The Relationship between Ankle Osteoarthritis and Locomotive Syndrome; the Effect of Surgical Treatment and the Influence of other Degenerative Diseases

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INTRODUCTION:

Locomotive syndrome (LS), a concept introduced by the Japanese Orthopaedic Association (JOA), 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 a typical degenerative disease, and a cause of LS, which can be ameliorated by surgery. However, the coexistence of degenerative diseases of the lumbar spine, hip, and knee joints could be a major source of bias in the evaluation of LS.

In this study, we evaluated the pre- and postoperative outcomes of LS in patients who underwent surgery for AOA and investigated the impact of comorbidities of other degenerative diseases on such patients.

METHODS:

The clinical data of patients who underwent surgery for AOA at our hospital between January 2016 and April 2022 were collected. Patients who underwent additional surgeries for spinal or limb disorders during the study period were excluded.

The LS stage of the patients was evaluated preoperatively and at 12 months postoperatively using three LS risk tests proposed by the JOA (the stand-up test, two-step test, and 25-Question Geriatric Locomotive Function Scale [GLFS-25]). The stand-up test evaluates the ability to stand from a seated position. The two-step test measures the maximum stride length over two strides. The GLFS-25 is a self-reported assessment tool of locomotor function. The risk levels for LS in each test and their total assessment were classified as stages 0, 1, 2, or 3. The worst LS stage obtained in each of the three tests was used to classify the patient's total LS stage. In addition, gait speed was assessed as part of the LS test. Gait speed was measured as maximum gait speed, comfortable gait speed, and 10 m walking time. Furthermore, the Japanese Society for Surgery of the Foot (JSSF) Scale was used for clinical foot score evaluation.

All patients underwent a preoperative bone scan, and were classified as the multiple OA group (group M) or the ankle OA group (group A), respectively, based on accumulation in the lumbar spine, hip, or knee joint in addition to the ankle joint or an accumulation exclusively in the ankle joint (Figure 1). The assessment of accumulation was made subjectively by one orthopaedic surgeon and one nuclear medicine physician, and a positive result was obtained if both judged that an accumulation was present. We used a two-sample t-test for statistical analyses, and p-value <0.05 was considered statistically significant.

RESULTS:

Thirty-eight patients were included in this study. The mean age of the patients was 67.8 years; 15 were male, and 23 were female (Table 1). Preoperatively, 23 cases were LS stage 3, 10 cases were stage 2, and 5 cases were stage 1 (Figure 2). At 12 months postoperatively, 13 patients were LS 3, 11 patients were LS 2, 12 patients were LS 1, and 2 patients were LS 0. An improved LS stage was observed in 16 patients (42.1%). Two-step test, GLFS-25, and JSSF scale improved significantly postoperatively (Table 2).

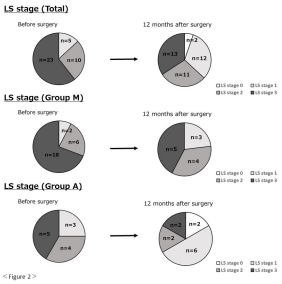
Group M comprised 26 patients and group A comprised 12. In group M, accumulation in the lumbar spine, hip, and knee joints was observed in 12, two, and 17 patients, respectively. Preoperatively, 18 patients (69.2%) in group M and five patients (41.7%) in group A were classified as LS stage 3 (Figure 2). A significant difference was observed in the preoperative two-step test between the groups. At 12 months postoperatively, nine patients (34.6%) in group M and seven patients (58.3%) in group A had improved LS stages. Comfortable gait speed increased significantly postoperatively in group A (Table 2). Moreover, the JSSF scale improved significantly postoperatively in both groups.

DISCUSSION AND CONCLUSION:

To our knowledge, this is the first study to investigate the impact of other degenerative diseases on the relationship between AOA and LS. In our study, patients in group M had a higher proportion of LS 3 than those in group A and worse preoperative LS test scores. Our findings suggest that AOA with the coexistence of degenerative diseases occurring at the proximal site is a risk factor for a decline in LS status. However, the preoperative LS test scores in Group A were also lower than the average of healthy people in their late 60s, suggesting that AOA alone may also be a cause of LS. The postoperative LS stage improvement rates were 34.6% and 58.3% in groups M and A, respectively. Patients with other degenerative diseases may find it difficult to achieve an improvement in overall physical function, even if only the ankle joint symptoms improve with surgical treatment.

In conclusion, this study provides further suggestion that osteoarthritis of the foot can be a cause of LS and can be ameliorated by surgical treatment. The presence of other degenerative disease could also influence the severity and improvement of LS.

< Figure 1 >
There is accumulation in both ankle joints as well as in the lumbar spine and right knee.



< Figure 2 >

Groups	Total (n=38)	Multiple (n=26)	Ankle (n=12)
Demographic data			
Age (year), mean	67.8	68.3	66.8
Sex, female, n (%)	23 (60.5%)	16 (61.5%)	7 (58.3%)
BMI	25.6	25.6	25.4
OA stage classification (n)			
Stage 2	1	0	1
Stage 3a	8	6	2
Stage 3b	13	8	5
Stage 4	13	10	3
Not classified	3	2	1
LS stage before surgery			
Prevalence of LS ≧1	100%	100%	100%
Prevalence of LS ≧2	86.8%	92.3%	75.0%
Prevalence of LS 3	60.5%	69.2%	41.7%
LS stage after 12 months			
Prevalence of LS ≧1	94.7%	100%	83.3%
Prevalence of LS ≧2	63.2%	76.9%	33.3%
Prevalence of LS 3	34.2%	42.3%	16.7%

< Table 1 >

Groups	Total (n=38)	Multiple (n=26)	Ankle (n=12)
Stand-up test score			
Before surgery, mean (median)	3.4	3.1	4.2
12 months, mean (median)	3.3	3.1	3.9
Two-step test score			
Before surgery, mean	1.17	1.11	1.30
12 months, mean	1.23[※]	1.17	1.36
GLFS-25 score			
Before surgery, mean	28.7	31.3	23.3
12 months, mean	18.5[※]	19.9[※]	15.5
Comfortable gait speed (m/s)			
Before surgery, mean	1.02	1.02	1.02
12 months, mean	1.09	1.06	1.17[※]
Maximum gait speed (m/s)			
Before surgery, mean	1.39	1.38	1.40
12 months, mean	1.48	1.41	1.64
JSSF scale			
Before surgery, mean	57.1	56.3	58.8
12 months, mean	86.3[※]	86.1[※]	86.9[※]

< Table 2 >
※ P < 0.05 versus before surgery