Peer Review File

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Reviewer A

The authors present the improvement in posture after immediate breast reconstruction with LD flap compared to those having mastectomy only. The authors are to be congratulated for the results of this study. Please comment on the following:

1) The authors titled their article “alteration in skeletal posture between breast reconstruction with latissimus dorsi flap and mastectomy”. Can you explain why did you choose this flap over other reconstructive modalities?

Reply 1: We appreciate your detailed comment. First, the latissimus dorsi flap is the most frequently used technique for breast reconstruction among autologous flaps because small to moderate breast size are most common in Asians. In addition, we continue performing this breast reconstruction with the confirmation of acceptable functional outcome without any complications (Reference 13). However, with unilateral LD, there was a question of whether there would be a difference when compared to mastectomy-only patients without reconstruction, and thus, a need for investigation on the optimal reconstruction method to avoid post-operative skeletal posture (spine) issues or malignant complications. Thank you again for your apt comment.

Changes in the text: Lines 48- 62.

2) Has there been any comparison between postural changes obtained from your study using this flap with results from other studies which used other flaps/modalities?

Reply 2: Thank you for your helpful comment. In the report of reference 8 and 9, it is reported that simple mastectomy can cause an influence on the posture of the spine and it was a comparison about the abdominal flap. In breast construction for Asians where LD flap is commonly taken from the autologous, the LD muscle is unilaterally transferred to the breast area so it is a prospective study that started from the fact that this influence could affect the skeletal posture. Preparation is ongoing to make progress of detailed studies about it. Thank you very much.

Changes in the text: N/A

3) It is not clear from your discussion whether this postural improvement is due to the fact of patient having immediate breast reconstruction in general or due to having reconstruction with this flap in particular. Please elaborate.

Reply 3: Thank you for the great comment. It was confirmed that the experimental

group showed improved recovery through a statistically significant reduction in the Cobb's angle – a fundamental parameter reflecting skeletal posture – compared to the control group. This was illustrated as a graph in Figure 5 and additionally described in the Discussion section.
Changes in the text: Line 264-271.

4) You mentioned through your study that difference in volume between both breasts is one of the main factors that can lead to postural changes after mastectomy. Where there any record of the cup size/ breast volume in the mastectomy only group and relation with severity of postural changes?
Reply 4: We apologize that our explanation was inadequate. First, further explanation was added to the last paragraph in the Discussion. The breast volume between the groups were quite different, as adding a small implant helps with LD flap breast reconstruction only to a certain degree and is challenging to use for large breast reconstruction, which resulted in the experimental group having a smaller breast volume than the control group. We have identified this as a limitation of the present study and will be addressing this in our follow-up study. Thanks for your detailed comment.
Changes in the text: Lines 258-271.

5) Role of post- operative physiotherapy in your study. Please comment.
Reply 5: Thank you for your comments. Unfortunately, we did not use post-operative physiotherapy in the experimental group in this study. The reason for this is that as the historical control group, patients who underwent mastectomy-only, did not exercise, the possibility of postural alteration due to exercise intervention could not be ruled out. The focus of this study was the possibility of postural and functional changes after unilateral LD flap. If postural change occurred after LD flap, the degree of posture change between LD flap and mastectomy (the experimental group) and mastectomy-only (the historical control group) was compared.
Changes in the text: Lines 55-62.

Reviewer B
1) I have read your paper with interest, however I have several questions. What was the main aim and main outcome measure of this prospective study? Have you made sample size calculations prior to this prospective study?
Reply 1: There is a general consensus among researchers that it is difficult to have a prospective study that lasts longer than a year. We were able to conduct a prospective observational study up to one year with an initial target subject count of 40 (two groups of 20) in preparation for the analysis of different effects that multiple evaluation factors

may have, thanks to additional patients with matching indications being recruited, and despite some patients being excluded during the course of the study. The main aim of this study began with a question about recovery based on the changes in the Cobb's angle; we also aimed to measure the Cobb's angle of skeletal posture using radiograph, and compare results between patients who received mastectomy-only and patients who had breast construction using LD flap.
As stated in the Results and Discussion sections, the difference in the Cobb's angle in the patient group with breast reconstruction using LD flap was smaller than the preoperative measurement, which can be indicative of recovery. Further, significant parameters that can aid the evaluation of postural changes have been discovered. These parameters were identified from the 3D scans following the analysis of the correlation with changes in Cobb's angle through parameters from CT image, gross photometry, and 3D scan. Thank you.
Changes in the text: N/A

