Author's response to reviews

Title: Diagnostic value of the lumbar extension-loading test in patients with lumbar spinal stenosis: a cross-sectional study

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Author's response to reviews: see over
Reviewer’s report

Title: Diagnostic value of the lumbar extension-loading test in patients with lumbar spinal stenosis: a cross-sectional study

Version: 2 Date: 10 March 2014

Reviewer: Naffis Anjarwalla

Reviewer’s report:

Major Compulsory Revision

1. The relation between physical findings and imaging should be mentioned for each of the tests and discussed.

**Answer:** Thank you very much for your suggestion. We have demonstrated the evaluation of the relationship between physical and imaging findings. We considered that for correct diagnosis of the responsible spinal level, it is necessary to accurately analyze not only lumbar spinal stenosis on the images, but also the patient’s subjective symptoms, physical findings, and objective neurological findings caused by the lumbar spinal stenosis. Therefore, we processed to diagnose the spinal level truly responsible as follows. We finally confirmed the consistent presence of lumbar spinal stenosis on MRI images after examining changes in the subjective symptoms, physical findings, and objective neurological findings between before and after the gait-loading or lumbar extension-loading test. These changes included the findings not only at rest, but also at walking and in the lumbar extension position. Previous studies have described asymptomatic patients, although they had advanced lumbar spinal stenosis. When subjective symptoms at rest were caused by only the lower responsible spinal level, the higher responsible
spinal level was masked. Therefore, we considered the ability to determine whether the higher spinal level is truly responsible after analyzing the changes in the subjective symptoms or objective neurological findings caused by loading tests. In this study, we wanted to emphasize that it is very important to understand the changes in the subjective symptoms and/or objective neurological findings between before and after the two loading tests to diagnose the truly responsible spinal level, but that the existence of lumbar spinal stenosis on images is less important. Accordingly, we did not discuss the relationship between the physical findings and the images of the patients with lumbar spinal stenosis. Although we did not mention this before revision of our paper, there was no particular correlation between the physical findings and the images of the patients with lumbar spinal stenosis.

We have added the following sentence to the Discussion section (page 13, lines 8–10):

For correct diagnosis of the responsible spinal level, it may be necessary to accurately analyze not only LSS on images, but also the patient’s subjective symptoms, physical findings, and objective neurological findings caused by LSS.

2. Did the results of the test actually change the management plan of the patient?

Answer: Thank you very much for your question. We diagnosed the spinal level truly responsible based on the consistency of the MRI findings of lumbar spinal stenosis after we evaluated not only the subjective symptoms and objective neurological findings at rest, but also the changes in these parameters between before and after the two loading tests. We are thus able to target the treatment only to the truly responsible spinal level. Accordingly, we do not target
the irresponsible spinal level, although we confirmed the presence of lumbar spinal stenosis on
the images.

3. If there was a change in the management plan of the patient did it seem to improve or
adversely effect the outcome?

**Answer:** Thank you very much for your question. We were able to accurately identify the
spinal level truly responsible using the two loading tests. Moreover, it was possible to
accurately determine the optimal treatment. Accordingly, we considered that the final results are
clinically useful. However, we cannot make any definitive conclusions because in terms of the
treatment outcome, the study group was not compared with a group that did not undergo the two
loading tests. This is a good topic for a future study.

4. It is stated that on of the possible advantages of the extension test is the time saving, but the
data on how long it took to bring on symptoms is not properly presented. It is suggested on
average that a saving of a minute may be achieved, but as the testing for each patient was not
standardised as to time of day, relation to analgesics taken etc this is not really valid. I would
suggest that this advantage has not been clearly demonstrated in this study.

**Answer:** Thank you very much for your comments. The gait-loading test is a well-known
provocation test that can diagnose the pathology of lumbar spinal stenosis with accuracy, and
this was mentioned in the background of our paper. We wanted to emphasize that the lumbar
extension-loading test is equally useful for understanding the pathology of lumbar spinal
stenosis and determining the truly responsible spinal level when symptoms are masked at rest.
We concluded that an advantage of the extension test is its ability to save time because the lumbar extension-loading test has a tendency to show changes in the findings earlier than does the gait-loading test, which is suggested by the following description in the Results section:

“The lumbar extension posture was maintained for a minimum of 1.0 minute and a maximum of 27.0 minutes (mean, 5.6 minutes) during the lumbar extension-loading test. The walking time ranged from 0.5 to 35.0 minutes (mean, 6.5 minutes) and the walking distance ranged from 100.0 to 1000.0 m (mean, 141.3 m) during the gait-loading test.” We considered that the two loading tests had never been validated in this study, which was pointed out by the reviewer. We have described this as a limitation of the study in the Discussion section.

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests: I declare that I have no competing interests
Reviewer’s report

Title: Diagnostic value of the lumbar extension-loading test in patients with lumbar spinal stenosis: a cross-sectional study

Version: 2 Date: 10 March 2014

Reviewer: Sean Hughes

Reviewer’s report:

This is an interesting paper which compares two methods of loading the spine in patients with neurogenic intermittent claudication, due to spinal or nerve root stenosis. The tests are performed in order to determine more accurately the correct level causing the patients symptoms and signs and therefore could more precisely predict the amount of decompression needed in these patients.

Using both lumbar extension loading and gait loading tests in 116 patients, the authors measured the symptoms and signs after these tests had been performed and noted quite marked changes.

