Author’s response to reviews

Title: Morphometric characteristics of the thoracolumbar and lumbar vertebrae in the Greek population: a computed tomography-based study on nine hundred vertebrae. “Hellenic Spine Society (HSS) 2017 Award Winner”

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Author’s response to reviews:

Dear Editor in Chief

Many thanks for the useful comments and the suggestions for improvement of our submission. We submit a revised text, in reality we extensively revised the article, and submit the revised text for the convenience of the reviewers. Additionally, we respond point to the point to the reviewers’ comments

Reviewer #1: I would like to congratulate the authors in winning the "Hellenic Spine Society (HSS) 2017 Award". I would also like to commend the authors in conducting this study to establish the normative data for the morphometry of thoracolumbar and lumbar vertebrae in the Greek population. However, I think the manuscript appears to be less organized and the reasons for conducting this study were not clearly explained in the introduction. Further, while the authors argued that different ethnicities would have different morphometric characteristics of thoracolumbar and lumbar vertebrae, the authors did not provide another comparison between
their findings and corresponding findings of other nations. Importantly, the current findings were obtained from patients visiting a single hospital, the findings may not be generalized to other districts in Greece. While the authors acknowledged this limitation, they did not propose any future studies to address this and other limitations.

Further, the authors appear to use the wrong terms for figures and tables.

I would like to provide further suggestions for the authors to refine the manuscript.

We wish to thanks the reviewer for his time spent and his useful comments and suggestions for improvement of our submission.

Abstract

1) Please use sex or gender throughout the abstract or the text.

We use the word sex

2) …. Age from 33 to 87 years old (mean 70 years + 8.7 years)

We corrected it

3) In the method section, all these individuals did not have spinal pathology. However, the authors wrote like the a screw was going to be inserted through the pedicle. If it was supposed to be the measurement of the distance along a hypothetical screw insertion trajectory, the authors should have stated that explicitly.

We used the word “hypothetical” as you suggested

4) Please remember to add the unit of measurement in the abstract (those in the SD brackets).

We added it

5) Please use a proper symbol for degree.

We use the word “degrees”
6) What were the reasons for choosing T9 to L5 for analysis?

The purpose of our study was to measure the normal Morphometric characteristics of the thoracolumbar and lumbar vertebrae in the Greek population in order to estimate the dimensions of pedicle screw sizes. Those individuals where picked from a pool of patients with vascular problems (mainly aortic aneurysmal disease) that had performed CT-angiography (mainly for abdominal aortic issues). We choose the T9 through L5 vertebrae in order to achieve homogeneity of the sample (visual vertebrae in all patients), since most of the CT scans didn’t involve the mid and upper thoracic vertebrae.

7) Please rewrite the last two sentences of the abstract. The message is not clear and there is grammatical mistakes.

We rewrote the last two sentences

8) The authors should highlight the contribution of this study to clinical practice too.

We wrote: “In the current study, vertebra and pedicle dimensions seems to have some similarities compared to other western population. However, in the thoracolumbar region the pedicles of T9 and T10 may hardy accommodate a 4.00mm pedicle screw, due to the narrow inner cancellous pedicle width. Values of vertebra and pedicle dimensions in the Greek population can be guidelines for proper selection of transpedicular screws and for further research.”

Introduction

1) Page 4, line 12, Did the authors mean that up to 11% of malposition or 11% of complications? I think the entire sentence should be rewritten to improve the readability

We rewrote the sentence. Actually we meant “malposition rate up to 11%.....”

2) Since the study has been conducted, please use past tense in describing the aim of the study

We have done it
3) Please provide reasons for choosing T9 to L5 for measurements. Was it related to clinical practice? Why did the authors measure other thoracic vertebrae as well?

There were no measurements of other thoracic vertebrae except those stated (T9-T12). This was also explained in the question no6 (abstract)

4) Page 4, line 21. Which population?

We added “…in the Greek population”

5) Page 4, line 25, Numerous studies were conducted …. (not contacted)

We corrected it

6) Page 4, line 27 to 29, Why did the authors provide 2 citations while they stated that there was only one study the investigated the pedicle dimension in the Greek population

There is only one study that of Christodoulou et al, we deleted the other reference

7) Please add "the" in front of all the Greek population throughout the manuscript.

We added it

Materials and Methods

1) Was this a retrospective study or a prospective study?

Retrospective studies are contacted in population that has already received treatment and the prospective ones in population that is under intention to treat. In our study the population analysed didn’t have spinal issues therefore it cannot be characterized as the one or the other. Additionally, since individual data hasn’t been provided here, consent for publication isn’t applicable.

