

The Effect of Surgery on Osteoarthritis of Ankle Joint for Locomotive Syndrome: Comparison of Supramalleolar Osteotomy and Arthrodesis

Kanu Shimokawa¹, Hidenori Matsubara¹, Toshifumi Hikichi¹, Satoshi Kato, Hiroyuki Tsuchiya¹

¹Kanazawa University

INTRODUCTION:

Locomotive syndrome (LS) is a concept introduced by the Japanese Orthopaedic Association (JOA) and is defined as a decline in locomotor function due to a musculoskeletal disorder, often leading to the need for nursing care. Ankle osteoarthritis (AOA) is typical degenerative diseases of the ankle, and we have previously reported that AOA is one of the causes of LS and may be ameliorated by surgery. Supramalleolar osteotomy and talocrural arthrodesis are the primary techniques for osteoarthritis of the ankle, and good results have been reported for both. Although various comparative studies have been reported, there are no reports comparing the results of these techniques in terms of locomotive syndrome. The study aimed to evaluate LS and its improvement in patients who underwent osteotomy or arthrodesis for AOA, and to compare outcomes between these techniques.

METHODS:

The clinical data of patients, who underwent surgery for AOA at our hospital between January 2016 and April 2021 and who agreed to participate in the pre- and postoperative examinations, were prospectively collected. They were treated with osteotomy (group O) or arthrodesis (group A). Patients younger than 40 years, patients with incomplete data, or patients who underwent other surgery for spinal or limb disorders during the study period (up to 12 months after surgery) were excluded. We evaluated the LS stage of the patients at a few days preoperatively and at 12 months postoperatively using the three LS risk tests (namely, the stand-up test, two-step test, and 25-Question Geriatric Locomotive Function Scale (GLFS-25)) proposed by the JOA. The stand-up test evaluates an ability to stand from the sitting position. The two-step test measures the maximum stride length over two strides. The GLFS-25 is a self-reported assessment of locomotor function. The risk levels for LS of each test and their total assessment were classified as stage 0, 1, 2, or 3. The worst LS stage obtained on each of these three tests was used to classify a patient's total LS stage for analysis. In addition, gait speed, functional reach test, and toe pressure were assessed as part of the LS test. Gait speed was measured at maximum walking speed and comfortable walking speed, respectively, and the time required to walk 10 meters. Furthermore, the Japanese Society for Surgery of the foot scale (JSSF scale), a clinical foot score in Japan, was used for evaluation. We used Wilcoxon rank sum test only for the stand-up test, and the two-sample t-test for the others. The results were compared before and after the surgery, and p-value <0.05 was considered statistically significant.

RESULTS:

Finally, 32 patients were included and evaluated in the study (group O, n = 14; and group A, n = 18). The preoperative prevalence of LS stage ≥ 1 was 100% in both groups, and LS stage 3 was 50.0% (7 patients) in group O and 66.7% (12 patients) in group A (Table.1). At 12 months postoperatively, 42.9% (6 patients) in group O and 38.9% (7 patients) in group A had improvement in their LS stage postoperatively. In the two-step test and GLFS-25, only group O showed significant improvement (two-step: 1.28 to 1.35, GLFS-25: 27.1 to 15.6) (Table.2). In the gait speed test, both maximal and comfortable gait tended to improve after surgery in the group O, but worsened in the group A, although the differences were not significant (O: 9.22 to 8.54 for comfortable gait and 7.11 to 6.62 for maximum gait, A: 9.66 to 9.68 and 6.75 to 7.05) (Table.2). In the stand-up test, functional reach test, and toe pressure, neither group showed significant improvements. In the JSSF scale, both groups showed significant improvements. Patients were further divided into two groups: those whose LS stage improved postoperatively and those who did not improve (Table.3). In group O, there was a significant difference between the two groups in the improvement of the JSSF scale and gait speed (both maximum and comfortable). In Group A, only the maximum gait speed was significantly different between the two groups.

DISCUSSION AND CONCLUSION:

This is the first study to compare surgical outcomes between supramalleolar osteotomy and talocrural arthrodesis for ankle osteoarthritis in terms of locomotive syndrome. In this study, the percentage of improvement in total LS stage was similar in both groups. However, in terms of each test, the group O tended to improve more than the group A in objective evaluation items related to gait function, such as the two-step test and gait speed. It was also suggested that improvement in LS stage in AOA patients may be associated with improvement in walking speed. The results suggest that osteotomy, a joint-preserving procedure, may have a better outcome if improvement in postoperative gait function is desired. On the other hand, improvement in locomotive syndrome in the corrective osteotomy group also tended to be associated with the degree of improvement in clinical scores (JSSF scale), suggesting that it is also important to select the surgical method considering the indication.

Groups	Total (n=32)	Osteotomy (n=14)	Arthrodesis (n=18)
Demographic data			
Age (year), mean	68.0	63.1	71.2
Sex, female, n (%)	19 (59.4%)	8 (57.1%)	11 (61.1%)
OA stage classification (n)			
Stage 2	1	0	1
Stage 3a	8	8	0
Stage 3b	12	4	8
Stage 4	9	1	8
Not classified	2	1	1
LS stage before surgery			
Prevalence of LS ≥1	100%	100%	100%
Prevalence of LS ≥2	87.5%	78.6%	94.4%
Prevalence of LS ≥3	59.4%	50.0%	66.7%
LS stage after 12 months			
Prevalence of LS ≥1	93.8%	92.9%	94.4%
Prevalence of LS ≥2	62.5%	57.1%	66.7%
Prevalence of LS ≥3	34.4%	21.4%	44.4%

< Table 1 >

Groups	Osteotomy (n=14)	Arthrodesis (n=18)		
Stand-up test score				
Before surgery, mean (median)	3.9 (4.5)	3.2 (3)		
12 months, mean (median)	4.1 (4)	2.9 (3)		
Two-step test score				
Before surgery, mean	1.28	1.12		
12 months, mean	1.35 [§]	1.15		
GLFS-25 score				
Before surgery, mean	27.1	29.4		
12 months, mean	15.6 [§]	21.9		
Gait speed (time)				
	comfortable	maximum	comfortable	maximum
Before surgery, mean	9.22	7.11	9.66	6.75
12 months, mean	8.54	6.62	9.68	7.05
JSSF scale				
Before surgery, mean	59.1	57.3		
12 months, mean	91.5 [§]	81.7 [§]		

< Table 2 >

§ P < 0.05 versus before surgery

Groups	Total(n=32)		A group(n=18)		O group(n=14)	
	Improve (n=13)	Not (n=19)	Improve (n=7)	Not (n=11)	Improve (n=6)	Not (n=8)
Age	64.2	70.1	67.9	73.4	60.0	65.5
Δ JSSF scale	30.5	26.2	20.0	27.3	42.7 [§]	24.8 [§]
Δ Maximum gait speed	-0.9 [§]	0.6 [§]	-0.2 [§]	0.7 [§]	-1.7 [§]	0.4 [§]
Δ Comfortable gait speed	-1.0	0.2	0.0	0.1	-2.0 [§]	0.3 [§]
Δ Functional reach test	1.9	-0.5	3.7	-1.1	-0.3	0.4
Δ Toe pressure	-2.6	-1.5	-2.3	-1.8	-2.9	-1.0

< Table 3 >

The table shows the amount of change in the evaluation items.

§ P < 0.05 between improve group and not improved group