

Effects of self-quarantine during the COVID-19 pandemic on patients with lumbar spinal stenosis

A case-control study

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Abstract

Prospective case-control study

This study aimed to investigate the effect of self-quarantine on the changes in low back symptoms and activities of daily living (ADL) due to low physical activity because of the COVID-19 pandemic in patients with lumbar spinal stenosis (LSS).

The frequency and intensity of low back and leg pain have reportedly increased in healthy subjects because of self-quarantine.

Patients with LSS who self-quarantined from baseline (SQ group) were matched to controls who did not self-quarantine (non-SQ group), based on age, sex, medication, ADL, and the numeric rating scale score for low back symptoms. The change in low back symptoms, ADL, and health-related quality of life between baseline and follow-up were compared between the groups.

The SQ and non-SQ group included 80 and 60 patients, respectively. Compared with the baseline, the numeric rating scale score for low back pain at follow-up in the SQ group significantly improved ($P = .004$, median; 1 point), but not in the non-SQ group. No significant difference was found regarding changes in leg pain or numbness. Low back pain improvement did not lead to ADL improvement. The short form 12 evaluation revealed the role/social component score in the SQ group to be significantly lower than that in the non-SQ group; no difference was found for the physical or mental components at follow-up.

Self-quarantine with conservative treatment effected short-term low back pain improvement in patients with LSS. However, no improvement in ADL was found. Self-quarantine had an unfavorable impact for health-related quality of life. The effect of self-quarantine can influence the treatment results of LSS.

Abbreviations: ADL = activities of daily living, HRQoL = health-related quality of life, LSS = lumbar spinal stenosis, MCS = mental component summary, NRS = numeric rating scale, PCS = physical component summary, RCS = role/social component summary, VAS = visual analogue scale.

Keywords: COVID-19, leg numbness, leg pain, low back pain, lumbar spinal stenosis, pandemic, self-quarantine

1. Introduction

Lumbar spinal stenosis (LSS) is among the most frequent causes of low back pain and leg numbness during movement.^[1] The symptoms adversely affect the health-related quality of life (HRQoL) and activities of daily living (ADL) of older adults^[2,3]; however, a well-known feature of LSS is symptom relief with rest or when sitting down.^[4,5]

The global spread of coronavirus disease (COVID-19) forced lifestyle changes upon the global population. The Japanese

government declared a state of emergency from April to May 2020, whilst requesting residents to self-quarantine and avoid non-essential outings. This order was not enforceable; therefore, whether residents obeyed or not was their own choice. On average, outings were restricted by 20% to 50% on holidays and by 20% to 30% on weekdays after the declaration.^[6] The frequency and intensity of low back and leg pain have reportedly increased according to studies regarding self-quarantine imposed during the COVID-19 pandemic.^[7,8] Causes may include stress,

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The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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psychological issues, and working posture during teleworking. However, these studies did not distinguish patients with chronic diseases, and they had limited data of older adults.^[7,8] To date, no study has evaluated the effects of self-quarantine on the symptoms of patients with LSS. Moreover, owing to the relationship between low back symptoms and functional disability, the HRQoL and ADL for these patients are worthy of concern.^[9] Therefore, this study aimed to investigate the effect of self-quarantine on the changes in low back symptoms and on the ADL in patients with LSS. We hypothesize that staying home accompanies short-term relief of low back symptoms, although it does not benefit HRQoL or ADL.

2. Methods

2.1. Study design, setting, and participants

This was a single-center, prospective case-control study enrolling patients with LSS who were followed-up via telemedicine from April to July 2020 by 2 spine surgeons and 2 orthopedic surgeons. Patients with LSS and degenerative spondylolisthesis, spondylolytic spondylolisthesis, lipomatosis, or foraminal stenosis were included. Patients were diagnosed using lumbar X-ray and magnetic resonance imaging or computed tomography. The following exclusion criteria were applied: those with missing numeric rating scale (NRS) data relating to low back symptoms; those with unclear data on their self-quarantine status; those who had neither back nor leg pain and did not use any medication at baseline; and those who had undergone whole lumbar fusion prior to baseline. Those patients who refused enrolment were also excluded.