They concluded that the lumbar extension loading test which was a simple standing test was as good as the gait loading test which required more space and that both tests are capable of accurately determining the involved spinal level.

The main problem with this paper is that we have no idea if this later statement is correct as the tests have not been correlated with either medical or surgical outcomes of these patients with spinal stenosis. What can be concluded is that patients who undergo either forms of loading do have altered symptoms and signs after both these tests.
Specific points;

1. Could the authors clarify exactly what the mean by spinal stenosis?

   **Answer:** Thank you very much for your comments. Our definition of lumbar spinal stenosis was the presence of neurological symptoms caused by lumbar spinal stenosis. The presence of lumbar spinal stenosis only on an image is not considered to be clinical lumbar spinal stenosis. Therefore, we considered that the patient’s neurological symptoms caused by lumbar spinal stenosis is the most important factor. Accordingly, we did not discuss the degree of lumbar spinal stenosis on the MR images. Certainly, the patients evaluated were only those with the presence of lumbar spinal stenosis on images.

2. Could the authors please explain how the clinical signs including reflexes were elicited after the tests? The text states that neurological findings were assessed while in the standing posture, how actually is that done with the patient standing?

   **Answer:** Thank you very much for your questions. It is possible to examine objective neurological findings including reflexes, sensory function, and motor function immediately after stopping the test. We examined the reflexes on one side while maintaining the patient in a standing position.

3. The gait loading test was performed before the lumbar extension test for a reason. But throughout the results and discussion the lumbar extension test is discussed first and consistency is needed.
Answer: Thank you very much for your comments. The gait-loading test is a well-known provocation test that can accurately diagnose the pathology of lumbar spinal stenosis, and this has been suggested in the background of our paper. We wanted to emphasize in this study that compared with the gait-loading test, the lumbar extension-loading test is equally useful for understanding the pathology of lumbar spinal stenosis and determining the truly responsible spinal level when symptoms are masked at rest. Accordingly, we performed the gait-loading test first and the lumbar extension-loading test second. However, we described the results in reverse order because we wanted to emphasize the lumbar extension-loading test results first and the gait-loading test results second.

4. Could the authors explain the significance of a reduced reflex? What may considered normal by one assessor could be reduced by another. Surely it is better in clinical practice to have either increased i.e. brisk; normal or absent reflexes.

Answer: Thank you very much for your comments. We agree that the evaluation of a reduced reflex may differ among assessors. The term “reduced” was omitted because of its obscurity.

5. Were the muscles powers graded?

Answer: Yes, they were. The muscle powers were graded using manual muscle testing.

We have added the following sentence to the Discussion section (page 8, lines 5–6): Muscle power was also graded using manual muscle testing.
6. How subjective is the finding of hypalgesia and what exactly does that mean?

   **Answer:** Thank you very much for your question. We precisely described the changes in the degrees and ranges of the findings of hypalgesia after the patients reported their subjective experiences.

7. How were the symptoms graded?

   **Answer:** Thank you very much for your question. The degrees and ranges of subjective symptoms were graded using a visual analog scale, although we did not describe the findings before the present revision. We have added the following sentence to the Discussion section (page 8, lines 1–2):

   The degrees and ranges of subjective symptoms were graded using a visual analog scale.

8. Who actually undertook the measurements and was it the same observer?

   **Answer:** Thank you very much for your question. For clarity, we have added the following description to the Discussion section (page 7, lines 15–17):

   The orthopedic surgeons administered the two loading tests and evaluated the subjective symptoms and objective neurological findings. Although some orthopedic surgeons were involved in both loading tests, the two loading tests of a given patient were examined by one orthopedic surgeon.

9. Although MRI’s were performed how did they correlate with the patients symptoms?
**Answer:** Thank you very much for your question. As mentioned above, we considered that the patient’s neurological symptoms caused by lumbar spinal stenosis were the most important factor, not the degree of lumbar spinal stenosis on the images, to diagnose the spinal level responsible for the leg symptoms caused by lumbar spinal stenosis. All patients had lumbar spinal stenosis on the images, but there was no particular inter-relationship between the leg symptoms caused by lumbar spinal stenosis and the images of the patients with lumbar spinal stenosis.

10. Perhaps the correct title of this paper is the use of these two spinal loading tests in assessing patients prior to treatment for spinal stenosis. In the end the findings show that after both these tests the patients’ signs and symptoms appear to increase, suggesting that more levels need decompression than would be expected on the basis of the patient’s original symptoms. The statement that lumbar extension loading test may help in understanding the pathology of Lumbar spinal stenosis is not explained. However if some of the points could be addressed I think this is a useful paper which suggests that lumbar extension loading could be helpful in evaluating patients who are undergoing treatment for spinal stenosis. But as it stands it certainly does not show that the tests can be recommended to diagnose the truly responsible level in patients with lumbar spinal stenosis. Until this test is combined either with therapeutic or surgical treatment for spinal stenosis we will not be any the wiser.

**Answer:** Thank you very much for your guidance. We have emphasized placing more importance on the diagnostic value of the lumbar extension-loading test than on the
gait-loading test in this study. We would like to explore the relationship between loading test results and treatment outcomes in a future paper.

Level of interest: An article of importance in its field

Quality of written English: Needs some language corrections before being published

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests: I declare that I have no competing interests.