2) You write that the two groups are similar, but the mastectomy group is significantly older than the LD group and the disease stage of the mastectomy group is higher. The LD group would be expected to recover much better/faster than the older mastectomy group. Thus the two groups are not comparable.
Reply 2: We appreciate your relevant comment. Reconstructive surgery itself increases the time for general anesthesia significantly compared to simple mastectomy, and the scope of surgery is also widened. Subsequently, as the feasibility of reconstructive operation depends on the recovery or cancer stage, the patient groups for reconstruction in the clinic are getting younger with the advancement in diagnostic techniques and patient groups for mastectomy-only can only get older, considering the general condition and postoperative recovery. This should have been added as a limitation, so I appreciate your comment. We are preparing a follow-up study for detailed comparisons, since continuation of evaluation for functional outcome data up to one year on patients with mastectomy-only was restricted for ethical reasons. The focus of the present study was to run comparisons on components related to scoliosis. A study on components related to QOL is being put together. Thank you.
Changes in the text: N/A

3) Why do you present data (VAS QOL) for the LD group which you do no present for the mastectomy group?
Reply 3: This study focused on the effects of breast reconstruction using an LD flap on the skeletal posture compared with the mastectomy-only group. Components related to functional recovery and QOL following LD flap breast reconstruction are part of our hospital's protocol to keep track of the course of the breast reconstruction. This data

was included for the LD group to emphasize the good QOL and high tolerability following this reconstruction. It was not included for the mastectomy-only group as this was not the focus on the study. Thank you for your detailed comment.
Changes in the text: N/A

4) It is unclear what the message of this paper is and what the message is based upon.
Reply 4: This paper showed that the change in skeletal posture following breast reconstruction using an LD flap was statistically better than mastectomy -only, based on the comparison between preoperative, 6-month postoperative, and 1-year postoperative time points. Moreover, parameters capable of predicting spine posture through those identified by a 3D scanner, rather than a scoliosis diagnosis using radiograph, was a key finding from this study with potential for clinical translation. This has been added near the end of the manuscript in the conclusion. This made the paper clearer. Thank you.
Changes in the text: Lines 300-308.

Reviewer C
Thank you for submitting a paper on a very important issue and studying it with such thoroughness. The paper meets the criteria of the journal and the Strobe-checklist is filled out accordingly. There are however some issues to be addressed and each paragraph of the paper will be evaluated below.

1) ABSTRACT
Describes the study and the results obtained sufficiently
Reply 1: Thank you for review. We apologize for failing to make the paper clear with too broad of a summarization. Additional descriptions were made in the background and conclusion of the abstract. Furthermore, the results section has been modified. We appreciate your detailed review.
Changes in the text: Lines 3-8, 25-27.

MATERIALS AND METHODS
2) Design
The authors state that the study is a randomized, prospective study, but do not describe how
randomization was performed. Please elaborate or correct.
Reply 2: This study was conducted prospectively after determining patient indications, and thus, no additional randomization was performed. Sorry for the confusion. Accordingly, we have updated the description to a prospective observational study. Thank you.

Changes in the text: N/A

Ethics
Ethical approval was given by local authorities
Changes in the text: N/A

Patients
3) Patients were enrolled upon informed consent. The authors should already in this part of the paper note that the patients undergoing mastectomy only was not enrolled in that part of the study, evaluating functional parameters and the reason for not doing that. Did any of the patient have any pre-op morbidity of the back or shoulder.
Reply 3: We excluded patients who had a history of neurologic disorders or musculoskeletal problems on the trunk or upper extremities. This has been noted in the text.
Changes in the text: Line 86-87.