Informed consent was obtained in the form of an opt-out option that was available on the hospital website. The institutional review board of our institution approved this study (approval number: 2–4).

2.2. Clinical outcome measures

NRS scores for low back (including buttock) pain, leg pain, and leg numbness were collected at baseline via telephonic consultations during April–July 2020) and at follow-up, verbally, via face-to-face outpatient consultation from August to November 2020. For patients who received multiple telemedicine consultations, the lowest NRS score was used as the baseline score. To calculate the improvement or deterioration of pain and numbness, changes in the NRS scores were calculated by deducting the NRS score at

baseline from the NRS score at follow-up. Additionally, the visual analogue scale (VAS) scores for low back pain, leg pain, and leg numbness were obtained at follow-up by self-administered questionnaires, which strengthened the data. The NRS and VAS scores range from 0 (no pain) to 10 (worst pain), and reduction of 1 point is considered minimal clinically important change according to previous literature.^[10]

After the telemedicine consultation, data on the physical activity of the patients at baseline were identified after follow-up by completing a self-administered questionnaire. Information on patients' self-quarantine, outdoor activities, exercises, and other physical activities were considered.

The short form 12 was used for the measurement of HRQoL at follow-up. The physical component summary (PCS), mental component summary (MCS), and role/social component summary (RCS) scores were calculated based on published methods.^[11] Additionally, the Criteria for Determination of the Daily Life Independence Level of the Elderly with Disability were collected at both study points and used for the measurement of ADL (Fig. 1).^[12–14] This tool is simple and easy to use, for physical and telephonic consultation. The physician registered these data in the medical record of each patient immediately after collection. Furthermore, data on patient demographics, comorbidities, and prescriptions were obtained from the medical records.

2.3. Case-control grouping

Matching was based on age, sex, medication (cold/hot patch), daily independence level, and the NRS scores for low back pain, leg pain, and leg numbness at baseline (Fig. 2).

2.4. Statistical analyses

Statistical correlations were determined using the Mann–Whitney *U* test for continuous variables and the χ^2 test for categorical variables. The Wilcoxon signed-rank test was used to compare repeated measurements. A *P* value < .05 was considered statistically significant. All statistical analyses were conducted using SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY).

3. Results

3.1. Patient demographics

Among the 412 patients with lumbar degenerative disease receiving telemedicine consultations, 177 met the inclusion criteria (Fig. 2). Among these patients, 80 reported to having

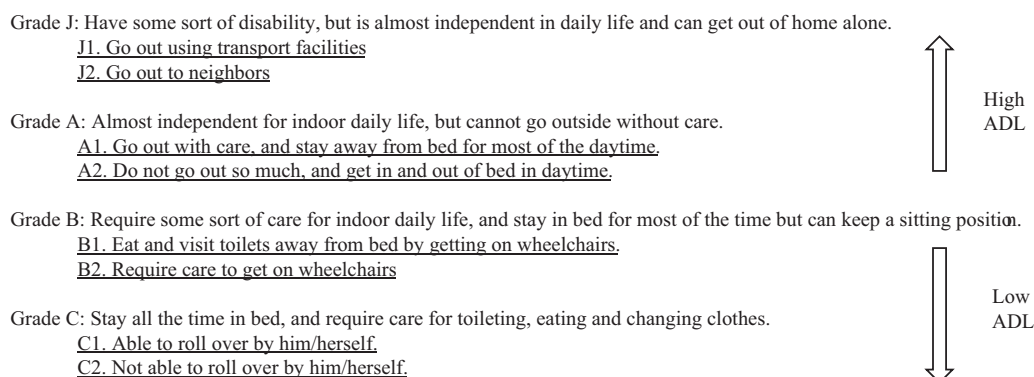


Figure 1. Criteria for Determination of the Daily Life Independence Level (bedridden level) of the Elderly with Disability. ADL = activities of daily living.

