



Long-term follow up of Navigation TKA using multi-directional mobile bearing design

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INTRODUCTION

Total knee arthroplasty (TKA) using navigation system is known to be more effective than conventional methods in achieving more accurate bone resection and neutral alignment [1,2]. Although fixed bearing TKA has shown satisfactory long term results [3], polyethylene (PE) wear and subsequent osteolysis remain, necessitating improvements in prosthesis design. Mobile bearing system have been used to overcome these disadvantages inherent to the fixed bearing design in TKA. TKA with mobile bearing PE liners has potential advantages that included reduction in wear due to increased conformity, improved range of motion (ROM), and compensation of rotational mismatch [4].

The purpose of this study was to compare the clinical and radiological results of Navigation total knee arthroplasty using multi directional mobile bearing design. The hypothesis was that Navigation-assisted TKA permit more accurate leg alignment and component placement, but mobile bearing design had high rate of polyethylene breakage in long-term follow up.

MATERIALS AND METHODS

From 2003 to 2006, a total of 111 navigation TKAs using multi-directional mobile bearing design were carried out and reviewed retrospectively. TKAs were performed by two experienced surgeons at one institute. Of the 111 patients, 102 were women and 9 were men. The mean duration of follow-up was 11.4 ± 1.0 years (range, 10.1 to 14.08 years). Clinical outcomes were evaluated in terms of Knee Society Score, Hospital for Special Surgery score, Western Ontario and McMaster University (WOMAC) score, range of motion and complications. Long-term radiological outcomes and survival rates were evaluated at least 10 years.

RESULTS

Average preoperative HSS score was 66.5 ± 9.8 and KSS pain and function score were 25.0 ± 11.8 and 44.5 ± 12.3 , respectively. Scores improved to 94.1 ± 8.2 , 46.6 ± 11.6 and 88.2 ± 14.6 at the last follow up, respectively. Mean preoperative WOMAC scores of 75.8 ± 16.5 improved to 13.8 ± 16.0 at last follow-up (Table 1). Five knees required re-operation, two for liner breakage, one for liner wear, one for distal femoral fracture and one for infection. The estimated 10-year prosthesis survival rates for any reason and for prosthesis-related problems were 95.5% and 97.4% , respectively (Figure 1).

DISCUSSION

The cruciate-retaining modile bearing prosthesis was designed based on some characteristics. The PE insert is allowed to move multi-directionally (rotation, anteroposterior motion, and mediolateral translation) on the top of the tibial tray, while a hook-shaped peg on the tray controls and prevents bearing dislocation. In addition, constant radius of the femoral component by 90° of flexion provides large contact areas, which contributes to localized stress peaks and transverse forces. Thus, this mobile system has been expected to reduce bearing-related problems and to improve kinematic limitations of first-generation mobile-bearing prosthesis. One study concluded that this

prosthesis was at least as effective in early clinical outcome and function as the established fixed-bearing implant [5].

Chang et al [6]. reported a relatively high rate of mechanical complications and revision in 241 primary TKAs using the e.motion-FP prosthesis. At a mean follow-up of 49 months, 18 knees (7.5%) had mechanical complications of which 13 required revisions. The reasons for revision were periprosthetic fracture in three cases, mechanical loosening in two, tibiofemoral dislocation in three, and bearing-related problems in five. Although this previous study stated that e.motion-FP was associated with a relatively high rate of early mechanical failures, it must be noted that, of the 13 knees with complications, two had axial malalignment and three had femoral malrotation. Considering that, of the total series of 241, 100 TKAs were performed using the navigation system and 141 knees performed with a conventional jig, some critical factors such as a mal-aligned component or a gap mismatch may endanger the stability of the imbalance-sensitive prosthesis.

In contrast, the current study revealed that the Navigation TKA using multi directional mobile bearing design demonstrated good clinical results and survival rate because of its self-aligning nature.

