Effect of self-quarantine due to COVID-19 on low back and leg symptoms in patients with lumbar spinal stenosis

Kazunori Hayashi (kh_ocg@yahoo.co.jp)
Osaka City Juso Hospital
Toru Tanaka
Osaka City Juso Hospital
Tsuneyuki Ebara
Osaka City Juso Hospital
Akira Sakawa
Osaka City Juso Hospital
Hidekazu Tanaka
Osaka City Juso Hospital
Hiroaki Nakamura
Osaka City University Hospital

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Abstract

The effect of self-quarantine and avoiding non-essential outings due to COVID-19 on the symptoms of patients with lumbar spinal stenosis (LSS) remains unknown. In this prospective study, patients with LSS who self-quarantined from baseline (SQ group; 80 patients) were matched to controls who did not self-quarantine (non-SQ group: 60 patients), based on age, gender, medication, activities of daily living (ADL), and low back symptoms. The change in low back symptoms, ADL, and health-related quality of life (HRQoL) between baseline and follow-up (after self-quarantine periods) were compared between the groups. Compared to baseline, the NRS score for low back pain at follow-up in SQ group significantly improved, but not in 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 SQ group to be lower than that in non-SQ group at follow-up; no difference was found for the physical or mental components. This study revealed self-quarantine with conservative treatment accompanied short-term low back pain improvement in patients with LSS. It might help to understand the situation in the spine department during the COVID-19 pandemic.

Introduction

Lumbar spinal stenosis (LSS) is one of the most frequent causes of low back pain and leg numbness while moving[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 humans to change their lifestyle behaviors. In Japan, a state of emergency was declared from April to May 2020, and the government requested 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 30–50% on holidays and by 20–30% 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 due to COVID-19[7,8]. Causes may include stress, psychological issues, and working posture during teleworking. However, these studies did not distinguish patients with chronic diseases, and the proportion of older adults were small. To date, the effect of self-quarantine on the symptoms of patients with LSS is unknown. Moreover, owing to the relationship between low back symptoms and functional disability, the HRQoL and ADL in this population are of concern[9]. Therefore, the aim of this study was to investigate the effect of self-quarantine on the change in low back symptoms and the impact on 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.

Methods

Study design, setting, and participants

This was a single-centre, prospective case-control study that included patients with LSS who were followed up via telemedicine from April to July 2020 by two spine surgeons and two orthopaedic surgeons. Patients with LSS and degenerative spondylolisthesis, spondylolytic spondylolisthesis, lipomatosis, or foraminal stenosis were included. Patients were diagnosed using lumbar X-ray and medical resonance imaging or computed tomography. The following patients were excluded: 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 multilevel lumbar fusion (more than four levels) 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 Osaka City Juso hospital approved this study (approval number: 2–4). All research was performed in accordance with approved regulations by the review board, and Declaration of Helsinki.

Clinical outcome measures

NRS scores for low back (including buttock) pain, leg pain, and leg numbness were collected at baseline via telemedicine (telephonic consultation, from April to 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 as the score at follow-up minus that at baseline. To strengthen the data, the visual analogue scale (VAS) scores for low back pain, leg pain, and leg numbness were also obtained at follow-up by self-administered questionnaire. The NRS and VAS scores range from 0 (no pain) to 10 (worst pain).

Data on whether patients had self-quarantined and whether they had been going out and exercising less frequently after their telemedicine consultation at baseline were identified after follow-up by completing a self-administered questionnaire.

Short Form 12 (SF-12) was used for the measurement of HRQoL at follow-up. Physical component summary (PCS), mental component summary (MCS), and role/social component summary (RCS) scores were calculated based on previous literature[10]. 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)[11–13]. This tool is simple and easy to use, both 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.

Statistical analyses

Statistical correlations were determined using the Mann–Whitney U test for continuous variables and the chi-square test for categorical variables. The Wilcoxon signed-rank test was used to compare repeated measurements. A p-value < 0.05 was considered statistically significant. All statistical analyses were conducted using SPSS version 26.0 (IBM, Chicago, IL).