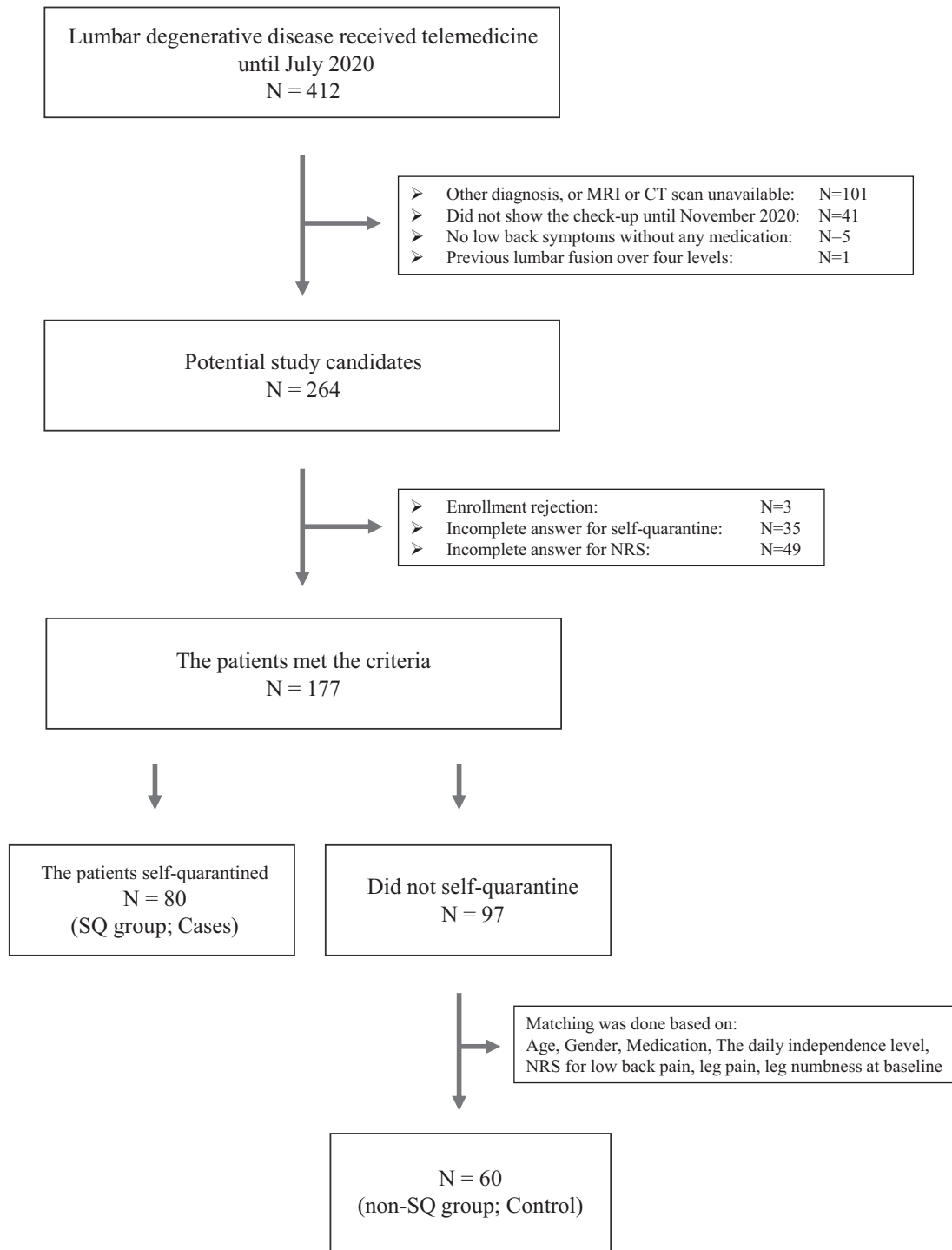


Figure 2. Flowchart outlining the inclusion and exclusion of participants. CT = computed tomography, MRI = magnetic resonance imaging, NRS = numeric rating scale, SQ = self-quarantine.

self-quarantined (SQ group; cases), while the remaining 97 reported that they had not. Compared with the patients who reported not to self-quarantine at baseline, the SQ group included more female patients and more patients who were prescribed a cold or hot patch (see Supplemental Digital Content Table S1, <http://links.lww.com/MD2/B79>, which indicates the detailed whole patients data at baseline before case-control matching). Moreover, the SQ group had significantly worse low

back pain and worse leg pain, which, however, was not significant. After case-control matching, 60 patients were selected as a control (non-SQ group) to finally reach an 80:60 case-control cohort. There were no significant differences in the demographics, sex, diagnosis, medication at baseline, daily independence level, and NRS scores for low back symptoms between the SQ and the non-SQ groups (Table 1). In terms of comorbidity, the SQ group included more patients with

Table 1
The detailed patient data at baseline.

