IMPROVEMENT OF ACTIVITIES OF DAILY LIVING AFTER TOTAL HIP ARTHROPLASTY USING COMPUTED TOMOGRAPHY BASED NAVIGATION SYSTEM

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INTRODUCTION

To restore a painless and well-functioning hip joint, accurate cup and stem implantations are important in total hip arthroplasty (THA). Accurate positioning of the acetabular cup in THA has been reported to prevent dislocation, limb length discrepancy, loosening of the cup, and accelerated wear, and this ultimately improves the longevity. However, to prevent dislocation, patients after THA are usually warned against deep flexion or flexion and internal rotation actions, resulting in many limitations in quality of life.

A computed tomography (CT)-based navigation system, one of the currently available navigation systems, has been reported to both place the cup accurately and minimize the variance in cup orientation. We have performed THA using a CT-based navigation system and have not imposed any restrictions on patient activity postoperatively**.**

A large number of studies in the literature have evaluated the quality of life (QOL) after THA. However, it has not been compared the QOL after THA using navigation system with the QOL after THA without navigation system.

The purpose of this retrospective study was to assess the outcome improvements after THA using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) in patients who underwent THA with a navigation system in our institutions and to compare them with those of THA without a navigation system that had been reported in the literature.

MATERIALS AND METHODS

Subjects in this study comprised a total of 245 THAs in 39 male and 206 female patients (mean age, 58.8±13.0 years; mean BMI, 22.7±3.2 kg/m^2). Between July 2007 and August 2012, patients were recruited in two institutions; Osaka University Graduate School of Medicine and Kyowakai Hospital. Those patients in our institutions had adequate data to allow complete scoring of the WOMAC for minimum one year postoperative follow-up. CT-based navigation was used in all THAs. Postoperatively, no limitations were imposed.

Electronic search of MEDLINE was conducted using search terms 'THA', 'QOL' and 'WOMAC'. Inclusion criteria were the following: (1) The study population had a primary THA; (2) the study designs were before-after study estimating three WOMAC subscales. Of the 111 citations, 16 articles were included in our study. In 10 of 16 articles, three WOMAC subscales were evaluated in one to two years after THA. We statistically compared the WOMAC subscales in our study with ten articles. For comparison of postoperative WOMAC scores in our study and those articles, Welch's t-test was used.

RESULTS

For 245 patients of our navigated THA series, the average WOMAC 'pain' subscale scores were 2.3±2.2, 'stiffness' subscale scores were 1.1±1.6 and 'physical function' subscale scores were 7.4±11.3 points in one year after surgery. When compared our results with the WOMAC index in 10 citations for pain and stiffness subscale scores, one study was significantly better and nine studies were significantly worse than our series. For physical function subscale scores, our series marked the best score and in nine out of 10 studies, the differences were statistically significant. Table 1 shows the comparison the WOMAC index between our institutions and the other institutions in those articles.

DISCUSSION

WOMAC subscales in our institutions were significantly better than that in most of articles which THA were performed without navigation. It would be because postoperative rehabilitations were performed without limitations in our institutions. The reasons were, first that, in the literatures, the cup positioning using CT-based navigation were accurate, and second that patients could squat on the floor, pick up an object while sitting on the chair, and sit on one's heels without dislocation if the cup positioning in THA were optimal. These results show that THA using with navigation can improve the postoperative QOL.

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DISCLOSURES

No disclosure

	Author, Year of Pulication, Country	Sample Size	Study Population	Measure	Follow-up Mean Score	p value***
	* WOMAC scale is 0-100, best to worst					
	Our Study. 2014	n=245	Female 206, Male 39	WOMAC*	1year	
	Japan		Age 58.5	Pain	2.3±2.2	
				Stiffness	1.1±1.6	
				Function	7.4±11.3	
1	S.Konan, et al. 2012,	n=72	Female 43, Male 29	WOMAC*	1 year	
	HSSJ, USA		Age49	Pain	14.76±7.26	0.000
				Stiffness	33.94±14.9	0.000
				Function	12.71±6.37	0.000
2	CJ Lavernia, et al. 2011	n=658	Female 316, Age 63	WOMAC*	>1year	
	CORR, USA			Pain	1.44±3.19	0.000
				Stiffness	0.62±1.37	0.000
				Function	8.24±12.5	0.400
			Male 216, Age 58	WOMAC*	>1year	
				Pain	1.9±3.72	0.168
				Stiffness	0.75±1.4	0.013
				Function	9.03±12.9	0.150
3	Quitana, et al. 2005	n=469	Female 238, Male231	WOMAC*	2years	
	OsteoArthritis and Cartilage, Spain		Age 69.4	Pain	3.0±3.2	0.000
				Stiffness	1.6±1.5	0.000
				Function	18.1±12.3	0.000
4	M Ostendorf, et al. 2004	n=114	Female 71, Male 43	WOMAC*	1year	
	JBJS Br, Netherlands		Age 67.6	Pain	3.6±4.3	0.003
				Stiffness	2.1±1.7	0.000
				Function	15.6±15.0	0.000
5	M Ostendorf, et al. 2004	n=161	Female 106, Male 55	WOMAC*	1year (n=124)	
	J. Arthroplasty, Netherlands		Age 68.4	Pain	3.7±4.4	0.000
				Stiffness	2.2±1.8	0.000
				Function	16.4±15.7	0.000
	** WOMAC scale is 0-100, worst to best					
	Our Study. 2014	n=245	Female 206, Male 39	WOMAC**	1year	
	Japan		Age 58.5	Pain	93.1±12.0	
				Stiffness	88.8±17.0	
				Function	92.5±12.1	
6	AK Nilsdotter, et al. 2002	n=148	n=59 Age>72years	WOMAC**	1year	
	Rheumatology, Sweden	Female 83,		Pain	82±19.5	0.000
		Male65		Stiffness	76.9±19.7	0.000
		Age 71		Function	72.4±21.2	0.000
			n=65 Age<72years	WOMAC**	1year	
				Pain	88.6±13.5	0.000
				Stiffness	80.5±18.3	0.002
				Function	83.7±14.9	0.000
7	T.Kostamo, et al. 2009	n=4114	Female 1924, Age 65,	WOMAC**	>2years	
	CORR, Canda			Pain	76.9±23.3	0.000
				Stiffness	70.1±25	0.000
				Function	71.6±23.8	0.000
			Male 1537, Age 63	WOMAC	>2years	
				Pain	80.5±22.1	0.000
				Stiffness	73.9±24.4	0.000
				Function	76.4±22.7	0.000
8	RB.Bourne, et al. 2010	n=3050	Femal 1769, Male 1281	WOMAC**	1 year	
	CORR, Canada		Age 68	Pain	91.11±13.85	0.009
				Stiffness	87.24±16.27	0.500
				Function	86.04±15.47	0.000
9	NV Greidanus, et al. 2013	n=156	MIS AL 69	WOMAC**	2years	
	CORR, Canada		Female 43, Male26	Pain	94.0±5.0	0.470
				Stiffness	86.4±16.3	0.290
				Function	92.1±11.4	0.740
			Alternate MIS 66	WOMAC**	2years	
			Female 46, Male20	Pain	91.6±8.9	0.200
				Stiffness	85.5±18.4	0.190
				Function	90.8±11.2	0.150
10	Buksditter et al. 2010	n=151	Female 83, Male 68	WOMAC**	1year	
	BMC Musculo disorder, Sweden		Age 70	Pain	85±16.4	0.000
				Stiffness	77±18.7	0.000
				Function	79±16.7	0.000
						*** Welch's t test

Table 1: Comparison the WOMAC index between our institutions and the other institutions in those articles