Surgery
4) The paper lacks a short description of the mastectomy (skin-sparing/nipple-sparing) or conventional mastectomy procedure (these data should be added to Table 1). In addition, the number of patients receiving an implant and its size, should be addressed as well.
Reply 4: We apologize for the insufficient explanation in the manuscript. First, the mastectomy was performed as a conventional mastectomy, and the procedure was described in more detail. In addition, when the volume of LD flap was insufficient, a small implant was placed in three patients, and this was also added to the revised manuscript. Thank you for pointing out the shortcoming.
Changes in the text: Line 90-97.

Biomechanical measurements
4) Are thoroughly described and the different methods sufficiently described and nicely selected (CT, 3D-scans, gross photometry (clinical photography).
Reply 4: Thank you. We will continue to strive to provide high quality data.
Changes in the text: N/A

Functional assessment and questionnaires
5) Lacks an explanation for not assessing the mastectomy-only group – please elaborate
Reply 5: This study was launched to examine the differences in outcomes in skeletal posture and spine scoliosis, in particular between patients with breast reconstruction using a unilateral LD flap and those undergoing mastectomy-only, and to determine

whether this had any significant impact on other easily measurable parameters. Functional outcomes and QOL have been added for breast reconstruction patients only, following the protocol that has been previously determined from work in our hospital. This is difficult to apply to the mastectomy-only group for ethical considerations; we are preparing a follow-up study where physical therapy will be incorporated and groups will be matched for each age and breast volume. We strive to provide you with exceptional research. Thank you for your meticulous comment.
Changes in the text: Line 315-325.

6) Are the Korean version of the SF-36 and DASH validated?– please supply a reference for therefore
Reply 6: We apologize, a mistake was made in entering reference numbers. We revised the reference numbers regarding the validation of the Korean version of SF-36 and DASH in the Methods section.
Changes in the text: Line 180, 187. “In this study, we used the Korean version of the questionnaire, which has proven reliable for measuring upper-extremity dysfunction (17).” “We used the Korean version of the SF-36 (18).”

7) The selected assessment methods are nicely chosen.
Reply 7: Thank you.
Changes in the text: N/A

8) The paper lacks an argument for not using the BREAST-Q.
Reply 8: Thank you for your helpful comment. Breast-Q is a questionnaire that stands for satisfaction and it is a practical tool that is widely used worldwide for evaluation. However, there are questions that seem distant to Asians, so there are many cases where the questions are modified and usually used in form of summaries. However, in this paper, a combined study was conducted with rehabilitation medicine and consultation was implemented about functional recovery to conduct an evaluation and it was intended to carry out an analysis not only about the evaluation but also about the aspect where measurements were taken for analysis. In the experimental group, LD flap related questionnaire can be used in Breast-Q but difficulties of applying and making progress at the same time in the control group were identified and the QOL and functional recovery outcomes followed the protocol of rehabilitation medicine and this is also a domain that was published in PRS journal of reference 15 so it is implemented equally. Once again, thank you very much for your support in enhancing the quality of the paper.
Changes in the text: N/A

RESULTS

9) Both group of patients received radiotherapy (equal number of patients) – how did RT affect the breast reconstruction? Or the functional assessment. Did the patients receive the same dose of RT?

Reply 9: Post-mastectomy RT (PMRT) was performed when the breast cancer was greater than 5 cm of breast cancer or more than 4 positive lymph nodes or had positive internal mammary lymph node based on previous evidence (PMID:27646947, PMID: 27646018).

There was no difference in radiation dose for PMRT between the two groups and there is no evidence that the RT dose affect to skeletal posture.

However, the cancer recurrence around the Nipple-areolar complex was additionally observed by mammography or ultrasonography during the follow-up period in Nipple sparing mastectomy followed by breast reconstruction using LD flap.

