

# Early results of posterior-stabilised NexGen Legacy total knee arthroplasty

D Ip, WC Wu, WL Tsang

Department of Orthopaedics and Traumatology, Pamela Youde Nethersole Eastern Hospital, Hong Kong

---

## ABSTRACT

**Objective.** To retrospectively assess the early results of the NexGen Legacy posterior-stabilised total knee prosthesis, which is a newer version of the Insall-Burstein II posterior-stabilised implant.

**Methods.** 48 consecutive elderly patients had 60 NexGen Legacy posterior-stabilised total knees. The mean follow-up duration was 21 months. Clinical evaluation was performed according to the Knee Society scores and a scoring system for patellofemoral articulation; radiographic assessment followed the guidelines of the Knee Society. Special emphasis was given to any patellofemoral complications, such as patellar clunk syndrome, patellar maltracking, and other disorders of the extensor mechanism.

**Results.** Only one patient had mild patellofemoral anterior knee pain at the latest follow-up; 2 patients had patellofemoral crepitus but no pain. No patellar clunk or any other complication of the patellofemoral articulation, such as patellar fracture or subluxation was found. The mean preoperative and postoperative Knee Society scores were 60 and 85 respectively. The mean postoperative knee flexion was 115°.

**Conclusion.** The overall early results from using the new implant were good, probably because of changes in design of the intercondylar box and its associated

cam-and-post mechanism, and a more anatomic trochlea surface, so that the trochlea accommodates the natural patella.

**Key words:** arthroplasty, replacement, knee; treatment outcome

---

## INTRODUCTION

The past decade has witnessed the success of posterior-stabilised (PS) total knee system,<sup>1</sup> such as the PS Insall-Burstein II (IB II) knee (Zimmer, Warsaw, United States), in the management of total knee arthroplasty. The PS IB II total knee system was developed by the Hospital for Special Surgery as a further improvement to the IB total knee system that was first introduced in 1978; the newer version features a metal-backed tibial component to improve load transmission at the bone-implant interface. The good-to-excellent results of the PS IB II system had been marred by reports of patellofemoral symptoms,<sup>1</sup> persistent anterior knee pain,<sup>2</sup> and the 'patellar clunk syndrome'.<sup>3,4</sup>

However, there is paucity of studies focusing on the clinical outcome of the newer NexGen Legacy (Zimmer, Warsaw, United States) total knee system, and whether the previous patellofemoral complications of the PS IB II prosthesis is improved in

this newer version. In this study, we examined the early results of this new implant system, focusing on whether this new prosthesis helped reduce the patellofemoral complications from use of the previous PS IB II version.

## MATERIALS AND METHODS

Between July 1999 to November 2000, 60 NexGen Legacy PS total knees were implanted in 48 patients with knee arthritis. The male to female ratio was 1:4, with a mean patient age of 69 years (range, 58–78 years). The left knee was involved in 26 patients, and the right in the other 34. Degenerative knee arthritis was the aetiology in 95% of cases, whereas rheumatoid arthritic knees with secondary degenerative arthritis accounted for the remainder. No patient had had previous knee surgeries, and no patient was lost to follow-up.

Preoperative and postoperative Knee Society<sup>5</sup> scores and clinical scores of the patellofemoral articulation<sup>6</sup> were determined. In the patellofemoral scoring system, a score of grade 0 signified no symptoms; grade I signified mild ache anteriorly perceived on climbing stairs; grade II signified moderate or severe pain on rising from a chair or limiting stair-climbing in a non-reciprocal fashion. The Knee Society scoring system rated the knee joint as well as the patient's ability to walk and climb stairs. This dual rating helped eliminate the problem of declining knee scores associated with infirmity and ageing.

In addition, any knee crepitus or other complications of patellofemoral articulation, such as subluxation or dislocation of the extensor mechanism, or patellar fracture were carefully recorded. Radiographic assessment included preoperative and serial postoperative standing scanogram, and lateral radiography to check the overall tibiofemoral alignment and component positioning. The Merchant's view was used to detect patellar tilt and subluxation.

