

## Peer Review File

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### Review Comments

#### Reviewer A

While your manuscript provides valuable insights into a complex surgical topic, there are some areas that could be refined to further augment the quality and impact of the work. Here are some respectful suggestions that could potentially improve the paper if you choose to implement them:

#### **Comment 1:** Introduction

- Consider expanding on the available statistics around primary chest wall reconstruction failure rates. This would help to better justify the need for this particular topic. You may cite further prior studies reporting aggregate complication rates if possible.
- Consider expanding on the biomechanics of chest wall defects and physics governing reconstruction requirements. This would educate readers on principles guiding material choice.

**Reply 1:** We appreciate the reviewer's suggestions. We have made some additions to the introduction section to address the complications and failure rates, while the exact percentages of each type of complication have been cited in subsequent paragraphs. Additionally, we have included a list of principles to follow for reconstruction in the introduction section, outlining the biomechanics and physics governing the reconstruction process.

**Changes in the text 1:** We added lines 72-83 (page 3).

#### **Comment 2:** Findings and Discussion

- When citing percentages for complication or failure rates, consider consistently noting the denominator sample size as well so readers can contextualize proportions.
- Consider comparing and contrasting the various reconstruction materials tried. What emerges as most versatile for difficulties? How does this review advance prior general knowledge of options?
- Consider widening to not just summarize options but scrutinize the evidence itself. How many cases truly validate each proposed principle? Are recommendations generalizable? What are inherent biases?
- Consider commenting on not just materials but the evolution of fixation techniques over the decades. How has this altered failure rates or the ability to salvage?
- Consider detailing the proposed next research steps more clearly (e.g., prospective registries of techniques tried, longer-term outcomes, cost-effectiveness studies around choice of salvage materials) This would provide a roadmap.

**Reply 2:** We thank the reviewer for his comments. However, due to the word limit of the journal, we were unable to address all of the points raised. Specifically, we

focused on discussing the evolution of fixation techniques used in chest wall reconstruction over the decades, as well as the future perspectives in this field.

**Changes in the text 2:** We added lines 348-384 (pages 13-14).

Overall, these suggestions aim to enhance the manuscript's quality and impact for clinicians and researchers considering the adoption of robotic approaches for complex thoracic surgery. I believe that implementing some of the above suggestions would make your important work even stronger.

## **Reviewer B**

I congratulate the authors on a very nicely written review article on a much-neglected area of the literature. I have the following questions and comments:

**Comment 1.** I am not sure the title is entirely accurate as the authors spend a great deal of time discussing the management of primary chest wall resection and repair. Maybe simply "complex chest wall repair" would be better?

**Reply 1:** We thank the reviewer for the comments. The article indeed covers the reconstruction of the chest wall in general. However, since there are only a few cases of failures in complex cases, the review mainly focuses on evaluating the possible causes of reconstruction failure and the available options for redo surgery. Therefore, we wanted to highlight this aspect in our title, emphasizing the failure of previous chest wall reconstructions.

**Changes in the text 1:** None.

**Comment 2.** The authors use the term "local previous conditions" to encompass infection and recurrence. I do not think this is accurate as infections are often obtained intraoperatively and are thus not "previous". Could this be better described as "non-mechanical failures" or name the specific failure etiology. The section titled "failure because of local conditions" is all about infection so why not just call it "failure because of infection"?

**Reply 2:** We thank the reviewer for the comments.

**Changes in the text 2:** "Local previous conditions" at line 85 has been changed in "local conditions" and the section "failure because of local conditions" has been named as "failure because of infection".

**Comment 3.** The discussion regarding failure due to recurrence needs some work. First of all, is it a failure of the reconstruction if there is cancer recurrence. I would say no, it is rather a failure of the primary oncologic procedure. So why then? Clearly an R0 resection is an important part of this. The discussion regarding margin distance, however, lacks some insight. First and foremost, why do thoracic chest wall margins need to differ so dramatically from orthopedic oncology principles for margin requirements in the extremity. A UPS in the extremity does not require a 4 cm margin yet they can obtain similar local recurrence rates. I think this dates back to the paper by King et al where they championed larger margins but utilized a simple univariate analysis that did not account for confounding factors. Why did 4 cm do better in that

paper, because the surgeons could obtain 4 cm margins. They did not obtain four cm margins for larger tumors due to fears regarding size of chest wall defect. In the end, the best we have to go on at this point is larger margins yet we must address the relatively weak data with a strong probability of significant confounding at its base.

