Peer Review File

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Reviewer A

Comment 1: I was struggling to understand the main Aim of this study. The title of the study is about osteoporotic fractures. But the inclusion criteria considers patient with injury and hence pedicle crew fixation was added.

In the discussion lots of studies have been quoted about osteoporotic fractures but again the same is not reflected in the study.

In essence you are comparing BKP and HA in TL vertebral fractures as the pedicle screw fixation is common on both.

There is ample literature already available regarding this.

Reply 1: Thank you for pointing this out.

As far as we could find, there were no studies comparing treatment with HA + PPS to treatment with BKP + PPS for OVF, and none of them were performed by the same surgeon for all surgeries and followed up for more than 2 years postoperatively. The purpose of this study was to compare the clinical outcomes of two different surgical procedures by the same surgeon for OVF in elderly patients with an average age of 76 years and more than 2 years postoperatively, and to demonstrate the clinical benefit of BKP + PPS. We thought this could be proposed as a new finding. We made a major revision.

Reviewer B

Comment 1: This is a retrospective study dealing with thoracolumbar osteoporotic vertebral body fractures in the elderly patients. The authors compare two groups, one managed with BKP + PPS and the other with HA + PPS. The groups are relatively weak with a number of 14 inclusions per group.

The authors concluded by advising to use BKP+PPS mainly because there is less loss of restoration of kyphosis in postop with BKP.

Mains criticals:

First, the authors compare two Percutaneous Treatment Techniques in the management of osteoporotic fractures. The difference between the two techniques is the treatment of the anterior column (vertebral body): either BKP or cementoplasty.

Since both groups had a posterior osteosynthesis device, the study was finally a comparison between BKP and CM. It remains interesting but the study has no originality.

In addition, the addition of a posterior osteosynthesis does not appear to be

standardized. It is not clear in the article that all patients receive the same osteosynthesis fixation, since the number of instrumented vertebrae differ between both groups. This leads to a major bias.
why didn't you suggest a short posterior osteosynthesis adjacent to the fractured vertebra?
Reply 1: First of all, thank you for your time and many detailed comments.
Now, the purpose of this study is to compare the clinical results of two different surgical procedures by the same surgeon for OVF in elderly patients with an average age of 76 years, over 2 years postoperatively, and to demonstrate the clinical benefit of BKP + PPS.
The control group is not cementoplasty, but a technique in which blocks of hydroxiapatite are filled sequentially into the vertebral body one by one without balloon cavitating of the vertebral body. A total of 30-50 blocks are filled into the vertebral body. This study compares HAVP + PPS with BKP + PPS.
To answer your question about standardization of posterior osteosynthesis.
If the existing vertebral fracture (healed) is included adjacent to the fractured vertebra, the treatment was based on the concept of extending the fixation area by one vertebra, so it will not be standardized. The basic concept of the surgical technique in this series is 1-above and 1-below fixation of the fractured vertebra.

Comment 2: Materials and methods:
Page 4
Line 29: concerning your indications for surgery: “burst fracture”, it means A3.3 magerl classification ou A4 AOspine classification? It is not clear?
We would have appreciated to have found in the demographic table a detail of the type of fracture according to the international classifications (Magerl or AOSpine).
Reply 2: The cases in this series are either B2, A3, or A4 of the AOspine classification.
Following your advice, we have added the distribution of AOspine classification for each group in Table 1.
Changes in the text: Table 1

Comment 3: Line 30: Why you mentioned “not indicated for BKP alone!” A3.3 (Magerl classification) ? A4 AOSpine?
In your figure 3A, it seems to be a A3.1 fracture which could be treated by BKP alone.
Reply 3: Thank you for your suggestion.
Due to the large intravertebral defect, BKP alone risks cement migration, and we

believe that a combination of PPS is preferable.