The axial patellofemoral position was defined as central (<5° tilted) or as having medial tilt (>5° tilted, with the medial side depressed) or lateral tilt (>5° tilted, with the lateral side depressed) as described by Bindelglass and Vince.<sup>7</sup> Special tangential viewing of the implant, if indicated, assessed suspected radiolucent lines under the tibial component. Joint line measurement was performed as described by Figgie et al.<sup>8</sup> Other radiographic assessments were performed according to the guidelines of the Knee Society.<sup>9</sup> Computed tomography was used only if there was a suspicion of malrotation of either the tibial or femoral component with resultant patellar maltracking.<sup>10</sup>

All but one of the patellae were resurfaced in this study, and all implants were cemented. The implants used were the PS version of the NexGen Legacy total knee system. We excluded patients who required varus-valgus-constrained implants and hinged prosthesis from bone loss or significant soft tissue ligamentous instabilities. All the knee arthroplasties in this series were primary total knee arthroplasties. The maximum motion ranges were recorded intra-operatively and postoperatively, and any flexion contracture was checked. The 'no thumb' test was used to see whether the patellar could track with its medial border in contact with the femoral component throughout the range of motion without the surgeon maintaining it in position manually.

## RESULTS

The mean follow-up duration was 21 months (range, 16–29 months). Preoperatively, the mean Knee Society score was 60 (range, 41–70), with a mean functional score of 55 (range, 40–65); postoperatively, it was 85 (range, 70–100), with a mean functional score of 70 (range, 55–100). Only one case of burned-out rheumatoid arthritis with a very thin patellar was not resurfaced: this was the only grade I case, according to the clinical scoring of patellofemoral articulation. All other patients were free of patellofemoral symptoms (grade 0). Two patients had knee crepitus, but neither had knee pain. Postoperatively, no patient had patellar clunk syndrome, patellar subluxation, or fracture.

### Range of knee movement

The mean range of knee movement preoperatively was 85° (range, 65°–110°) and postoperatively, it was 115° (range, 95°–125°). Eight patients had preoperative flexion contracture averaging 20° (range, 15°–30°), but no patient had knee flexion contracture post-operatively.

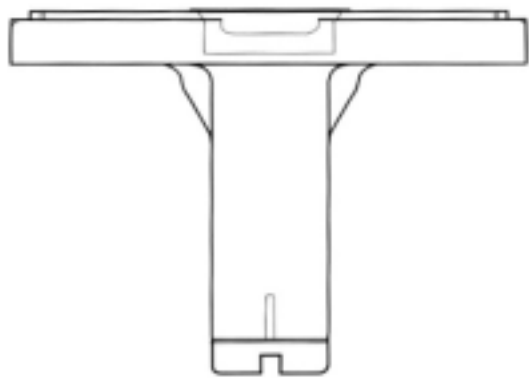
### Complications

Although none of the patients required any revision surgery, 7 experienced complications. Three of the complications were medical: one patient had non-fatal pulmonary embolism from proximal deep venous thrombosis, the second had calf deep venous thrombosis confirmed using Doppler ultrasonography, and the third had acute post-renal failure secondary to acute urinary retention. The other 4 complications were mechanical: one patient had an

accidental partial division of the medial collateral ligament, and one had an undisplaced crack fracture of the lateral femoral condyle during hammering. The other 2 mechanical complications may be potentially preventable with future refinements of instrumentation.

In the NexGen Legacy instrument set, a special device is used to introduce the polythene insert onto the tibial base plate. In one instance, the junction between the hook end of this device (which hooks onto the tibial plate and the main body) broke intra-operatively; this necessitated an urgent call to the manufacturer to obtain a new introducer before the operation could proceed, as it was impossible to push the tibial polythene onto the metal tibial tray without damaging the tibial insert. We feel that the junction of the hook and body is too thin and can easily break.