Results

Patient demographics and case-control grouping

Among the 412 patients with lumbar degenerative disease receiving telemedicine consultations, 177 met the inclusion criteria (Fig. 2). No patient was diagnosed with COVID-19 prior to follow-up. Among these patients, 80 reported to having self-quarantined (SQ group; cases), while the remaining 97 reported that they had not. Compared to 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 (Supplemental Table 1). Moreover, the SQ group had significantly worse low back pain as well as worse leg pain, although the latter was not significant. Matching was based on age, gender, medication (cold/hot patch and pain killers), daily independence level, and the NRS scores for low back pain, leg pain, and leg numbness at baseline. We selected 60 of the 97 remaining patients (non-SQ group; control) to finally reach an 80:60 case-control cohort. There were no significant differences in the demographics, diagnosis, medication, daily independence level, or NRS scores for low back symptoms between the SQ and the non-SQ group. The SQ group included more patients with hypertension than the non-SQ group (Table 1).

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	0.554
	BMI (kg/m^2)	24.9	24.0	0.337
	Follow-up period for LSS (months)	71.9	63.9	0.532
	Period from baseline to check-up (days)	67.4	66.8	0.965
Gender	Female	45	28	0.261
	Male	35	32	
Additional diagnosis	None of the following	52	40	0.837
	Degenerative spondylolisthesis	19	15	0.864
	Foraminal stenosis	6	2	0.466
	Lipomatosis	2	2	1.000
	Spondylotic spondylolisthesis	1	1	1.000
Comorbidity	Yes	69	44	0.081
	Hypertension	49	24	0.016
	Diabetes	21	13	0.568
	Asthma/pulmonary diseases	5	7	0.244
	Cardiac/vascular diseases	12	7	0.595
	Liver/kidney diseases	7	2	0.301
	Osteoporosis needed medication	6	8	0.255
Medication at baseline	Yes	70	57	0.130
	Cold/hot patch	49	35	0.727
	NSAIDs/Tramadol/Acetaminophen	44	32	0.845
	Pregabalin/Mirogabalin	29	31	0.068
	Prostaglandin	16	14	0.634
	Mecobalamin	13	7	0.443
	Any prescription change	16	10	0.460

Factors		SQ group (n = 80)	non-SQ group (n = 60)	*p*
The daily independence level at baseline	J1	55	43	0.641
	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)	0.771
	Leg pain	3.3 (3)	3.1 (3)	0.748
	Leg numbness	2.3 (1.5)	2.4 (2)	0.892

MRI: magnetic resonance imaging, CT: computed tomography, NRS: numeric rating scale, SQ: self-quarantine

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 to that of the non-SQ group (p = 0.087, Fig. 3a). The SQ group showed a significant improvement in NRS score for low back pain at follow-up compared to that at baseline (p = 0.004, median; 1 point), while the non-SQ group did not (p = 0.612). Regarding the NRS score for leg pain, no difference in score was noted at follow-up between the groups (p = 0.146, Fig. 3b); additionally, there was no improvement in pain in either group from baseline to follow-up (p = 0.175 and p = 0.018, median: 0 points, respectively). Regarding the NRS score for leg numbness, no difference in score was noted at follow-up between the groups (p = 0.392); moreover, no significant improvement was observed in either group (p = 0.106 and p = 0.827, respectively, Fig. 3c).

Similar results were found for the VAS scores (8 participants who were not able to 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; there was a significant difference between the groups (p = 0.030). 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 difference was found between the groups (p = 0.311 and p = 0.849, respectively).

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

Seventy patients in the case-control cohort 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 ($p = 0.540$). 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, $p = 0.014$). 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 ($p = 0.022$).

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 in the non-SQ group the scores were 35.7, 52.0, and 46.4, respectively. Although there was no significant difference in the PCS or MCS score between the groups ($p = 0.567$ and $p = 0.239$, respectively), the RCS score in the SQ group was significantly lower than that in the non-SQ group ($p = 0.048$).

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 ($p = 0.365$). The patients who saw 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 who saw no improvement in ADL between baseline and follow-up ($p = 0.066$, Table 2). There was no significant difference in the change in NRS score for low back pain or leg numbness.

