Functional recovery in staged bilateral total knee arthroplasty

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Financial disclosure

S. Nakamura received research grant from Kyocera

Staged total knee arthroplasty (TKA)

The difference in outcomes between the first and contralateral knee is unknown

The optimal interval between TKA on the functional recovery is unknown

Purpose

To compare knee function and patient-reported outcomes between first- and second-operated knees

To evaluate the effect of the time between surgeries on the recovery of the second TKA

Materials and methods

56 patients who underwent staged primary TKA due to osteoarthritis were included

Patient demographics

Age 74.2 years old (7.7)

Height 151.5 cm (8.6)

Weight 61.5 kg (12.4)

Interval between TKA 14.9 months (14.9)

Evaluation

Muscle strength (knee extension, flexion)
Timed up and go (TUG) test
10 m walking time
Knee Society score (KSS)
New Knee Society score (2011 KSS)

Interval

Early < 6 months
Intermediate 6-12 months

Late > 12 months

Preoperative comparison between 1st- and 2nd-surgery

	First	Second	p-value		
Knee extension strength (Nm/kg)	0.876 (0.345)	0.925 (0.428)	0.135		
Knee flexion strength (Nm/kg)	0.527 (0.259)	0.532 (0.189)	0.891		
Time up and go test (seconds)	14.5 (11.5)	12.3 (10.3)	0.003		
10 m walking time (seconds)	12.6 (9.5)	10.9 (7.3)	0.030		
Knee extension angle (degrees)	-9.3 (8.1)	-7.8 (8.1)	0.115		
Knee flexion angle (degrees)	114.7 (25.2)	117.8 (16.1)	0.371		
KSS knee score	40.8 (22.5)	47.4 (19.8)	0.010		
KSS function score	46.4 (26.7)	54.8 (28.6)	0.121		
2011 KSS symptoms	5.8 (4.7)	8.5 (5.4)	<0.001		
2011 KSS satisfaction	11.9 (5.2)	14.1 (6.5)	0.014		
2011 KSS expectation	12.7 (3.3)	12.8 (3.1)	0.691		
2011 KSS functional activities	32.7 (19.8)	41.4 (17.9)	<0.001		
Hip-knee-ankle angle (degrees)	11.6 varus (7.5)	9.5 varus (10.0)	0.045		
All values were shown in average (standard deviation). KSS: Knee Society score					

Postoperative comparison between 1st- and 2nd-surgery

	1 month			1 year		
	First	Second	p-value	First	Second	p-value
Knee extension strength (Nm/kg)	0.694 (0.296)	0.672 (0.292)	0.633	1.155 (0.467)	1.157 (0.438)	0.941
Knee flexion strength (Nm/kg)	0.415 (0.138)	0.409 (0.175)	0.615	0.546 (0.208)	0.490 (0.154)	0.112
Time up and go test (seconds)	12.3 (8.7)	11.3 (6.4)	0.440	9.2 (4.6)	8.8 (3.8)	0.476
10 m walking time (seconds)	12.6 (13.2)	9.7 (3.6)	0.114	8.2 (3.9)	7.5 (2.6)	0.146
Knee extension angle (degrees)	-5.6 (4.7)	-5.7 (4.7)	0.844	-1.7 (3.6)	-2.5 (3.8)	0.282
Knee flexion angle (degrees)	116.7 (12.7)	112.4 (11.6)	0.059	119.5 (12.9)	119.1 (12.8)	0.961
KSS knee score	79.4 (12.8)	74.1 (21.8)	0.091	89.8 (11.8)	91.4 (8.5)	0.447
KSS function score	62.3 (22.7)	55.5 (26.6)	0.107	77.5 (22.7)	82.2 (17.8)	0.174
2011 KSS symptoms	15.7 (5.0)	15.9 (6.0)	0.830	20.2 (5.5)	19.8 (5.2)	0.660
2011 KSS satisfaction	21.3 (7.4)	20.9 (8.2)	0.777	27.0 (8.3)	26.9 (8.5)	0.962
2011 KSS expectation	9.0 (2.3)	8.8 (3.0)	0.735	9.6 (2.8)	9.8 (2.7)	0.688
2011 KSS functional activities	50.9 (19.4)	47.3 (22.1)	0.388	65.0 (22.7)	65.6 (20.7)	0.881
All values were shown in average (standard deviation). KSS: Knee Society score						

