

Peer Review File

Article information: <https://dx.doi.org/10.21037/jtd-23-450>

Review Comments

Reviewer A

- 1) Authors should avoid using references in headings (line 59, 65, etc), it is confusing and nonspecific.
- 2) Line 64: "mandate surgical resection/treatment"
- 3) Line 82: use just "melanoma"
- 4) Line 82: colorectal (one R)
- 5) Line 90 preoperative work-up/assessment
- 6) Line 117: word "signs" repeated twice
- 7) Line 160: Very confusing statement, what is structural integrity of the reconstruction? Surgical therapy?
- 8) Line 347: 3 cm; Line 349: 6 cm

Reply 1: References in headings have been eliminated
Changes in the text: References have been repositioned in the text

Reply 2: Expression has been corrected
Changes in the text: as requested

Reply 3: Expression has been corrected
Changes in the text: as requested

Reply 4: Expression has been corrected
Changes in the text: as requested

Reply 5: Expression has been modified
Changes in the text: as requested

Reply 6: Word "signs" repeated
Changes in the text: one word eliminated

Reply 7: Re write sentence
Changes in the text: sentence has been rewritten: "as due to the chronic nature of infection there is always some degree of fibrosis that stabilizes by itself the chest wall"

Reply 8: Change "cms" to "cm"
Changes in the text: as requested

Reviewer B

Aranda et al presented their work named "STERNAL RESECTION AND RECONSTRUCTION". I have the following comments:

- Please add the word "A REVIEW" after your title.
- Please specify if you have IRB approval for adding intra-operative picture, If you feel your study doesn't need IRB, please add a reference to that.
- Line 59, 65, 72 : Please avoid adding references in the sections titles.
- Please add a table with indications of resection/published percentages of such indications and indication for reconstructions/published percentages of such reconstructions.
- Language revision is essential eg Line 75: chondo should be "chondrosarcoma", "activities,nutrition" in line 108, "traduces" in line 110, line 305, line 306,etc.
- Please spell out any abbreviations at their first time eg O2 in line 97, ECOG in line 101, BMI in line 103, CT, MRI, PET in line 136, DNA, RNA in line 250.
- Please try to add a diagram with treatment algorithm based on your literature review.
- Line 176: Please add a reference to this sentence "most authors agree that a minimum margin of 3 cm is considered necessary to minimize the risk of local recurrence"
- Line 183: Please add a picture of different reconstruction techniques even with hand sketching.
- Line 191: please specify if this is a "systematic' review and in such case, please identify the searched databases eg PubMed, Ovid Embase, etc.
- Line 200: Please try to add a table with published series on sternectomy , add number of patients, R0 percentage, type of sternectomy (total, subtotal,etc), outcomes, and the used reconstruction techniques).
- Please add a paragraph or hand sketch figure showing possible incision for sternectomy.
- If possible, please try to write average cost of different reconstruction approaches with proper reference. This may be in the form of a table.

Reply 1: expression “a review” added to title

Changes in the text: as requested

Reply 2: IRB approval

Changes in the text: Prior to surgery, all patients signed an informed consent form reviewed and approved by the Hospital Ethics Committee where they give specific authorization to take intraoperative photographs and/or videos for scientific or educational purposes, always preserving the patient's identity.

This explanation has been included in the section “ethical statement”

Reply 3: References has been avoided in titles

Changes in the text: references have been repositioned in the text

Reply 4, Reply 11: Table with resection/reconstruction published percentages;

published series on sternectomy (number of patients, type of resection,...)

Changes in the text: two new tables have been added, one including the indications for sternal resection , the other summarizing the main studies included in this paper (R0 resection included when available)

Reply 5: Language revision

Changes in the text: expressions have been reviewed with an online translator and modified if deemed incorrect

Reply 6: Abbreviations use

Changes in the text: O2 has been replaced by “oxygen” while BMI CT, MRI and PET have been previously spelt out; ECOG scale has no possible spell out since it is a name itself while DNA and RNA have been replaced by “genetic material”

Reply 7: Treatment diagram

Changes in the text: two new figures about this topic have been added

Reply 8: Adding a reference

Changes in the text: reference added as requested

Reply 9: Adding a picture of reconstruction techniques

Changes in the text: None. Given the great heterogeneity of clinical scenarios and the wide variety of available reconstructive techniques, in our opinion it is impossible to represent them all graphically beyond the intraoperative images already included or the description in the text.

Reply 10: Systematic review

Changes in the text: this paper is not intended to be a systematic review. Medline and Embase databases were scanned for articles about preoperative evaluation, available reconstruction techniques and its outcomes in patients with any sternal disease that require resection.

Reply 12: Possible incision for sternectomy

Changes in the text: included a new paragraph: “thus surgical access is usually made through a vertical, elliptical incision morphology the tumor and the surrounding soft tissues supposedly affected”

Reply 13: Average cost of different reconstruction approaches

Changes in the text: none. Unfortunately, this information is not currently available in the literature. Moreover, it greatly varies depending on many factors as variable as the type of approach or even commercial supply agreements

Reviewer C

nice, comprehensive review.

congratulations for the authors

Reply: thank you very much for your comment

Reviewer D

Dear Authors,

Congratulations for the precisely written article.