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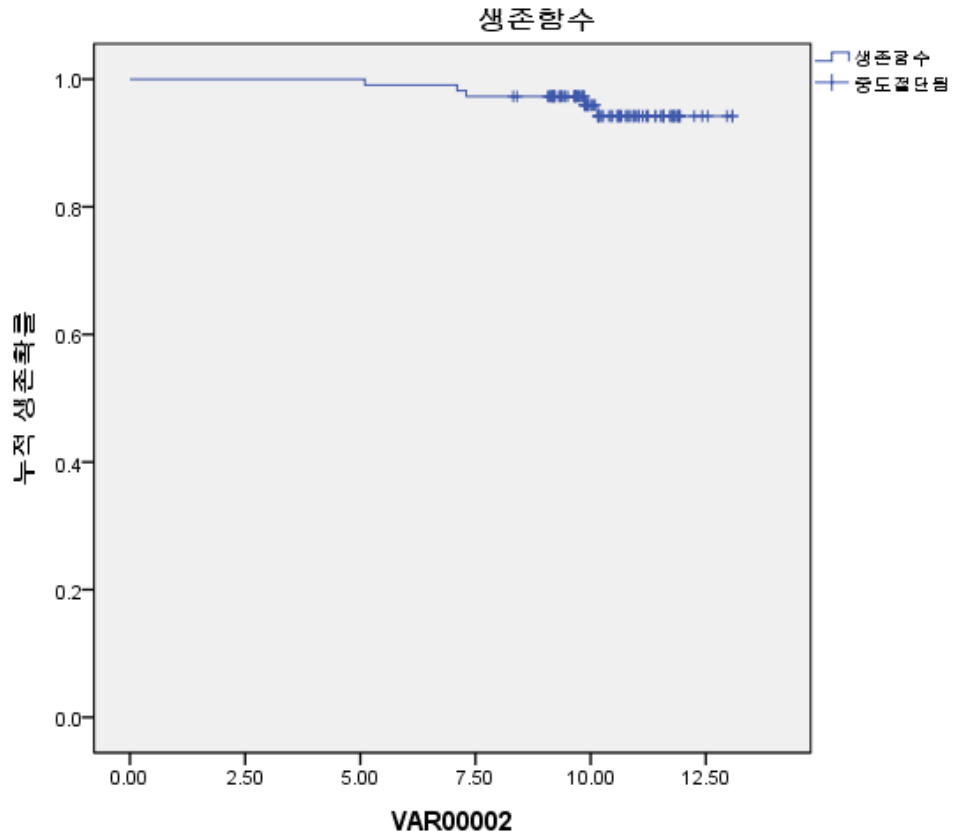
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DISCLOSRES

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FIGURE

Figure 1. Kaplan-Meier Survival Curve



TABLES

Table 1. Clinical outcomes between two alignment methods at the final follow up

	Preop	Postop	<i>P</i> -value
HSS	66.5±9.8	94.1±8.2	0.001
WOMAC	75.8±16.5	13.8±16.0	0.000
ROM	119.2±18.4	129.8±10.3	0.03
KSS (pain)	25.0±11.8	46.6±11.6	0.002
KSS (function)	44.5±12.3	88.2±14.6	0.001

Table 2. Radiographic outcomes between two alignment methods at the final follow up

	Navigation TKA using mobile bearing prosthesis (N=111)
Mechanical axis	1.4±3.4
Coronal femoral inclination	88.2±7.5
Coronal tibial inclination	89.6±2.2
Sagittal femoral inclination	5.8±9.0
Sagittal tibial inclination	86.7±11.2
Mean varus laxity	4.2±1.89
Mean valgus laxity	3.8±1.30
Total joint laxity	7.9±2.0

Table 3. Classified radiographic outcomes

	Navigation TKA using mobile bearing prosthesis (N=111)
Excellent (within $\pm 2^\circ$)	69 (62.2%)
Acceptable (within $\pm 3^\circ$)	32 (28.8%)
Outlier (over $\pm 3^\circ$)	10 (9%)
Flexion laxity outlier ($>10^\circ$ laxity)	5 (4.5%)