The second complication involved inadvertent dropping of one of the small nails used to anchor the tibial base plate into the medullary canal of the tibia. The NexGen Legacy offers 2 designs of the tibial base plate: a stemmed design (Fig. 1), and a more shallow 4-pegged design. We used the stemmed tibial base plate design in every case. However, a drawback of using this version is that after preparation of the proximal tibia, frequently a large hole in the medullary cavity is left behind. We recommend future use of a large piece of gauze to fill this hole, in order to prevent the small anchoring nails or other objects from dropping into the tibial medullary cavity.



**Figure 1** Stemmed tibial base plate of NexGen Legacy.

### Tibial alignment

The preoperative mean tibiofemoral alignment was neutral in 8 knees; the mean varus in 25 knees was  $15^\circ$  (range,  $7^\circ$ – $40^\circ$ ) and the remaining 17 had a mean valgus of  $8^\circ$  (range,  $4^\circ$ – $20^\circ$ ). All except 2 patients had properly corrected tibiofemoral alignment; these 2 patients had

a mild residual varus of  $8^\circ$  and  $12^\circ$ , respectively, as detected on the postoperative standing scanogram. No patient had significant changes in the joint line of less than 8 mm. Postoperative Merchant's view revealed a lateral patellar tilt in 2 patients, but not patellar subluxation or dislocation of the extensor mechanism. There were no radiolucent lines detected around any components.

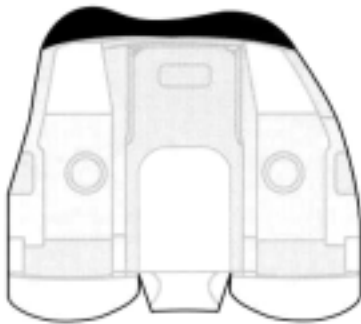
Intra-operatively, 2 patients required extensive lateral release for valgus knee, whereas 4 required extensive medial releases for significant knee varus. Four patients required cement build-up of bone defect at the medial tibial plateau, and one required both cementing and screwing to build up the medial tibial bone defect. Lateral release was performed in 4 cases, and all knees were checked for normal patellar tracking before final wound closure. We resurfaced all the patellae in this study, except in one case, which had an extra thin patella with burned out rheumatoid arthritis. No simultaneous or sequential total knee procedures were performed, and no intra-operative or postoperative mortality was recorded.

### DISCUSSION

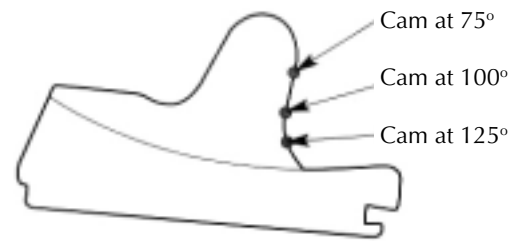
Compared with the older PS IB II total knee system, there are many new design features in the NexGen Legacy total knee system that may account for the observed lack of significant patellofemoral symptoms, lack of patellar clunk syndrome, and attainment of excellent knee flexion range. The relative lack of patellofemoral symptoms may be related to a redesign of the trochlea articulating surface into a more anatomical and patella-conforming design (Fig. 2). This change involved a raised lateral flange of the femoral component and a deepened trochlear groove, thus creating a more anatomical design of the trochlea articulating surface, as evidenced by the specially designed right and left femoral components, which may help reduce the incidence of postoperative patellofemoral symptoms. By contrast, previous large-scale studies showed prominent patellofemoral symptoms of 9%,<sup>11</sup> and up to 20%<sup>4</sup> for the PS IB II total knee implant.