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	0.878
Demographics	Age (y)	79	78.1	0.626
	BMI (kg/m^2)	24.5	26.4	0.290
Gender	Female	8	10	1.000
	Male	8	10	
Medication	NSAIDs/Tramadol/Acetaminophen	12	5	0.003
NRS at baseline	Low back pain	4.75	4.00	0.440
	Leg pain	4.09	2.48	0.089
	Leg numbness	2.44	2.10	0.718
NRS improvement	Low back pain	1.25	0.25	0.352
	Leg pain	1.66	0.58	0.066
	Leg numbness	0.12	0.05	0.683

Discussion

In the present study, we evaluated the low back and leg symptoms of patients with LSS, dichotomized into those who self-quarantined during 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 HRQoL or ADL. We found that more female patients and more patients with severe low back and leg pain tended to self-quarantine. After case-control matching, the improvement in NRS score for low back pain in the SQ group was significant, while that in the non-SQ group was not. There was no significant difference between the groups regarding the NRS score for leg pain or numbness. Nevertheless, self-quarantine did not help to 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.

From May to July 2020, the outpatient clinic of our hospital was closed to concentrate medical resources on the treatment of COVID-19. We continued follow-up on nearly all patients with lumbar degenerative disease via telemedicine; thus, participant baseline evaluation was performed telephonically. NRS was used to evaluate pain and numbness, and the daily life independence level was used for ADL estimation

in order to determine the patient's symptoms. Reportedly, the NRS is more responsive and sensitive than the VAS and can be administered verbally[14]. While a self-administered VAS was used at follow-up to strengthen the data, 8 participants were not able to complete the form—this may have been due 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[15]; 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 the case-control analyses, 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 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 SF-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 found at follow-up. Limiting outings and exercise likely diminishes social roles, 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 a relationship between an improvement in ADL 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 COVID-19 pandemic. Kuitunen et al. reported a 31% decrease in low back symptom–related emergency department visits during and after national lockdown[16]. Clinic visits and the surgical caseload for lumbar spinal diseases also decreased[17,18]. Although the pandemic forced medical providers and patients to concentrate resources, pain relief upon staying home may also be a potential cause of decreased hospital visits.

This study had several strengths. Since it was a single-centre 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 centre 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 to having limited 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[7]; these aspects could worsen pain, numbness, and ADL deterioration. Moreover, consistent physical inactivity is a risk factor for osteoporosis in older adults[19]. 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.

Declarations

Author Contributions

K.H. and H.N. conceived and designed this study. K.H., T.T., A.S., T.E., and H.T. collected data from patients. K.H. analysed the data and wrote the manuscript. All authors reviewed the manuscript.

Additional Information

Competing financial interest: The authors declare no competing financial interests.

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Figures

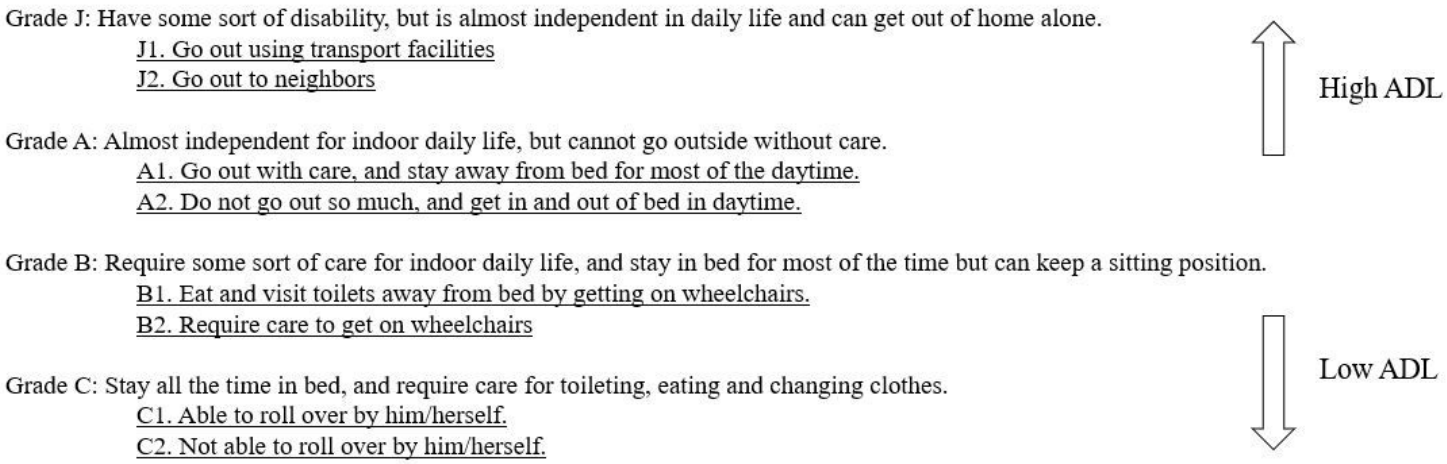

Figure 1

Criteria for Determination of the Daily Life Independence Level (bedridden level) of the Elderly With Disability ADL: activities of daily living

