Reviewer's report

Title: Computer Aided Vertebral Visualization and Analysis: A Pilot Study Using the Sand Rat, a Small Animal Model of Disk Degeneration

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Reviewer: Dr Ville Remes

Level of interest: A paper whose findings are important to those with closely related research interests

Advice on publication: Unable to decide on acceptance or rejection until the authors have responded to the compulsory revisions

I would like thank Editor providing me the possibility to review this interesting study. I am pleased to note that authors have continued their research work in developing animal model of the development and imaging of the disc degeneration. I would have below mentioned critics and development suggestions for their paper.

Please, find detailed comments below. Discretionary revisions are shown by abbreviation DR in parenthesis after comment. The rest are compulsory comments.

General comments:

I find, however, several shortcomings in this study.

* Number of radiographs which were measured was very low.
* Material -section is missing.
* Text is very "mathematical". (DR)
* Repeatability of measurements is unclear.
* Significance of the sclerosis measurement is unclear.
* Discussion is way too short.
* I would very careful to draw such a conclusions as the authors have done based on this very small material.

Although quality of written English is good I notice that in several sections there are two space characters instead of one. But this is probably corrected during final editorial process.

Abstract
Background:

1. Would be pleased to see short sentence about "What would be the benefits of the computer assisted vertebral visualization system". More accurate diagnosis/measurements? Saves time?
2. Para 1, line 5: I found misleading to state that "Radiographs...were used" as only six of them were used. In original article (Gruber H et al. Spine 27:230-4, 2002) there were at least 158 animals.
3. I believe that it is overstatement to say that "techniques are applicable to human spine" as this was not studied and thus these conclusions cannot be drawn based on this study.

Background

4. Para 1, line 1: Please add "in animals". (DR)
5. Possible benefits of the introduced system should be shortly discussed here.
6. Why the amount of sclerosis (signal intensity) was measured. To my knowledge, sclerosis is only one rough estimation of the end-stage disc degeneration.

Material and methods

7. Description of study material is missing. Species, number, age and sex of the used rodent.
8. Why did the authors use only six radiographs for analysis? They have previously reported results at least radiographs of the 158 rodents. Why all these were not included. This would have increased scientific significance of the paper.
9. Why hand made measurements were not compared to measurements made by computer.
10. Please, omit Figure 1.
11. Methods section contains a lot "mathematical text". I admit that when reporting novel techniques one must be very detail in description. I would ask authors to consider an option that in M & M section they would report only general description of the system and in appendix they would give an detailed description of the method including all equations.(DR)
12. Space character is missing between words objective and was in location vertebral end plates -session.
13. When measuring signal intensities what value was considered as threshold for "sclerosis". It might be difficult to define one. This needs to be discussed in discussion.
14. Why the depth of the vertebrae was not measured. This should discussed.
15. One goal of the study was to measure "Overall angle of the curvature of the spine". Results, however, are not reported.
16. Why the reported parameters were chosen. From the clinical view of point meaningful measurements would be possible scoliosis, kyphosis, lordosis and vertebral body height (anterior vs. posterior and height compared to upper and lower vertebrae). According to my opinion, only rough estimation of disc space height and visual evaluation of the sclerosis are meaningful. Please, comment in discussion.
17. Does this method take a long time to perform? Compared for example to manual measurements from digital images. Please, discuss.

Results

18. Please, omit Table 1.
19. Table 2.: Please, explain abbreviations of the in caption. Give also units, if possible, for the measurements. Is it necessary to report "Orientation slope" in Table 2. It could be omitted. Please, provide only two decimals for the numbers. Could R and L in the sclerosis index L be replaced by upper and lower end plate sclerosis index if that is meant?
20. What was repeatability of measurements? Was this tested?

Discussion

21. Discussion is too short. At least following aspects of the study should be discussed:
21.1. Limitations of the radiograph in evaluation of the disc degeneration (compared to MRI)
21.2. Pros and cons of the computer-made measurements
21.3. Low number of radiographs?
21.4. Possible sources of error in the measurements and limitations of the method
21.5. What is the effect of rotation and tilt (scoliosis) to the measurements
21.6. Possible clinical applications, if any.

Competing interests:

None declared.