Factors	SQ group (n=80)	non-SQ group (n=60)	P
Demographics			
Age (y)	75.5	74.9	.554
BMI (kg/m ²)	24.9	24.0	.337
Follow-up period for LSS (months)	71.9	63.9	.532
Period from baseline to follow-up (days)	67.4	66.8	.965
Sex			
Female	45	28	.261
Male	35	32	
Additional diagnosis			
None of the following	52	40	.837
Degenerative spondylolisthesis	19	15	.864
Foraminal stenosis	6	2	.466
Lipomatosis	2	2	1.000
Spondylotic spondylolisthesis	1	1	1.000
Comorbidity			
Yes	69	44	.081
Hypertension	49	24	.016
Diabetes	21	13	.568
Asthma/pulmonary diseases	5	7	.244
Cardiac/vascular diseases	12	7	.595
Liver/kidney diseases	7	2	.301
Osteoporosis required medication	6	8	.255
Medication at baseline			
Yes	70	57	.130
Cold/hot patch	49	35	.727
NSAIDs	28	22	.839
Tramadol/Acetaminophen	20	13	.646
Pregabalin/Mirogabalin	29	31	.068
Prostaglandin	16	14	.634
Mecobalamin	13	7	.443
Any prescription change	16	10	.460
The daily independence level at baseline			
J1	55	43	.641
J2	21	15	
A1	2	0	
A2	0	0	
not identified	2	2	
Numerical rating scale			
Low back pain (median)	4.2 (4.5)	4.0 (4.5)	.771
Leg pain	3.3 (3)	3.1 (3)	.748
Leg numbness	2.3 (1.5)	2.4 (2)	.892

BMI = body mass index, LSS = lumbar spinal stenosis, NSAIDs = non-steroidal anti-inflammatory drugs.

hypertension than the non-SQ group. However, no difference was noted in the rates of diabetes, pulmonary diseases, cardiac diseases, and osteoporosis requiring medication.

3.2. Pain and numbness after the self-quarantine period

After the self-quarantine period, a lower NRS score for low back pain at follow-up was found for the SQ group compared with that of the non-SQ group ($P=.087$, Fig. 3A). The SQ group showed a significant improvement in NRS score for low back pain at follow-up compared with that at baseline ($P=.004$, median; 1 point), while the non-SQ group did not ($P=.612$). Regarding the NRS score for leg pain, no differences in scores were noted at follow-up between the groups ($P=.146$, Fig. 3B); additionally, there was no improvement in pain in either group from baseline to follow-up ($P=.175$ and $P=.018$, median: 0

points, respectively). Regarding the NRS score for leg numbness, no difference in score was noted at follow-up between the groups ($P=.392$); moreover, no significant improvement was observed in either group ($P=.106$ and $P=.827$, respectively, Fig. 3C).

The results were similar with the VAS scores (8 participants who could not complete the form were excluded from the analysis). The median VAS score for low back pain at follow-up was 2.9 and 4.4 in the SQ and non-SQ group, respectively; the between-group difference was significant ($P=.030$). The median VAS score for leg pain was 3.2 and 1.9 in the SQ and non-SQ group, respectively, while for leg numbness it was 2.7 and 2.2, respectively; no between-group difference found ($P=.311$ and $P=.849$, respectively).

3.3. Pain relief in patients with severe low back pain after the self-quarantine period

In this case-control cohort, 70 patients with LSS reported low back pain corresponding to a baseline NRS score exceeding 5; 40 patients were from the SQ group (SQ severe cohort) and the remaining 30 were from the non-SQ group (non-SQ severe cohort). The median baseline NRS score for low back pain was 6 and 5.5 for the SQ severe and non-SQ severe cohort, respectively; there was no significant difference ($P=.540$). The improvement in low back pain from baseline to follow-up was significantly greater in the SQ severe cohort than that in the non-SQ severe cohort (median score difference: 1.5 and 0, respectively, $P=.014$). Furthermore, the median VAS score for low back pain at follow-up was 3.9 and 5.5 for the SQ severe and non-SQ severe group, respectively, with a significant difference between the groups ($P=.022$).