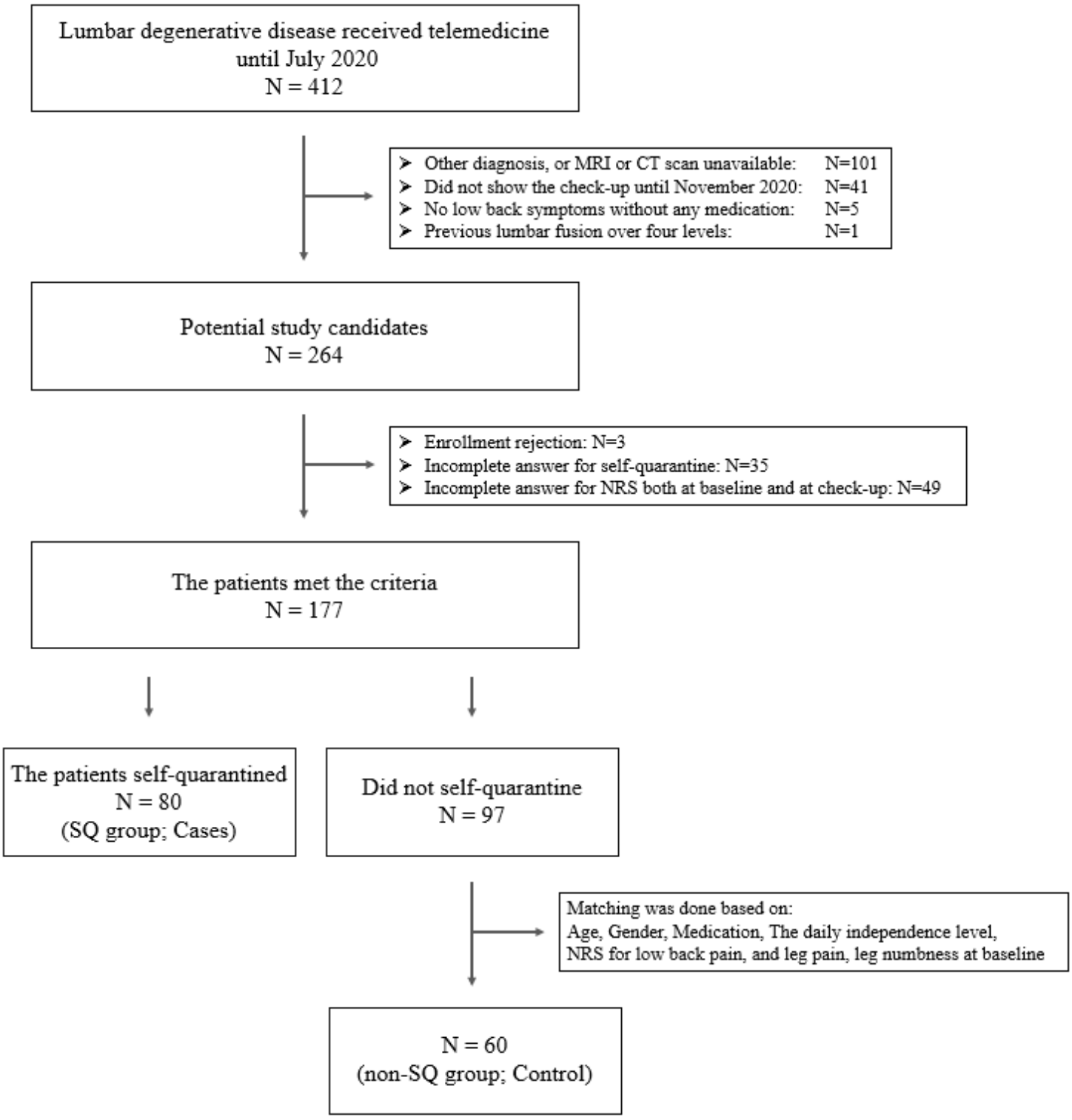

Figure 2

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

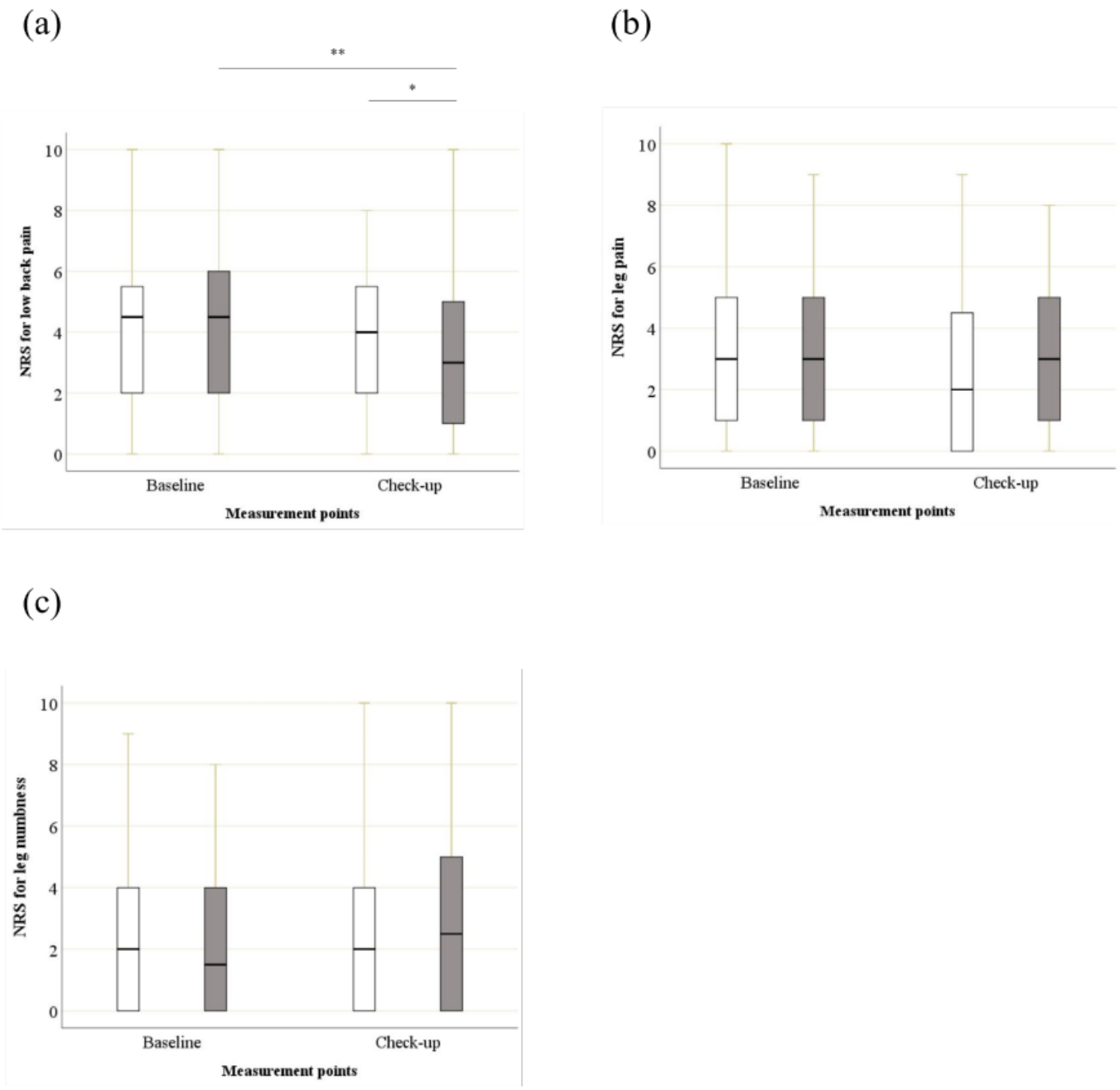

Figure 3

Box plot of the change in numeric rating scale score of the non-SQ group (white box) and the SQ group (gray box); (a) for low back pain, (b) leg pain, (c) and leg numbness NRS: numeric rating scale

