82)	0.076
Sex (male:female)	1:53	3:91	0.232
Side (proportion of right)	0.54	0.51	0.163
Body mass index <sup>b</sup> (kg/m <sup>2</sup> )	26 (19-35)	27 (20-35)	0.621
Followup <sup>c</sup> (years)	2.8 (2-4.5)	2.8 (2-4)	0.142
Feller's patellar score <sup>d</sup>	18 (12-25)	17 (14-23)	0.245
Knee Society score <sup>e</sup>	97 (39-150)	96 (43-155)	0.512
WOMAC score <sup>f</sup>	41 (17-70)	43 (19-75)	0.412

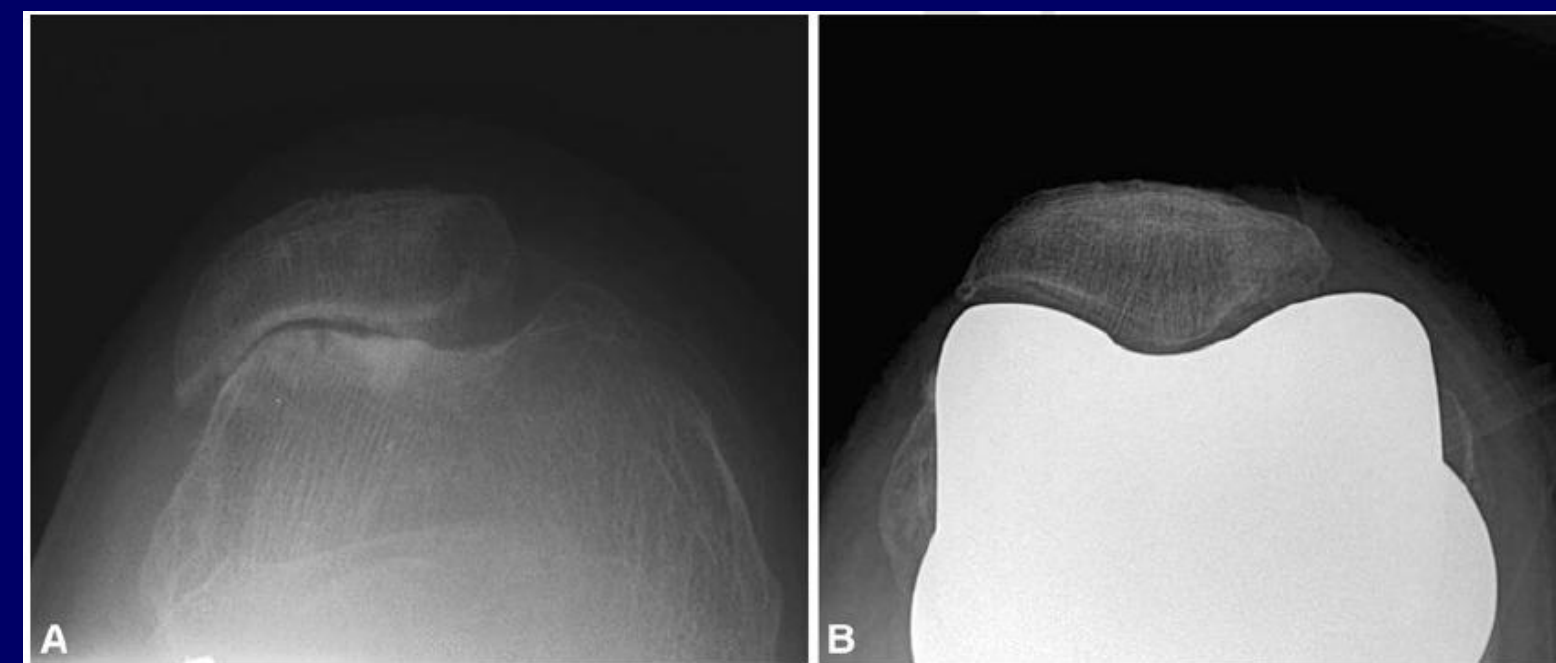


Fig. 1A-B Skyline patellar radiographs of the knee of a 67-year-old woman (PC group) who underwent TKA and patelloplasty without patellar resurfacing shows (A) the nonresurfaced patella with advanced patellofemoral arthritis before surgery and (B) 4 years postoperatively. Similar to the resurfaced patella, the lateral facet of the nonresurfaced patella is supported, and the trochlear groove of the femoral component well matches the articular surface of the patella. Patellar crepitus resolved within 9 months of onset.