3.4. HRQoL at follow-up

The median PCS, MCS, and RCS scores in the SQ group were 32.7, 53.0, and 43.0, respectively (Fig. 4), while those in the non-SQ group were 35.7, 52.0, and 46.4, respectively. Although there was no significant difference in the PCS or MCS score between the groups ($P=.567$ and $P=.239$, respectively), the RCS score in the SQ group was significantly lower than that in the non-SQ group ($P=.048$).

3.5. Daily life independence level

Regarding the difference in ADL between baseline and follow-up, 10 and 8 patients in the SQ group and 6 and 2 patients in the non-SQ group showed an improvement and a deterioration, respectively. No relationship was found between self-quarantining and an improvement in ADL ($P=.365$). Those patients who experienced an improvement in their ADL (e.g., from J2 at baseline to J1 at follow-up, Fig. 1) tended to report a greater improvement in leg pain according to the NRS score compared to those showing no improvement in ADL between baseline and follow-up ($P=.066$, Table 2). There was no significant difference in the change in NRS score for low back pain or leg numbness between the patients who experienced an improvement in ADL and those who did not.

4. Discussion

This study evaluated the low back and leg symptoms of patients with LSS, dichotomized into those who self-quarantined during

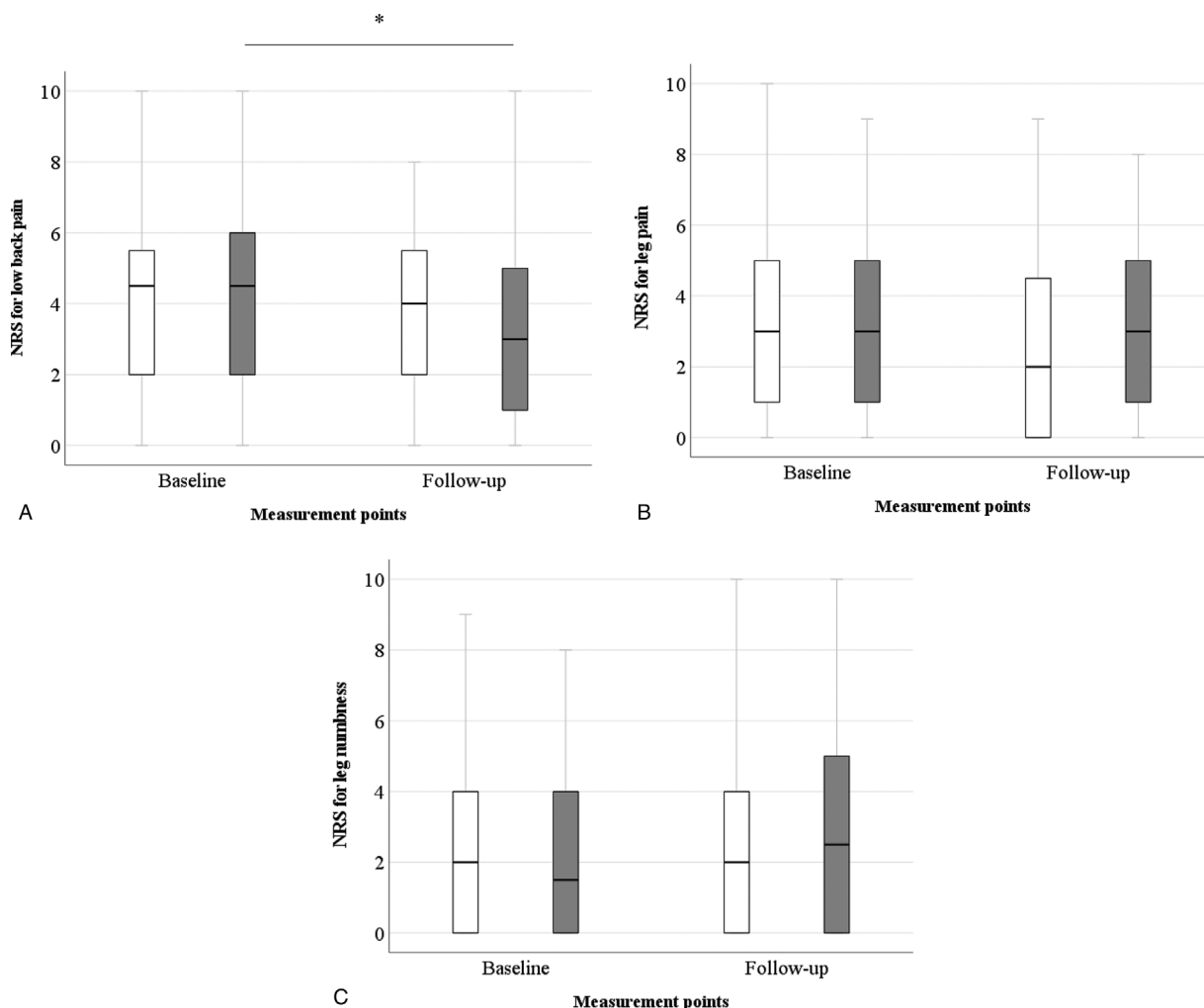


Figure 3. Box plot of the change in numeric rating scale score of the non-SQ group (white box) and the SQ group (grey box); (A) for low back pain, (B) leg pain, (C) and leg numbness. NRS = numeric rating scale.

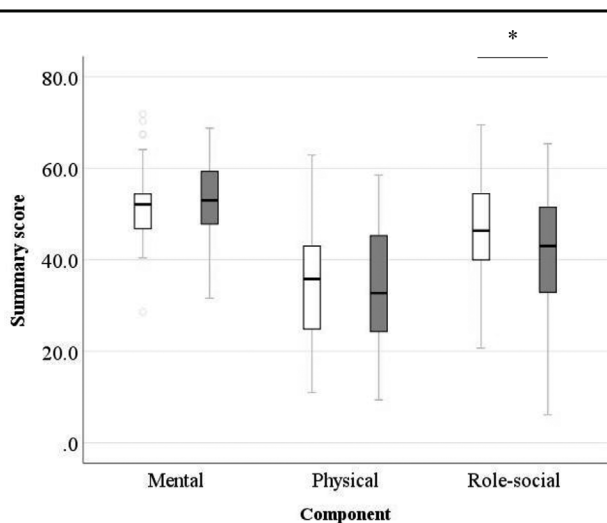


Figure 4. Box plot of the mental, physical, and role/social component summary scores of Short Form 12 (SF-12) at follow-up for the non-SQ group (white box) and the SQ group (grey box).