**Reply 3:** We thank the reviewer for the comment. We agree that the title is misleading. The recurrence of cancer is not a failure of reconstruction. Rather, it poses a problem for the surgeon who must perform redo surgery after a previous reconstruction, and this is the main point that the paragraph focuses on. Unfortunately, there is a lack of published literature on this topic, which is why the bibliography appears sparse. It is difficult to determine the precise margin required for large resections in this paragraph, as it greatly depends on the tumor's histology, whether it is benign or malignant. Referring to a 2 or 4 cm margin is only an example and not a definitive rule. (In the case of metastases or benign lesions, 2 cm of margins may be sufficient, while at least 4 cm of margins should be achieved in the case of primary chest wall malignant neoplasms (sarcoma) (7). Desmoid tumors, although considered benign soft-tissue tumors of the chest wall, are locally invasive and have a high rate of recurrence. Abbas et al. (8) reported a local relapse of 89% with positive margins versus 18% with negative margins; therefore, a clear margin at least of 5 cm should be warranted. King et al. (9) found out that the 5-year survival rate of patients with malignant chest wall neoplasms with a 4 cm resection was significantly higher when compared with those with a 2 cm resection margin (56 vs 29%.) The main aim of this paragraph is to generally define the possibility of recurrence in different tumors and highlight the very few cases of redo surgery in already performed reconstructions, which require a second operation due to oncological failure.

**Changes in the text 3:** None

**Comment 4.** IN the same section, the MSK paper is not cited appropriately. The authors suggest the occurrence of a MDS can affect the rate of recurrence. Every patient in that paper had a multidisciplinary approach. The difference was free flaps allowed the surgeons to create larger defects and thus achieve an R0 resection more frequently. There is no doubt that MDS is important, the explanation you provide with this paper is not the way to do it.

**Reply 4:** We thank the author for the comment; we agree that the explanation could be misleading, so we added the reference to the MSK work when talking about the importance of a MDT discussion at first and multidisciplinary surgical management at lines 126-128 (page 5).

**Changes in the text 4:** We removed lines 115-119 (page 5)

**Comment 5.** One useful thing you could do with this paper is create a standard definition for implant failure. This would most likely be a graded system like most graded complications. A cracked plate that requires no intervention should not be counted similar to a PMMA infection requiring prosthesis explant for instance. You have the capability to promote this with your comprehensive effort.

**Reply 5:** We thank the reviewer for the suggestion. Although we agree that a cracked plate or a PMMA infection require different management approaches and represent distinct types of implant failure, grading the failure of the implant goes beyond the scope of this review. The primary objective of this review is to collect different experiences presented in the literature regarding the management of various types of failures. Our aim is to consolidate these experiences as no guidelines exist on this rare topic.

**Changes in the text 5:** None.

**Comment 6.** I think you need to be very careful about promoting certain technologies. For instance titanium mesh is not FDA approved in the US and is not well studied. Promoting it before you know about long term efficacy is problematic. Moreover, one of the principal causes of failures in your titanium failure discussion is simply the creation of unsound constructs. Rib plates were designed to cross no more than a 2 cm gap, thus when they are used to cross giant gaps, of course they will fail. I think you need to emphasize this as such practices can also lead to harm, A disrupted plate next to the lung can be a dagger. The principle I would mention is that titanium prostheses were created to support underlying bone while it heals, they were never intended to replace that bone. That is the fundamental misconception held by many surgeons.

**Reply 6:** We thank the reviewer for this suggestion. Firstly, we eliminated the suggestion for titanium meshes from the abstracts and the last sentences of the paragraphs (line 333). The suggestion is now only mentioned in line 308 as an isolated experience by Dell'Amore et al. We also widened the discussion on pros and cons of titanium prostheses (lines 168-178, page 7) as follows: The successful implantation of a prosthetic rib requires thorough preoperative planning to prevent complications. The imaging should be carefully studied to estimate the size of the post-resection defect (22). The size of the defect must be evaluated first to determine the optimal prosthesis and the most suitable reconstruction. The length of the plate determines the maximum rib-rib defect that can be bridged. The positioning of the ribs should be assessed secondly. Most of the failures occur in anterior chest wall implants, probably because of the larger chest movement during respiration and repeated stress. Another complication is prosthesis screw loosening, which can happen because of the mismatch between the screw length and the measured rib thickness. The system's parallel gauge measures the thickest aspect of the rib. The surgeon must ensure that the drilling, plates, and screws are placed over this thickest aspect of the rib to correspond to the measured screw length and prevent screw protrusion and loosening (22).

**Changes in the text 6:** We eliminated the suggestion for titanium meshes from the abstracts and the last sentences of the paragraphs (line 333). The suggestion is now only mentioned in line 308 as an isolated experience by Dell'Amore et al. We also widened the discussion on pros and cons of titanium prostheses (lines 168-178, page 7). We also added lines 205-206.

**Comment 7.** I would change the title of the sternotomy section to something more accurate such as post-sternotomy complications. An inherent element of this is the unfavorable environment in which these wounds are created: 1) Devascularized tissue due to mammary harvest 2) Lengthy cases 3) Hypothermia 4) Patient population with microvascular disease due to smoking, DM, cholesterol, etc...