Comment 4: Line 32: “PLC” : All patients have MRI before surgery ?
Reply 4: Yes, all patients underwent MRI prior to surgery. We have modified our text as advised (see Page 6, line 17).
Changes in the text: Page 6, Line17

Comment 5: Line 35: STIR sequence in MRI appears best adapted to show fresh fracture?
Reply 5: Thank you for pointing this out.
The STIR image is not only for fresh fractures but can also be high intensity for about a few months after the injury, so we include dynamic instability on x-ray in our evaluation to determine fresh fractures.

Comment 6: How to be sure that it is an osteoporotic fracture? post trauma? nothing on the mechanism of fractures? All patients had a bone densitometry before surgery?
Reply 6: Yes, all patients undergo bone mineral density prior to surgery. We have modified our text as advised (see Page 6, line 17). All cases are low-energy trauma, this means osteoporotic fracture. Although the mechanism of fracture is not described in detail in this series.
Changes in the text: Page 6, Line17

Comment 7: Line 37: why the inclusion periods between the two groups differ. it seems that the team has changed its approach and has been dealing all its osteoporotic fractures with BKP since 2017 ? can you explain this different times?
Reply 7: Thank you for pointing this out. The studies in this series are in Japan, Since May 2017, the national medical insurance system has allowed the simultaneous use of BKP and spinal instrumentation. Hence we have adopted HAVP + PPS before April 2017 and BKP + PPS after May 2017 for cases with surgical indications. We have modified our text as advised (see Page 6, line 14-17).
Changes in the text: Page 6, Line14-17

Comment 8: - It would have been appreciated to collect different biomechanical variables such as the height of the vertebral body, pre- and post-surgery, and during the follow up.
Do you have the data?
Reply 8: Thank you for pointing this out. Unfortunately, we do not have these data.

In this series, we use the wedge angle of the fractured vertebrae (figure 2).

Comment 9: Page 6
Line 1: “After surgery, the patient was instructed to wear a custom-made soft brace”
Why? What is the advantage of percutaneous surgery if it is to be treated with contention after the surgery? it is a double punishment?
-Either there are other associated fractures and your inclusion criteria are not clear.
-Either there are no other associated fractures and the surgical treatment is sufficient on its own with no need for postoperative contention.
What do you think?
Reply 9: Thank you for your perceptive point. This may involve Japanese practice. In Japan, many spine surgeons use braces for their patients after spine surgery.
The purpose of using braces is firstly to rest the soft tissues around the spine and secondly to prevent malposition. This is not limited to osteoporotic vertebral fractures but is an empirical aspect of the practice. It is a great opportunity to learn about the differences in postoperative therapy. We have modified our text as advised (see Page 9, line 14-15).
Changes in the text: Page9 Line14-15

Comment 10: Results:
-Line 21: concerning the average operation time.
-It is logical that the duration of the operation should be longer in the BKP group. This is because the balloon needs to be inflated and left in place for some time before the cement is injected.
Shouldn't the other technique that is similar to a cementoplasty take longer than kyphoplasty?
Reply 10: PVP with HA blocks is time-consuming because 30-50 HA blocks are filled transpedicularly into each vertebra, one at a time. We have modified our text as advised (see Page 18, line 11-13).
Changes in the text: Page 18, line 11-13

Comment 11: -Systematic posterior osteosynthesis on a porotic bone (with very little cancellous bone) is not systematically relevant because of the high risk of screw failure. what do you think?
In your series, all your screws have held well?
Reply 11: Yes, we were fortunate to have 0% screw deviation in this series and no postoperative PS migration.

Comment 12: Discussion:
-Finally, the main information is that there is less postoperative worsening with the BKP. We advise authors to write one or two sentences at the beginning of the discussion that summarize the main results of the article.
Reply 12: Thank you very much for your advice. We have followed your advice and added a statement at the beginning of the discussion that BKP + PPS has less postoperative correction loss compared to HA + PPS(see Page 12, line 11).
Changes in the text: page 12 line 11

Comment 13: -Authors should cite recent and relevant literature on the subject relevant to their topic
(PMID: 29170272, PMID: 26000665 , PMID: 30348192, PMID: 26378356)
Reply 13: Following your advice, we have added four papers as references. (see Page 12, line 12-18)
(PMID: 29170272, PMID: 26000665 , PMID: 30348192, PMID: 26378356)
Changes in the text: Page 12, line 12-18