Comparison in improvement between 1st- and 2nd-surgery

	Pre-operation to 1 month			Pre-operation to 1 year		
	First	Second	p-value	First	Second	p-value
Knee extension strength (Nm/kg)	-0.116 (0.513)	-0.231 (0.540)	0.208	0.358 (0.612)	0.294 (0.592)	0.553
Knee flexion strength (Nm/kg)	-0.070 (0.325)	-0.120 (0.350)	0.590	0.086 (0.382)	0.189 (0.214)	0.114
Time up and go test (seconds)	1.3 (15.5)	1.2 (10.8)	0.960	4.5 (12.8)	2.4 (6.8)	0.296
10 m walking time (seconds)	-0.6 (17.4)	3.1 (5.6)	0.127	3.8 (5.6)	5.4 (4.5)	0.295
Knee extension angle (degrees)	3.6 (9.2)	2.3 (8.5)	0.306	7.7 (8.6)	5.5 (8.3)	0.058
Knee flexion angle (degrees)	5.9 (36.2)	-0.9 (22.3)	0.271	8.3 (36.1)	7.6 (33.0)	0.903
KSS knee score	39.3 (27.8)	28.3 (32.2)	0.021	49.7 (26.8)	45.6 (22.8)	0.337
KSS function score	16.8 (29.5)	2.7 (36.9)	0.004	31.9 (31.3)	29.4 (37.7)	0.615
2011 KSS symptoms	10.0 (7.1)	7.5 (8.1)	0.086	14.5 (7.8)	11.4 (8.2)	0.013
2011 KSS satisfaction	9.6 (8.9)	7.0 (9.9)	0.096	15.3 (10.4)	13.0 (10.5)	0.183
2011 KSS expectation	-3.7 (4.5)	-3.8 (4.7)	0.691	-2.9 (4.7)	-2.6 (4.3)	0.926
2011 KSS functional activities	18.7 (24.9)	6.7 (30.1)	0.008	32.8 (29.4)	24.9 (31.1)	0.088
All values were shown in average (standard deviation). KSS: Knee Society score						

Preoperative comparison of second knees

	Early (n = 17)	Intermediate (n = 20)	Late (n = 19)	p-value			
Knee extension strength (Nm/kg)	0.995 (0.562)	0.962 (0.326)	0.829 (0.394)	0.492			
Knee flexion strength (Nm/kg)	0.612 (0.223)	0.497 (0.199)	0.511 (0.144)	0.259			
Time up and go test (seconds)	15.2 (18.2)	11.6 (4.1)	10.6 (3.6)	0.419			
10 m walking time (seconds)	12.5 (11.3)	10.1 (3.5)	10.4 (5.6)	0.601			
Knee extension angle (degrees)	-8.0 (7.7)	-8.2 (8.5)	-7.4 (8.4)	0.954			
Knee flexion angle (degrees)	113.7 (15.8)	119.2 (16.2)	119.7 (16.5)	0.502			
KSS knee score	44.8 (24.0)	47.3 (20.2)	50.0 (15.9)	0.751			
KSS function score	54.7 (30.5)	54.0 (31.2)	53.8 (22.5)	0.981			
2011 KSS symptoms	7.9 (5.2)	9.1 (6.4)	8.6 (4.6)	0.815			
2011 KSS satisfaction	14.2 (6.6)	13.3 (6.2)	15.0 (6.8)	0.725			
2011 KSS expectation	12.5 (3.9)	12.8 (3.4)	13.2 (2.0)	0.840			
2011 KSS functional activities	40.9 (23.4)	40.0 (18.1)	43.4 (11.3)	0.837			
All values were shown in average (standard deviation). KSS: Knee Society score							

Comparison in improvement of second knees

	Early (n = 17)	Intermediate (n = 20)	Late (n = 19)	p-value		
Knee extension strength (Nm/kg)	0.121 (SD = 0.548)	0.267 (SD = 0.658)	0.477 (SD = 0.531)	0.180		
Knee flexion strength (Nm/kg)	0.207 (SD = 0.206)	0.220 (SD = 0.192)	0.139 (SD = 0.246)	0.488		
Time up and go test (seconds)	0.4 (SD = 8.5)	3.9 (SD = 7.1)	2.5 (SD = 4.5)	0.310		
10 m walking time (seconds)	3.7 (SD = 11.6)	1.8 (SD = 4.9)	2.8 (SD = 7.1)	0.772		
Knee extension angle (degrees)	4.4 (SD = 8.8)	5.8 (SD = 8.2)	4.5 (SD = 8.8)	0.862		
Knee flexion angle (degrees)	3.3 (SD = 19.2)	2.9 (SD = 21.8)	-1.6 (SD = 21.4)	0.740		
KSS knee score	48.4 (SD = 26.3)	43.0 (SD = 22.2)	45.9 (SD = 20.9)	0.773		
KSS function score	22.1 (SD = 42.3)	33.8 (SD = 35.9)	31.3 (SD = 36.1)	0.627		
2011 KSS symptoms	11.4 (SD = 8.7)	11.3 (SD = 9.0)	11.5 (SD = 7.0)	0.995		
2011 KSS satisfaction	9.8 (SD = 9.1)	14.6 (SD = 10.4)	14.3 (SD = 11.5)	0.307		
2011 KSS expectation	-2.8 (SD = 4.9)	-3.6 (SD = 3.9)	-1.9 (SD = 4.7)	0.520		
2011 KSS functional activities	18.9 (SD = 34.7)	29.9 (SD = 30.6)	25.1 (SD = 29.0)	0.577		
All values were shown in average (standard deviation). KSS: Knee Society score						

Conclusion

- 1 In the first-operated knees, greater improvement in ambulatory function was measured due to lower preoperative conditions, compared to the opposite knee.
- 2 The time between surgeries seems not to affect the rate of recovery of the second knee.

References

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