Reviewer’s report

Title: BIOMECHANICAL EFFECTS OF METASTASIS IN THE OSTEOPOROTIC LUMBAR SPINE

Version: 0 Date: 17 Jul 2017

Reviewer: Michiel Van De Sande

Reviewer’s report:

Review for BMSD-D-17-00204.

Full title: Risk of fracture in osteoporotic patients with metastatic cancer to the spine.

Rephrase, risk of fracture not aim of this study. Biomechanical effect is.

Aim: Describe the biomechanical effect of a metastatic lesion in an osteoporotic lumbar spine model.

Clearly stated.

General: Authors used an earlier developed FE model of two spinal segments (L3-L5) to analyse effect of metastasis size and bone mineral density (BMD) on vertebral bulge (VB) and vertebral height (VH). 6 different scenarios (0, 15 and 30% mets combined with normal BMD or osteoporosis) were used.

Abstract:

Line 13: Rephrase, possible increased risk

Line 19: Incorrect, this L3-sacrum model was already developed for another purpose (disc degeneration and ligament failure), mention in abstract / rephrase sentence.

Lines 32-36: Best to show results in absolute mm as well as percentages. Otherwise choose one of the two. Please rephrase.

Line 36: Last sentence results, in model, not actual osteoporotic spine. Please rephrase.


Background:

Line 32: Please describe which studies.

Methods:
Line 7: If model is validated in total, is it possible to take top part (L3-L5) and use for analyses without validation? Please clarify.

Line 16: Model based on cadaveric male spine of 52 y.o. Not sure if generated soft tissue of 52 y.o. male is representative. Please clarify.

Line 18-19: Why generate discs, is it possible to make an additional MRI scan in order to visualize soft tissue? And, could this change outcome?

Line 32: Authors only studied lytic lesions. E.g. high percentage of prostatic metastasis are blastic lesion. Especially in the male spine, blastic lesions are frequently seen.

Line 50: in order to lift 8.3 kg's with outstretched arms, one must be quit athletic, probably end stage disease cancer patients do not fit this description.

Page 5

Line 29+30: no fig 3a and 3b, only fig 3 with two lines. Please adjust.

Results

Line 47+54: also state absolute numbers

Line 56: state absolute numbers and percentages.

Page 6

Discussion

Line 6: model not developed for this purpose. Please rephrase

Line 9: your primary study result is not stated in text. (line 56 page 4).

Page 7

Line 20: As mentioned as limitation, only one loading regime. In my opinion there should not only be multiple loading regimes studied, a lower loading regime should definitely be studied. See previous remark.

General discussion: please describe limitation of only using lytic lesions.

Conclusion: rephrase, add: in finite element analysis of spinal model originally developed for…
Table: show results in table.

Graphs: lower two, please change line type, cannot distinguish.

Conclusion: Aim is clearly stated and valid, important research question. Although, due to the fact that only lytic lesions are researched, loading regime is too high in my opinion and a cadaveric spine of a 52 y.o. male was used to develop this model (other purpose), results should be carefully interpreted and can therefore not be used in general population. Fracture risk research should ideally be done large prospective cohorts, due to the patient heterogeneity, e.g. lesion size, aspect, type of tumor. (mentioned by authors).

One of their conclusions is based on numbers that are not stated, only in graph.

**Are the methods appropriate and well described?**
If not, please specify what is required in your comments to the authors.

Yes

**Does the work include the necessary controls?**
If not, please specify which controls are required in your comments to the authors.

No

**Are the conclusions drawn adequately supported by the data shown?**
If not, please explain in your comments to the authors.

No

**Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?**
If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I recommend additional statistical review

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Please indicate the quality of language in the manuscript:

Needs some language corrections before being published

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