the COVID-19 pandemic and those who did not. Our findings support our hypothesis that staying home accompanies short-term relief of low back pain, although it does not benefit the HRQoL or ADL. Our results show that more female patients and more patients with severe low back and leg pain tended to self-quarantine. After case-control matching, the NRS scores for low back pain in the SQ group had significant improvements, while that in the non-SQ group showed nothing significant. There was no significant difference between the groups regarding the NRS score for leg pain or numbness. Nevertheless, self-quarantine did not help regain HRQoL or ADL. Per our knowledge, this is the first study to evaluate the short-term effects of limiting outings and exercise during the self-quarantine period on low back symptoms in patients with LSS.

During May–July 2020, our outpatient department was closed to concentrate medical resources toward the management of COVID-19 caseloads. We continued to follow-up on almost all patients with lumbar degenerative disease through telemedicine; thus, participant baseline evaluation was performed telephonically. The NRS was used to evaluate pain and numbness, and the daily life independence level was used for ADL estimation to

Table 2
Comparison of demographic data and NRS scores for low back symptoms between patients who experienced an improvement in daily life independence level and those who did not.

Factors	Patients with ADL improvement (n=16)	ADL not improved (n=20)	P
Self-quarantined	10	12	.878
Demographics			
Age (y)	79	78.1	.626
BMI (kg/m ²)	24.5	26.4	.290
Sex			
Female	8	10	1.000
Male	8	10	
NRS at baseline			
Low back pain	4.75	4.00	.440
Leg pain	4.09	2.48	.089
Leg numbness	2.44	2.10	.718
NRS improvement			
Low back pain	1.25	0.25	.352
Leg pain	1.66	0.58	.066
Leg numbness	0.12	0.05	.683

ADL = activity of daily life, BMI = body mass index, NRS = numerical rating scale.

determine the patient's symptoms. Reportedly, the NRS is more responsive and sensitive than the VAS and can be administered verbally.^[15] While a self-administered VAS was used at follow-up to strengthen the data, 8 participants could not complete the form—which could be attributed to vision-related issues or lack of understanding the contents.