In addition, there was a complete lack of patellar clunk syndrome in contrast to the reported incidence of 2% to 3% for the PS IB II implant in large-scale studies<sup>12</sup> and 7.5% in a study from Hong Kong.<sup>4</sup>

The pathogenesis of patellar clunk syndrome is thought to include factors such as the design of the intercondylar box,<sup>4</sup> proximity of placement of the patellar button so that the patellar prosthesis impinges



**Figure 2** Patella-conforming femoral component design of NexGen Legacy.



**Figure 3** Different contact points of the femoral cam on the tibial post in relation to knee flexion. Arrows indicate the different points of contact of the femoral cam on the tibial post with different knee flexion.

on the quadriceps tendon,<sup>13,14</sup> and lack of adequate synovial tissue debridement at the junction between the quadriceps tendon and the patellar superior pole. In this study, there was no radiographic evidence of proximal placement of the patellar button in any patient. Furthermore, meticulous care was exercised in every case to clear all the synovium especially between the quadriceps tendon under-surface and the patellar superior pole. We thus believe that the lack of patellar clunk syndrome is mainly caused by changes in design of the intercondylar box and its associated cam-and-post mechanism, as a result of the new, more anatomic trochlea surface, which accommodates the natural patella. The spine-cam interaction of NexGen Legacy has a similar pathway and angle of contact as the older design; however, the femoral cam is positioned further posterior and proximal. This more posteriorly situated intercondylar box probably contributes most to the absence of patellar clunk syndrome, because the chance of soft tissue entrapment on knee flexion will be lessened.<sup>4</sup> Other PS total knee designs that have a more posteriorly situated intercondylar box, such as the PS Genesis II total knee, rarely lead to the patellar clunk syndrome by the same token.

The attainment of an increased knee flexion range in the NexGen Legacy's total knee system may also be related to the changes in the new cam-and-post mechanism. The new design increases the knee flexion range and stability, by allowing the femoral cam to ride down the post instead of up—as in most previous PS designs—before eventually moving up the post on extreme flexion. This feature may effectively increase the 'jump distance' and allows greater knee flexion to

be achieved before dislocation (Fig. 3). Very good average knee flexion range (115°) has been reported only from those series of PS IB II knee implants performed by its originator at the Hospital for Special Surgery.<sup>15</sup> Those excellent results of knee flexion range have not been reproduced by other centres using the same implant: the mean knee flexion range is only 90° in the majority of patients.<sup>3</sup> In our study, the very good Knee Society scores compared favourably with the similarly excellent results of previous PS IB II series reported from the Hospital for Special Surgery.<sup>15</sup>

Despite the above favourable results, caution needs to be exercised to prevent certain complications. Furthermore, there are still unanswered questions regarding this new implant, such as long-term clinical results. Additionally, the recent realisation that significant polythene wear can result from the tibial post,<sup>16</sup> probably would warrant future retrieval studies to investigate whether the change in the spine-cam interaction with this new prosthesis may increase or decrease wear.

The currently expected standard of new total knee implants includes not only excellent durability in the elderly population, but also provision of good survivorship in the younger, more active individuals requiring total knee arthroplasty. The popular mobile-bearing total knee arthroplasties do have potential problems of their own, such as possibly more backside tibial polythene wear. Recent reports on its kinematics<sup>17</sup> tend to cast doubts as to the presumed smooth mobility of these 'mobile' bearing platforms.

With the NexGen Legacy PS prosthesis, there is a redesign of the articulating surfaces with a view to providing less contact stress. This, coupled with a

better knee flexion range without sacrificing stability, as well as a more patellar-friendly design, may hold promise for younger middle-aged individuals.

## CONCLUSIONS

We obtained favourable early results from the use of the NexGen Legacy PS total knee system in treating knee arthritis among elderly patients. We are especially impressed by the lack of patellofemoral symptoms of

the patients in our series, together with a total absence of the patellar clunk syndrome.

Worthwhile future studies include long-term clinical studies of the clinical outcome, retrieval studies to compare the pattern of wear of the polythene insert with that of the PS IB II prosthesis, with special attention given to the tibial post, and possible video-fluoroscopic<sup>18</sup> studies instead of cadaveric studies,<sup>19</sup> in order to better understand the kinematics of this new implant with emphasis on its stability on deep knee bending and femoral rollback.