Changes in the text: N/A

10) Did the patients, irrespective of reconstruction or not, receive physiotherapy for enhancement of post-operative recovery?

Reply 10: As shown in a previous study (reference 15), physiotherapy has been demonstrated to improve recovery, and thus, it was deemed that there was a possibility that bias could occur when physiotherapy was performed. Hence, physiotherapy was not performed. We have added this additional description in the limitations section.

Changes in the text: Line 300-308.

11) Table 1 shows that the patients undergoing mastectomy-only had larger breasts than the reconstruction-group – any comments to which degree this might have impacted the results?

Likewise – the patients undergoing reconstruction are significantly younger – any impact?

Reply 11: Thank you for your insightful comment. Generally, when LD flap is used for breast reconstruction, the surgical procedure becomes much longer than mastectomy-only and if the cancer stage is higher, then it is considered suitable to focus first on breast cancer treatment rather than immediate breast reconstruction. Accordingly, for the patient group that undergo immediate breast reconstruction, it is implemented on younger patients inconsideration of the recovery process and in case the breast volume to use LD flap is huge, it is not fitting for indication so the breast volume was rather measured high in mastectomy-only without consideration needed for the breast volume. Although there are differences in the result value, it is not to the point where pathologic

treatment is needed in the skeletal posture because of the differences so it is perceived that there won't be any major problem. The limitation about this has been added in the discussion. Once again, thank you very much for reviewing this study with careful supervision.
Changes in the text: Line 315-325.

DISCUSSION
12) Please elaborate on the possible impact on age and breast size-difference=The discussion lacks a paragraph on impact of time (months to years) of the reconstruction or the mastectomy on posture and shoulder movement (please see Lohana P et al. JPRAS 2019; 72:1060).
Reply 12: Statistical analysis was carried out using the change in preoperative and postoperative measurement in each patient instead of a comparison between patients. This was done to minimize the bias that could occur from the difference in age and breast size between the mastectomy-only and LD flap breast reconstruction groups. We are preparing our next study where a larger patient group with varying ages and breast sizes are targeted. It has been shown that the change in the Cobb's angle was increasing up to 1-year postoperatively in the mastectomy-only group, whereas notable restoration was seen in the group with breast reconstruction using the LD flap. We concluded that there was an impact at 1-year post operation, as there was a significant difference between the two groups. This has been added to the Discussion. Thank you.
Changes in the text: Line 300-308.

CONCLUSION
13) The conclusion is sufficient but may benefit from a perspectivation on the results obtained and further studies to be performed.
Reply 13: This has been addressed in the last paragraph in the Discussion. Thank you.
Changes in the text: Line 309-325.

REFERENCES
See above
14) Elsewise the number of references and their relevance is adequate
Reply 14: Thank you.
Changes in the text: N/A

FIGURES
15) Are very illustrative, but the figures should be re-numerated – Figure 1 should be named figure 3, figure 3 should be figure 2 and finally figure 2 should be named figure 1 – this to represent the order of presentation in the paper.

A figure illustrating how Cobb´s angle is measured should be added.
Reply 15: We apologize for the confusion. The method of measuring Cobb's angle has been added to Fig. 1, and the numbering in the rest of the manuscript has been modified accordingly. Thank you for improving the flow of the manuscript.
Changes in the text: Line 120-122.

TABLES
16) Table 1 should enclose data on implant-use and their sizes.
Reply 13: Implants were used in three out of the 31 patients, and a small (average 133.3 mL) implant was used. This was added to the Results for readability, as it was difficult to add to the table. Thank you.
Changes in the text: Line 204-206.

17) Tables 2, 3, and 4 – the statistically significant results should be highlighted in bold and or italics to increase readability
Table 5 – as above and the table could be split up into smaller entities – again to increase readability.
Reply 17: We apologize for the lack of readability. Those are now bolded and italicized. Thank you.
Changes in the text: Table 2,3, and 4.