**Reply 7:** We thank the reviewer for the suggestions.

**Changes in the text 7:** We changed the title to “post-sternotomy complications”.

## **Reviewer C**

**Comment 1.** Can the authors provide a reference to support their statement “ ... type of prosthesis adopted, defect extension (>3 ribs or >100 cm<sup>2</sup>, sternal resections),....” Being risk factor for complete failure in the introduction section?

**Reply 1:** We thank the reviewer for the comment. We added Reference 1.

**Changes in the text 1:** We added reference 1 in line 85: Gonfiotti A, Salvicchi A, Voltolini L. Chest-Wall Tumors and Surgical Techniques: State-of-the-Art and Our Institutional Experience. J Clin Med 2022;11:5516.

**Comment 2.** In the methods , consider “ A literature review was performed through PubMed, Scopus, ScienceDirect and Google Scholar to identify studies published after 1970 till August 2023 evaluating ....”

**Reply 2:** We thank the reviewer for the comment. We made the suggested changes.

**Changes in the text 2:** Changed lines 93-94, page 4.

**Comment 3.** Please consider including this reference in Table 2. Wong THY, Siu ICH, Lo KKN, Tsang EYH, Wan IYP, Lau RWH, Chiu TW, Ng CSH. 10-Year Experience of Chest Wall Reconstruction: Retrospective Review of Titanium Plate MatrixRIBTM System. Frontiers in Surgery 2022 July 5;9:947193

**Reply 3:** We thank the reviewer for the suggestion.

**Changes in the text 3:** We added these data in Table 2.

Minor

**Comment 4.** Figure 1 legend “ an anterolater tight (ALT) flap” spelling error.

**Reply 4:** We thank the reviewer for the comment.

**Changes in the text 4:** We changed as suggested.

**Comment 5.** Table 2 key “ MMMM: methyl-methacrylate” should be “ MMM: methyl-methacrylate”?

**Reply 5:** We thank the reviewer for the comment.

**Changes in the text 5:** We changed as suggested.

## **Reviewer D**

Dear authors,

This is a good review that needs some refinement before recommending it for publication.

Comments for improvement:

**Comment 1:** - Abstract:

o Include the key question of your review in the text. This means reducing the amount of “other” non-crucial text in the introduction.

o Any sternal repair failure needs a muscle flap. I would add it to the list of basic maneuvers described. I will also add the use of omentum in such difficult scenarios.

**Reply 1:** We thank the reviewer for the comment.

**Changes in the text 1:** We added the lines 45-47 in the abstract.

**Comment 2.-** In the introduction, I would add a sentence precisely describing the aim of the narrative review

**Reply 2:** We thank the reviewer for the comment.

**Changes in the text 2:** We added the lines 88-90 in the introduction.

**Comment 3.** - I miss comments and discussion about the use of omentum to offer coverage in difficult specially infected chest wall defects and reinterventions. Please, consider: J Thorac Cardiovasc Surg. 2003 Mar;125(3):526-32. doi:

10.1067/mtc.2003.12 or Interact Cardiovasc Thorac Surg . 2005 Jun;4(3):250-5. doi: 10.1510/icvts.2004.103432 (among others)

**Reply 3:** We thank the reviewer for the comment. Due to space limitations in the journal, we were unable to expand our discussion on the use of omentum. However, we have included some key points in a new paragraph titled "Role of Soft Tissues in Complex Chest Wall Reconstructions".

**Changes in the text 3:** We added the paragraph “Role of soft tissues in complex chest wall reconstructions”

**Comment 4:** - This review attempts a deep analysis of hard tissue repair in the chest wall after complications, however, those repairs cannot be successful if soft tissue solutions do not accompany them. I miss some comments on muscle flaps.

**Reply 4:** We thank the reviewer for the comment. Due to space limitations in the journal, we were unable to expand our discussion on the use of soft tissues. However, we have included some key points in a new paragraph titled "Role of Soft Tissues in Complex Chest Wall Reconstructions".

**Changes in the text 4:** We added the paragraph “Role of soft tissues in complex chest wall reconstructions”

**Comment 5:** - There is a problem with the figures and their foot legend. I see that figure 1 (images A to F) have its adequate legend. Then Figure 2 (images A to F) correspond to a plate fracture and refixation and recoveage but has a foot legend corresponding to Figure 3. Its correct legend is in Figure 4. Please review all images and correct.

**Reply 5:** We thank the reviewer for the comment.

**Changes in the text 5:** All the changes have been made.

#### **Reviewer E**

**Comment 1:** Not interesting

Key Words and query are not clear and very simple

English must be corrected and is too much “latin/spanish”

**Reply 1:** We added some lines to make more clear the final aim of the review both in the abstract and in the introduction (lines 88-90). Some minor English corrections have been done.

**Changes to the text 1:** We have made some changes to our document. Specifically, we have added lines 45-47 and 88-90. Additionally, we have revised the English language used in the document.