Peer Review File

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Reviewer A

Comment 1: What conservative therapies were recommended during the time the patient was followed? Could you please be more specific?

Reply 1: The conservative therapies followed included analgesics, physiotherapy, and steroid injections, as is the norm for most patients who present to our clinic.

Changes in the text: We have added this detail. Lines 110-112 now read "After neurosurgical evaluation, conservative therapies including physiotherapy, analgesics, and steroid injections were recommended".

Comment 2: Were there other exam findings that are part of the usual care for patients with LSS, such as DTR's, upper motor neuron findings, qualitative gait observations? These details may provide insight into the utility of other commonly used clinical tools available to physical therapists.

Reply 2: Thank you for the suggestion. Yes, the patient in her first presentation to us demonstrated abnormal qualitative gait observations such as a slouching posture in response to pain when standing straighter. Upper motor neuron signs were not reported at this time. In our initial submission, we also wrote that, when assessed in March 2021, the patient could only to mobilize for a few meters even with the assistance of a four-wheel walker before needing rest. Furthermore, physical examination at this time revealed bilateral lower limb weakness and paranesthesia upon exertion.

Changes in the text: Lines 93-95 now read "Qualitative gait observations revealed a slouching posture with symptoms worsening when standing upright for several minutes. Upper motor neuron signs were not reported".

Reviewer B

Comment: The authors report a single case of an 85-year-old patient with lumbar spinal stenosis who initially opted for conservative treatment and over the course of two years demonstrated deterioration of various objective walking metrics. The surgeons used this information to recommend for surgery but it is unclear whether surgery led to a postoperative improvement in walking function. This is somewhat essential to know, as the walking function in an 85-year-old lady may have several different reasons to show deterioration over 2 years (e.g., cardiac, pulmonary, COVID, vascular disease with intermittent claudication, etc.) and this report gives no evidence that the back disease is clearly causal for the deterioration. Moreover, the topic of objective outcome measures enjoys much advances in practical

application and research but some of the most relevant studies incl. meta-analyses on objective outcome measures are not discussed. This seems relevant, as the authors chose outcome measures that do not belong to the group of most applied or best validated outcome measures for lumbar degenerative spine disease. Together with the low sample size (n=1) these are the main weaknesses that in my opinion would need to be adequately addressed before considering the article further.

Reply: Thank you very much for the feedback. We respond to each subsection of your feedback below.

Comment 1: The surgeons used this information to recommend for surgery but it is unclear whether surgery led to a postoperative improvement in walking function.

Reply 1: We did not recommend the patient to undergo surgery based on their deteriorating walking metrics – the recommendation for surgery was made due to a deterioration of the patient's symptoms (bilateral lower limb weakness, paraesthesia, inability to mobilize beyond a few metres) and quality of life despite undergoing conservative therapy, and after a shared decision-making process with the patient and her family. In lines 119-122, we clarify "As her clinical symptoms had deteriorated and were now significantly affecting her quality of life, surgical management was recommended after neurosurgical evaluation and a shared decision-making process with the patient and her family".

Instead, the focus of this case report is that we were able to document the deterioration of a patient with lumbar spinal stenosis using walking metrics and we matched these deteriorations with an increasing need for walking assistance (no assistance needed → one walking stick → four-wheel walker). In lines 132-136, we say "To our knowledge, this is the first recorded case actively tracking the decline of a patient with LSS by objectively measuring their walking patterns for such a prolonged duration. By doing so, we have demonstrated correlation between deteriorating walking metrics and an increased need for walking assistance".

Changes in the text: To further clarify that we did not recommend surgery based on the patient's walking metrics, we removed "Although only simple metrics were used, these assessments were helpful in shaping the treatment plan for the subject" from our Discussion (lines 190-191).

Comment 2: The walking function in an 85-year-old lady may have several different reasons to show deterioration over 2 years (e.g., cardiac, pulmonary, COVID, vascular disease with intermittent claudication, etc.) and this report gives no evidence that the back disease is clearly causal for the deterioration.

Reply 2: That is a valid point. To clarify, we made that assumption on the basis that, besides her lumbar stenosis, the patient was otherwise healthy with no other notable comorbidities.

Changes in the text: In lines 103-105, we clarify: She did not develop any other medical comorbidities during this time and her walking deterioration was likely secondary to her worsening lumbar stenosis.

Comment 3: Moreover, the topic of objective outcome measures enjoys much advances in practical application and research but some of the most relevant studies incl. meta-analyses on objective outcome measures are not discussed. This seems relevant, as the authors chose outcome measures that do not belong to the group of most applied or best validated outcome measures for lumbar degenerative spine disease.

Reply 3: Thank you for pointing that out. As per your recommendation, we found a systematic review by Stienen et al. which overviews objective outcome assessments in lumbar spine patients and included this in our Discussion. We also explain why we measured walking metrics (step count, walking speed, step length) measurable using wearable devices as opposed to the clinician-observed tests detailed in the aforementioned systematic review.

Changes in the text: In lines 150-155, we say "A systematic review by Stienen et al. (2019) revealed that other forms of objective outcome measurement primarily include clinician-observed tests such as the timed up and go test, the motorized treadmill test, and the self-paced walking test. These appeared in 9.8-31.7% of papers incorporating the objective outcome analysis of spine patients (17). However, the frequency of these assessments is limited to in-person presentations and cannot match the day-to-day monitoring of walking patterns made possible using wearable devices".

Comment 4: Small sample size.

Reply 4: Yes, this is a limitation of our case report. We now point this out in our Discussion and recommend future studies to investigate further.

Changes in the text: In lines 181-183, we say: "However, the present report is limited by sample size, and future studies are required to consolidate these findings before they can be tangibly translated into clinical contexts".