Comment 14: -Page 8 lines 44: The authors discuss the value of percutaneous posterior osteosynthesis. Recent literature on the subject should be mentioned.
Indeed, the cited articles do not concern only osteoporotic fractures but post-traumatic ones. ok, that is appreciated. However, significant series have been recently published. They should be cited. (PMID: 33758064, PMID: 35292568)
Reply 14: Following your advice, we have added these papers as references(see Page 14, line 14-18 and Page15, line1-2). (PMID: 33758064, PMID: 35292568).
Changes in the text: Page 14, line 14-18, Page15 line1-2

Comment 15: -Page9, line 21: the reason why " BKP + PPS has a shorter operation time" is not clear and not obvious. Inflating the balloons and letting them inflate inside the vertebral body to create a cavity should take more time.
Please explain more in detail.
Reply 15: Thank you for pointing this out.
It takes longer to fill the HA block into the vertebrae one by one with HAVP than it takes to inflate the balloon with BKP. This is the reason why BKP is a shorter surgery. We have modified our text as advised (see Page 18, line 11-13).
Changes in the text: Page 18, line 11-13

Comment 16: - The discussion should mention other implant techniques that have developed (stent, Spine jack, armed kyphoplasty) and discuss the results

with these papers.
Indeed, Recently, introduced vertebral augmentation techniques using intravertebral distraction devices, such as vertebral body stents and Spine Jack, could be effective in fracture reduction. (for example: PMID: 31649154)
Reply 16: Thank you for your clarification.
In Japan, vertebral body stents have only been available since 2021, and we have not been able to evaluate their performance for more than 2 years. As for Spine Jack, as of November 2022, it has not been approved and is not yet available for use in Japan. We would like to add this as a reference (see Page 15, line 11-14). (PMID: 31649154)
Changes in the text: Page 15 line11-14

Comment 17: -page 9, line 44, concerning the limitation
The two-year follow-up seems to me very good.
Nothing about the type of fracture?
Nothing about cement leakage, which is more frequent in osteoporotic fractures?
Nothing about the restoration of the vertebral body, which should be better in the BKP group?
We don't understand why there is not the same number of instrumented vertebrae? the idea is to make a short instrumentation? It is difficult to compare patients who have not all had the same posterior osteosynthesis?
In fact the study is like comparing CM vs BKP in osteoporotic fractures.
Reply 17: Thank you for your astute remarks. In this series, there were no complications due to cement leakage. As for the vertebral body repair, there is a slight advantage in the BKP group, as you noted.
As mentioned above, the basic concept is a surgical technique of percutaneous vertebroplasty to the fractured vertebra and PPS fixation with 1-above, 1-below. If the fractured vertebra contains a pre-existing vertebral fracture (preexisting) adjacent to the fractured vertebra, the treatment was based on the concept of extending the braking range by one vertebra, so that in some cases, 2-above,1-below or 1-above,2-below or 2-above,2-below was used, and this point has not been standardized. It becomes.
There is no difference between the two groups, but if necessary, we would consider omitting the results regarding the Instrumented area.

Comment 18: Minor criticals:
The introduction seems a rather long and should focus more on the objective of the study.

Page 7, line 7: case report has to be removed and presented as a legend of the figure 3.

Reply 18: Thank you. Following your advice, we have made some corrections in the introduction, focusing on the purpose of the study. And the case report will be listed as a legend in figure 3.

Changes in the text: legend in figure 3

Reviewer C

Comment 1: Interesting comparison but comment should be made in discussion about the use of Spinejack implant that allows a titanium expandable strut as internal fracture fixation with cement.

Reply 1: Thank you very much. As of November 2022, the use of Spine jack is not approved in Japan. We would like to add this as a reference (see Page 15, line 11-14). (PMID: 31649154)

Changes in the text: Page 15 line11-14