2) What were the inclusion and exclusion criteria of this study? Did the authors exclude people with a prior history of vertebral fracture, osteoporosis or other spinal deformity?
We added “Participants with a history of spinal surgery, vertebrae fractures, deformities, osteoporosis and pre-existing spinal pathology were excluded from the study.”

3) Apparently, the participants did not sign any consent form for participating in this study. Was it ethical? Did the participants know that their data was extracted for a study without notification?

The CT scans that were analysed, were given from the archive of the mentioned department after they had been anonymised with sex and age as the only details kept. There was no access from the researchers to their personal data such as names etc. or current state (alive or dead) so there is no ethical dilemma placed here. Should consider revising our paragraph to state the above more clearly. Additionally, since individual data hasn’t been provided here, consent for publication isn’t applicable.

4) The last sentence of the population studied section (Page 52 to 54) should be deleted.

We deleted the last sentence

5) The authors should explain why they selected various measurement parameters of thoracolumbar and lumbar vertebrae? Would they be clinically relevant? Were they related to preoperative or postoperative complications? Please explain (Page 4 line 56 to Page 5, line 10).

It is clearly stated in the paper the reason and clinical significance of knowing these parameters to achieve a good outcome in a spinal operation. Furthermore, the population studied had no spinal pathology

6) What was the qualification of the person(s) measuring various morphometric parameters? How many people measured the dimensions? Did they do it on the same day or different days? Please specify.

The measurements were conducted by two people in different dates. Both have in their daily basis routine the analysis of CT scans for spinal and vascular issues

7) Why did the authors use non-parametric tests? Please specific the company of SPSS and SAS, and STAT. Why did not the authors use a single statistical software program? I don't
see the reason for using three software programs to run such simple tests. Please describe how to run the reliability test? Did the author ask the same examiner to re-measure all measurements at a certain period of time? If yes, how long was the duration between the repeated measurements? Did the authors run the inter-rater reliability study for the measurements? Did the authors use ICC? Which type of ICC was used? The details of the reliability study were missing in the methods section.

We used Nonparametric tests as this type of statistics do not rely on any distribution. They can thus be applied even if parametric conditions of validity are not met.

Results

1) While it is good that the authors used different subheadings to report the findings, the results should be presented succinctly. It is better to report the overall trend of each parameter (e.g., increasing in size or angle caudally) and then refer the readers to the tables or figures for details. Importantly, please don't mix up the term tables from figures.

We changed the results and we also described the overall trend of each dimension, if we noticed one.

2) Page 5 line 37, the sentence is incomplete. Please revise. In particular, where is the widest outer cortical pedicle height? In fact, the term widest may not be the right word for describing height. Please also describe the trend of pedicel height at different levels

We revised the sentence” ..the largest pedicle height…..was found at T11…..”

3) Page 5 line 49, please add "found' after the sentence "The greater PAA was …." We have done it

4) Page 5 line 49. It should be "vertebra" not "vertebral"

We corrected it

5) Page 5 line 50, please add "the hypothetical entry point of the screw…” We added it
6) Page 5 line 52, please use "vertebra" to replace "vertebral"

We have done it

7) Page 5 line 54, do you mean that "the smallest PAA was found at T12 …"?

Yes.”…. the narrowest PAA in males was at T12 vertebra with a mean…..”

8) Page 6 line 1 to 2, Please add a noun after "cancellous" and after "cortical"

We have add it

9) Overall, I think the male section should report the range of results (e.g., angle or dimensions) and describe the trend along the entire spine for each parameter rather than just reporting the maximum and minimum. Although a series of morphometric measurements were reported, it would not help readers to picture the general trend. The same revision is needed for the female section and the rest of the result section.

We had corrected them, and we described the overall trend when there was one

10) Since the authors did run the statistics to compare each dimension between genders, please report the findings in the results. In fact, it would be really helpful if the authors can tabulate the results of male and female participants for easy comparisons.

We tabulated the results, whenever it was possible

11) Please revise the first sentence on page 7, line 9 to 13.

We revised “The statistical difference between sexes for each level of the thoracolumbar and lumbar spine from T9 to L5, it was found that in all vertebrae, statistically significant difference with p<0.0001 was observed for the PLTP of the left and right sided pedicles”
12) The authors should report the common findings more precisely. As certain morphometric characteristics demonstrated significant between-gender difference across multiple levels, the authors could simply summarize this trend rather than repeating the same sentence in multiple paragraphs.

We tried to do it and we tabulated the results in a way

13) I think the authors can report common findings of the entire thoracolumbar and the lumbar regions. It is unnecessary to report the details of each level. Instead, please tabulate a good table for your readers to perusal.