Before case-control matching, the SQ group reported a significantly higher baseline NRS score for low back pain than that reported by the remaining patients. Walking ability in patients with lumbar degenerative disease has a reported inverse correlation with back pain severity;^[16] thus, it is reasonable that patients with severe back pain limited outings and exercise after the order from the government. This difference led to failure in yielding 1:1 matching.

In this cohort, low back pain improved more in the SQ group than in the non-SQ group. Notably, all patients received conservative treatment prior to and during self-quarantine. Approximately 90% of participants received a prescription, and the doctor provided pain relief via exercise guidance delivered through a scheduled telephonic call. There was only a minor difference in the prescribed medications between the groups. Therefore, our findings suggest that, as an adjunct to conservative treatment, self-quarantining was superior to not self-quarantining for improving low back pain and, thus, staying home may have contributed to a short-term improvement in symptoms in patients with LSS.

However, the short form 12 RCS score in the SQ group was significantly lower than that in the non-SQ-group, while no difference in the PCS or MCS scores were noted at follow-up. Limiting outings and exercise probably diminishes social activities, at least temporarily; thus, this finding is reasonable as a side-effect of self-quarantine. It suggests that, despite self-quarantine helping to decrease the NRS score for low back pain, it is not a sufficient treatment option for LSS.

In the SQ group, we failed to find any relationship between ADL improvement and low back and leg pain relief. The abovementioned findings indicate that self-quarantine did not

significantly contribute to relief of leg pain or numbness. Thus, a potential cause of ADL impairment could have been persistent neurogenic claudication, despite self-quarantining.

Our findings are consistent with those of other studies concerning the ill-effects of COVID-19 pandemic. Kuitunen et al reported a 31% decrease in low back symptom-related emergency department visits during and after national lockdown.^[17] Clinic visits and the surgical caseload for lumbar spinal diseases also decreased.^[18,19] Although the pandemic forced medical providers and patients to concentrate resources, pain relief upon staying home may be another cause of decreased hospital visits.

This study had several strengths. Since it was a single-center study conducted at a general hospital, accurate information on medication and comorbidities were obtained from medical records—consideration of medication is important in the evaluation of changes in symptoms. Additionally, since the baseline evaluation was conducted telephonically, the associated ethical and social burden under the state of emergency was minimal. Treatment bias was avoided since physicians were not aware of the quarantine status of the patients until follow-up.

However, there were also several limitations. First, patients with severe symptoms who required referral to another spine center and those who underwent early surgical intervention were excluded due to ethical reasons. Nonetheless, the findings suggest that self-quarantine may benefit low back pain relief, at least in mild cases that can be managed conservatively. Second, patients reported their self-quarantine status by answering a yes/no question and quantitative data regarding limitation of movement were not available. However, each patient had their own physical activity level and low back symptoms of LSS arise from own daily life activity. Findings suggest that patients who reported having limited their outings or exercise during lockdown were likely to experience a reduction in low back pain. Third, the mean period between baseline and follow-up was 2 months—we assessed the short-term effect of self-quarantine. Notably, quarantine has an adverse effect on anxiety, stress, and other psychological factors^[8]; these aspects could worsen pain, numbness, and ADL deterioration. Moreover, consistent physical inactivity is a risk factor for osteoporosis in older adults.^[20] Future studies should involve a longer follow-up period to assess these factors.

In conclusion, we found an improvement in low back pain in patients with LSS who performed self-quarantine from May to July 2020, during the early period of the COVID-19 pandemic in Japan. However, no significant improvement in leg pain or numbness was found, and self-quarantine did not benefit HRQoL or ADL. These results may help spine practitioners and surgeons to understand changes in patient symptoms during the COVID-19 pandemic period, and lead to optimizing the use of healthcare resources.

Author contributions

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