## CONCLUSIONS

•Our study suggests the development of patellar crepitus is associated with advanced patellofemoral osteoarthritis and joint line elevation.

•Furthermore, all patients achieved complete symptom relief without an arthroscopic procedure or arthrotomy.

•Patellar crepitus is self-limited and a benign problem.

•We continue not to resurface arthritic patella and counsel patients with patellar crepitus that their symptoms will improve without intervention.

TABLE 2: Univariate Analysis Results

Parameter	PC group (n = 54)	Control group (n = 94)	p value
<b>Clinical factors</b>			
<b>Outerbridge grade of patellar cartilage (number, %)</b>			
Grade < 3	37 (69)	76 (81)	Referent
Grade 3	10 (19)	16 (17)	0.152
Grade 4	7 (13)	2 (2)	0.003*
Preoperative alignment <sup>a</sup> (°)	2.83 ± 4.38	1.86 ± 5.83	0.412
Postoperative alignment <sup>a</sup> (°)	5.37 ± 1.81	5.82 ± 2.00	0.542
<b>Radiographic factors</b>			
Preoperative patellar tendon length <sup>b</sup> (mm)	50.87 ± 6.46	48.36 ± 6.54	0.025*
Preoperative patellar height <sup>c</sup> (mm)	31.79 ± 2.28	31.60 ± 2.77	0.375
Preoperative Insall-Salvati ratio <sup>d</sup>	0.61 ± 0.08	0.62 ± 0.09	0.512
Postoperative patellar tendon length <sup>b</sup> (mm)	50.05 ± 6.27	47.79 ± 6.82	0.048*
Postoperative Insall-Salvati ratio <sup>d</sup>	0.60 ± 0.06	0.61 ± 0.07	0.075
Postoperative patellar height <sup>c</sup> (mm)	30.94 ± 2.01	30.74 ± 2.50	0.157
Femoral component flexion <sup>e</sup> (°)	-0.18 ± 2.67	-0.41 ± 3.12	0.211
Posterior tibial slope <sup>f</sup> (°)	1.13 ± 2.43	1.02 ± 2.29	0.712
Posterior femoral offset <sup>g</sup> (mm)	4.82 ± 2.38	5.45 ± 3.24	0.571
Posterior tibial offset <sup>h</sup> (mm)	9.13 ± 2.49	9.18 ± 2.74	0.315
Patellar tilt <sup>i</sup> (°)	3.83 ± 6.64	2.92 ± 5.77	0.617
Change in joint line <sup>j</sup> (mm)	6.40 ± 3.72	4.12 ± 2.80	< 0.0001*
<b>Surgical factors</b>			
Lateral release required (number)	N	N	Not applicable
<b>Previous knee arthroscopy (number, %)</b>			
None (0)	51 (94)	92 (98)	Referent
1	3 (6)	1(1)	0.527
2	-	1(1)	0.451
Femoral component size <sup>k</sup> (mm)	61.20 ± 3.21	60.40 ± 2.57	0.225
Tibial component size <sup>l</sup> (mm)	68.85 ± 3.36	69.13 ± 3.25	0.297
Polyethylene thickness <sup>m</sup> (mm)	12.30 ± 1.37	12.51 ± 1.60	0.475

TABLE 3: Multivariate logistic regression analysis results

Parameter	Odds ratio	95% confidence level	p value
<b>Outerbridge grade of patellar cartilage</b>			
Grade 3	0.8	0.6-1.0	0.212
Grade 4	11.9	7.8-16.3	< 0.0001*
Preoperative patellar tendon length (mm)	0.9	0.7-1.4	0.143
Postoperative Insall-Salvati ratio	0.8	0.7-1.1	0.412
Postoperative patellar height (mm)	0.4	0.2-0.6	0.375
Postoperative patellar tendon length (mm)	0.7	0.6-1.3	0.152
Femoral component flexion (°)	0.5	0.3-0.8	0.075
Femoral component size (mm)	0.4	0.2-0.6	0.311
Change in joint line (mm)	5.1	4.5-5.7	0.0272*