## REFERENCES

1. Font-Rodriguez DE, Scuderi GR, Insall JN. Survivorship of cemented total knee arthroplasty. *Clin Orthop* 1997;345:79–86.
2. Larson CM, Lachiewicz PF. Patellofemoral complications with the Insall-Burstein II posterior-stabilised total knee arthroplasty. *J Arthroplasty* 1999;14:288–92.
3. Li PL, Zamora J, Bentley G. The results at ten years of the Insall-Burstein II total knee replacement. Clinical, radiological and survivorship studies. *J Bone Joint Surg Br* 1999;81:647–53.
4. IP D, Wu WC, Tsang WL. Comparison of two total knee prostheses on the incidence of patella clunk syndrome. *Int Orthop* 2002;26:48–51.
5. Insall JN, Dorr LD, Scott RD, Scott WN. Rationale of the knee society clinical rating system. *Clin Orthop* 1989;248:13–4.
6. Stern SH, Insall JN. Total knee arthroplasty in obese patients. *J Bone Joint Surg Am* 1990;72:1400–4.
7. Bindelglass D, Vince KG. Patellar tilt and subluxation following subvastus and parapatellar approach in total knee arthroplasty. *J Arthroplasty* 1996;11:507–11.
8. Figgie HE 3rd, Goldberg VM, Heiple KG, Moller HS 3rd, Gordon NH. The influence of tibial-patellafemoral location on function of the knee in patients with the posterior stabilised condylar knee prosthesis. *J Bone Joint Surg Am* 1986;68:1035–40.
9. Ewald FC. The Knee Society total knee arthroplasty roentgenographic evaluation and scoring system. *Clin Orthop* 1989;248:9–12.
10. Berger RA, Crossett LS, Jacobs JJ, Rubash HE. Malrotation causing patellofemoral complications after total knee arthroplasty. *Clin Orthop* 1998;356:144–53.
11. Rowley DI, McGurty DW. A seven-year experience of data collection on the Insall-Burstein II total knee arthroplasty. A prospective study. *J Bone Joint Surg Br* 2001;83:185–90.
12. Beight JL, Yao B, Hozack WJ, Hearn SL, Booth RE Jr. The patellar “clunk” syndrome after posterior stabilized total knee arthroplasty. *Clin Orthop* 1994;229:139–42.
13. Shoji H, Shimozaki E. Patellar clunk syndrome in total knee arthroplasty without patellar resurfacing. *J Arthroplasty* 1996;11:198–201.
14. Hozack WJ, Rothman RH, Booth RE Jr, Balderston RA. The patellar clunk syndrome. A complication of posterior stabilized total knee arthroplasty. *Clin Orthop* 1989 241:203–8.
15. Scuderi GR, Insall JN. The posterior stabilised knee prosthesis. *Orthop Clin North Am* 1989;20:71–8.
16. Puloski SKT, McCalden RW, MacDonald SJ, Rorabeck CH, Bourne RB. Tibial post wear in posterior stabilized total knee arthroplasty. An unrecognized source of polyethylene debris. *J Bone Joint Surg Am* 2001;83:390–7.
17. Parks NL, Engh GA, Topoleski LD, Emperado J. The Coventry Award. Modular tibial insert micromotion. A concern with contemporary knee implants. *Clin Orthop* 1998;356:10–5.
18. Dennis DA, Komistek RD, Hoff WA, Gabriel SM. In vivo knee kinematics derived using an inverse perspective technique. *Clin Orthop* 1996;331:107–17.
19. Chew JT, Stewart NJ, Hanssen AD, Luo ZP, Rand JA, An KN. Differences in patella tracking and knee kinematics among three different total knee designs. *Clin Orthop* 1997;345:87–98.