It was already done downloading an additional file along with the typical submission

14) Page 8, line 37, what was significant? PVBH?

Yes and also the PTLP

15) Since the detailed measurement procedure of the reliability study was not clearly described in the methods section, it is difficult to interpret the results. What was the brand of the CT scanner(s)? Why there were difference in slice thickness?

The CTs had been performed in the past and the only parameter that played important role in the clarity and accuracy of the measurements was the slice thickness that had been used. However, it was highlighted that the variety of the slice thickness is one of the limitations of the study.

16) Which type of ICC was used in this study? Did the authors evaluate intra-rater or inter-rater reliability, or between-day or within-day reliability of measurements? The author should report the Bland and Altman limits of agreement, standard error of measurement, and minimal clinical important difference (MCID). The MCID can help clinicians understand the relative measurement errors and what values are clinically significant difference.

The reliability study was done using the statistical packages mentioned in the text.

17) Were there any differences in any of the measured vertebral parameters between each adjacent vertebral level.
Sorry, this was not assessed in this study.

Discussion

1) Page 9 line 4, please replace "tauma" with "trauma".

We had corrected

2) Page 9, line 10. Please add citation to this sentence.

We added reference [5]

3) Page 9 line 16, While this topic sentence is talking about significant differences in morphometric measurements of vertebrae and pedicles between gender and race, the paragraph is unrelated to it. Please either revise the topic sentence to focus on the comparison with a previous Greek study, or revise the entire paragraph to address the differences in morphometric characteristics between races and gender.

We revised it as follow “Some morphometric measurements of the vertebrae and pedicles significantly differ among different ethnic groups and preoperative software-based morphometric data should be collected for preoperative planning [9, 15-19 ]. Vertebral morphometric measurements of the Greek population shared some similarities and differences compared to other ethnic groups. There is only one study in the literature regarding the pedicle dimensions in the Greek population….’

4) Page 9, line 32, please use "years" to replace "yrs"

We corrected it to “years”

5) The entire second paragraph can be shorten significantly. I don't think it is necessary to report all the details of a previous study to compare with the current findings. Instead, please make the comparison precisely.

We made it shorter and made the comparison
6) Page 9 line 50 to Page 10 line 44, The authors used the 3rd to 7th paragraphs in the discussion to report the detailed findings of a previous Greek study, it was largely unnecessary. Since those findings were not new, please only report the main difference and similarity between the two studies. Importantly, while the current study did not examine T3 to T8 vertebrae, the corresponding findings in a previous Greek study was irrelevant to the current discussion.

We reported only the main differences and similarities regarding only the vertebrae from L9 through L5.

7) Page 10 line 10 to 15, the authors should elaborate more about how the lordosis will have a differential effect on AVBH and PVBH?

The aim of this study is to document the morphometric characteristics of the studied vertebral levels. The discussion how the lordosis will have a differential effect on AVBH and PVBH may be interesting but such broadening of the topic was not embraced in the aim of the study.

8) The authors should compare the current findings with similar findings in other countries (other than Greece). Did they have similar sample size?

We compared the results of this study with others studies, especially with that of Zindrick et al. who conducted one of the largest morphometric measurements (2,905) of the pedicles by CT in Western populations. [20] Zindrick MR, Wiltse LL, Doormik A, Widell EH, Knight GW, Patwardhan SG, Thomas JC. Analysis of the morphometric characteristics of the thoracic and lumbar pedicles. Spine. 1987; 12:160–165

9) The authors should discuss how the slice thickness or axial CT scan affect the interpretation of findings.

It was noted as one of the limitations od the study.

10) Given the large age ranges of the participants, did age affect the measured morphometric dimensions?

Sorry, this was not assessed. However, the authors think that the change in the height of the vertebral column by age is mainly due to intervertebral disc changes (degeneration) and not due
to vertebrae. Therefore, we believe that the age has minimal or even no effect on the measured morphometric dimensions.

11) Please discuss future research direction and the clinical implications of the current findings. We state that this database may prove to be of great significance for forthcoming comparative studies.

And

It can also serve as a basis in order to detect pathological changes in the spine and furthermore to plan operative interventions.

Tables and figures

1) Table 1 to 8 should be figures rather than tables

We think that this doesn’t make a difference in this case.

2) Please provide the significant values for the comparison between males and females in all the tables. Please tabulate the results rather than plotting graphs.

We tabulate the results in an additional file.

3) All the numbers in the figures are so blurry, please provide the values in the figures.

in figures it was depicted the way of measurements.

The values are provided in the additional file.