

Peer Review File

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Reviewer A

This study is a comparative evaluation of the use of 3DppTi cages for lumbar fusion and the rate of fusion and subsidence with an anterior or lateral approach. This article is important because no other study has evaluated the benefit of 3DppTi cages by approach. However, I have several concerns that need to be addressed before considering publication.

- 1) The presence or absence of cage subsidence may correlate with the surgeon's technique. It would be prudent to include information on the surgeon's years of experience.
- 2) There are cases of subsidence, but there is no discussion of why it happened. The authors should describe possible reasons.
- 3) There is no description of how the two types of cages were selected. If the choice was based on surgeon preference, then cage selection may be biased. If so, the authors should describe it.
- 4) Authors should show images of cases with subsidence if available.

Comment 1:

Reply 1: We have added this information in the methods section

Changes in the text: Page 7; 87-88

Comment 2:

Reply 2: Included in discussion

Changes in the text: Page 10; 176-181

Comment 3:

Reply 3: We have added this information in the methods section. Given this is a retrospective study, there is inherent bias in the choice of cages used. Only 2 types of cages were used in this series.

Changes in the text: Page 7; 95-98

Comment 4:

Reply 4: We have included figures with immediate and delayed post-operative imaging for both cases

Changes in the text: Figures 1 and 2

Reviewer B

Thanks for inviting for reviewing this article. The manuscript is well written, and the results are displayed well. The translation of spinal fusion practice through 3D printed Titanium Alloy cage to clinical practice could be of great value.

We thank the reviewer for their kind comments.

Reviewer C

line 106-109: how much bone graft was used in each cage?

line 118~121: did you used CT or plain dynamic x-rays to evaluate the radiological fusion?

line 143~ : do you plan the cage size before size or is it determined intraoperatively? and please provide the details of the cage size actually used.

line 162~ : what was the level of subsidence case 2?

could you provide the perioperative images (XR, CT, MR) of the cases with subsidence? it would be helpful if you provide the prognosis of the case that underwent revision surgery.

Please explain why you think the subsidence occurred in your two cases. And are there any special consideration or tips to avoid?

Comment 1:

Reply 1: The amount of bone graft was not recorded for each case, but the volume was dependent on the size of the central bone graft window of each cage. Generally 5-10cc of bone graft is used to fill this window. We have included this in the Methods section. Changes in the text: Page 7;96-97

Comment 2:

Reply 2: We have added this information in the methods section – computed tomography imaging was used.

Changes in the text: Page 7; 102

Comment 3:

Reply 3: The cage size is determined by trialing a cage size by the surgeon in each case intra-operatively with assistance of fluoroscopy. Cage heights were 8, 10 or 12mm, width 50 or 55mm and depth 22mm.

Changes in the text: Page 9; 97-99

Comment 4:

Reply 4: We have included in the results section – L3/4

Changes in the text: Page 9; 141-142

Comment 5:

Reply 5: We have included figures with immediate and delayed post-operative imaging for both cases. The case that underwent revision had additional posterior fixation and decompression and has now fused.

Changes in the text: Figures 1 and 2

Comment 6:

Reply 6: We have added discussion around subsidence in our patients

Changes in the text: Page 10; 176-180

Reviewer D

Interesting study that highlights a novel alternative to standard PEEK cages using 3D printed titanium alloy cages which may be associated with higher fusion rates and less risk for cage subsidence. I have the following recommendations:

Recommend including discussion on cost of 3D printed alloy cages compared to standard PEEK cages?

Include lack of clinical outcomes to correlate with findings of low subsidence and re-operation rates in limitations.

Surprising that Osteoporosis and smoking status were not significantly correlated with cage subsidence as one would suspect poor bone quality to be a major risk factor for early cage subsidence. Were the two patient who had subsidence ones with osteoporosis or smokers? I recommend further discussion on this topic in your discussion as to why your cohort did not reveal these factors as risk factors given it has been reported consistently in other literature

Median follow up time is 12 months. What is the range of follow-up time? What is the rate of non-union in cohort?

Was there statistical analysis available to show this study was sufficiently powered with its current n? Seems too small.

Please include the definition of how subsidence was measured in methods. >2 mm?

What was the average size of lordotic cage angle used in this study? Hyper-lordotic cages (>15 degrees) have been reported to increase risk of subsidence.

Typo: Page 3 Line 79: “non-union” demonstrates a 5% non0union and subsidence rate, which is comparable to PEEK cages

Comment 1:

Reply 1: We have included in discussion

Changes in the text: Page 12; 220-222

Comment 2:

Reply 2: We have included this in our discussion

Changes in the text: Page 10;169-174

Comment 3:

Reply 3: Neither patient had any patient risk factors for subsidence – included in results and discussion.

Changes in the text: Page 9; 144, Page 10; 176-181

Comment 4:

Reply 4: We have included in the results section – Range 7-24 months

Changes in the text: Page 9; 136

Comment 5:

Reply 5: Given this was a retrospective observational case series no power calculations were performed.

Changes in the text:

Comment 6:

Reply 6: The definition of subsidence was using the Marchi grading with Grade 0 showing 0-24% loss of post-operative disc height.

Changes in the text: See page 7; 109-110

Comment 7:

Reply 7: Cages used in this study were all between 10-15 degrees lordosis. No hyperlordotic cages were used. We have included this in the Methods section.

Changes in the text: Page 7; 98-99

Comment 8:

Reply 8: We have amended typo, thankyou

Changes in the text: Page 6; 69

Reviewer E

This study has limited value as a heterogenous case series investigation without comparison to a relevant control group of either non-3D printed/ non-porous Ti or 3D

printed porous PEEK. Furthermore, ALIF and LLIF are associated with different interbody fusion and subsidence profiles that would be suited for independent analysis. 2 subsidence cases is not enough to support a logistic regression. If the goal of this study is to identify subsidence risk factors more patients experiencing subsidence are needed. Fusion rate is not mentioned in the results section.

These are not new results in the literature and doesn't add significantly to current knowledge- there are numerous other studies that include 3d printed titanium cages that are not mentioned in the discussion.

We thank the reviewer for their comments. Whilst we admit this is a small case series with no comparison group, the point of the study was to focus on 3D printed cages inserted via an anterolateral technique with respect to subsidence rates. A true study would require a prospective well powered trial as we state in the last line of the Conclusion. Lines 237-8