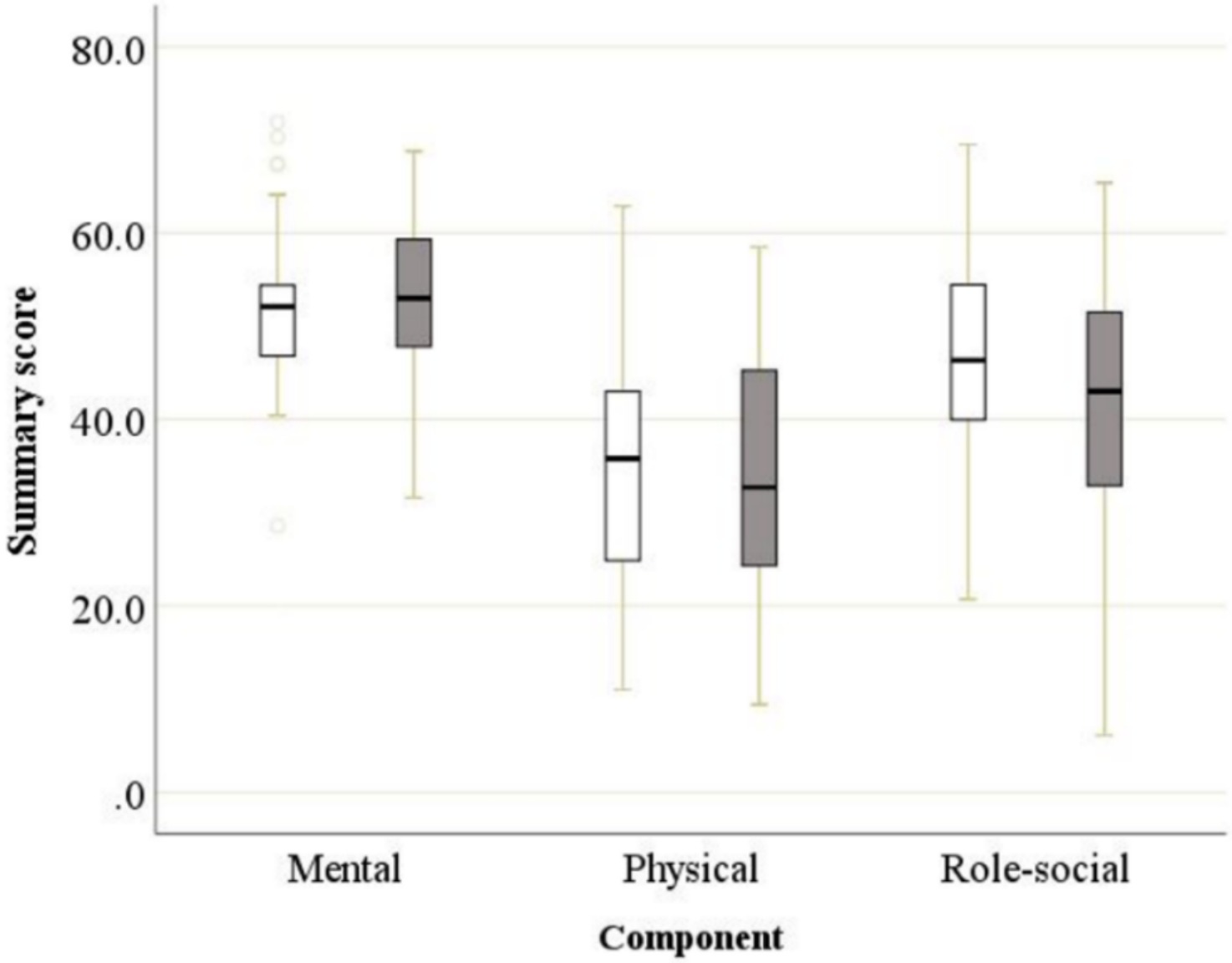

Figure 4

Box plot of the mental, physical, and role/social component summary scores of Short Form 12 at follow-up for the non-SQ severe cohort (white box) and the SQ severe cohort (gray box)

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SuppleTable.docx