My suggestions are as follows.

1-In SCJ infections infections, in addition to resections also would vac applications could be performed.

2- Breast cancer metastasis to sternum an or recurrence from a breast cancer especially after radiation treatment are the nightmares. Please provide detailed information in these, because they are the major reasons for bony sternum wide resections. especiallyly if internal mammarian noddles are involved.

3- Please provide detailed information about neoadjuvant treatments. when and how?

4- Reconstruction part has been written in detail. Please provide similar approach to resection part.

5- Give more detailed information about soft tissue reconstruction. Which muscles could be used? Rectus muscles ?, latisimus Dorsi.

Please go into more detailed and updated information.

Reply 1: VAC use in SCJ infections

Changes in the text: we do agree that VAC could be performed in such a type of infections; in fact, we have used wide debridement plus VAC therapy in some cases with excellent results. However , trying to stick to the aspect of sternal resection and not overcharging the text, we did not consider to elaborate on this topic although a short comment about VAC has now been included.

Reply 2: Breast cancer metastasis resection

Changes in the text: None. In our own experience, most of sternal resections due to breast cancer relapse are (as you said) real nighmares, as a real R0 resection is rarely achieved (specially when lymph nodes are involved) thus the published 5-year overall survival ranging 20% to 50% is not usually the norm. Moreover, radical surgery does not appear to decrease recurrence rates thus we tend to be as conservative as possible, reserving the most aggressive surgeries for that most “desperate cases” with palliative intention (avoid bleeding from the tumor, ulceration,...) .

Reply 3: Neoadjuvant treatments

Changes in the text: none. As stated in the text, the most common primary sternal tumor is chondrosarcoma and radical resection without adjuvant therapy seems to be associated with a good overall survival in many published series . Apart from chondrosarcoma, information about neoadjuvant treatment has not been recorded and

neoadjuvant protocols (when indicated) are highly variable depending of the tumor histology or the institution where they are applied so we believe that a detailed analysis of these treatments is beyond the scope of this article mainly referred to sternal resection and reconstruction.

Reply 4: Resection part more detailed

Changes in the text:none. Resection part encompasses indications, preoperative assessment and strategies for resection, where indications for partial or more extensive sternal resection are present. We consider that there is more information that can add value to this section, while the “excessive detail” in the reconstruction part is in fact nothing but an attempt to cover the wide variety of available techniques in an organized, understandable way.

Reply 5: Soft tissue reconstruction details

Changes in the text: none. As stated in the text, sternal defects often require complex soft tissue reconstruction, usually performed (as in our Hospital) by an experienced plastic surgeon. We have no specific experience or training on it so probably a description of the many soft tissue coverage options is well beyond the scope of this article.

Reviewer E

Dear Authors,

Thank you for submitting your paper entitled 'Sternal resection and reconstruction' to the Journal of Thoracic Disease. This is a narrative review outlining the current indications, preoperative management, techniques and outcomes of sternal resection and reconstruction. As you stated, sternal resection and reconstruction procedures are not commonly performed, but very challenging. The current state of knowledge on these operations is based on retrospective case series with varying patient numbers. Therefore, standards for these procedures have not and are unlikely to be established. The management of sternal resection is case-dependent and requires the involvement of a multidisciplinary team. I find your narrative review interesting and clearly reflecting the current evidence on sternal resections. I therefore find it relevant to the thoracic surgeons dealing with such cases.

In order to improve the manuscript, I would recommend:

- 1) shortening the "operability workup" section, which contains a lot of obvious information regarding not only patients who are qualified for sternal resections.
- 2) changing the anatomical terms from lateral notch to clavicular notch of the manubrium and medial inferior head of the clavicle to sternal end of the clavicle (indications, line 60)
- 3) changing the term describing giant clear cell sarcoma from malignant melanoma to soft tissue malignant melanoma (line 82).
- 4) a minor revision of the English by a native speaker.

Your Sincerely

Reply 1: Shortening operability workup section

Changes in the text: section has been shortened.

Reply 2: Changing anatomical terms

Changes in the text: terms modified as requested

Reply 3: Changing “giant cell sarcoma” term

Changes in the text: term has been changed as requested

Reply 4: English revision

Changes in the text: We will do our best to do so

Reviewer F

It would be helpful for the author to summarize their sections on operability work-up , resectability work-up with individual detailed flow diagrams to enable the reader to better understand the train of thought and process.

In the resectability workup section, would the authors have some images to show as figures to illustrate the role of different imaging modalities.

For sternoclavicular joint infection, how does the author optimize the patient ? Would you recommend draining percutaneously any collection seen on CT scan prior to surgery? Could this provide guidance to correct antimicrobial therapy before any surgery? Would the author always close up the area during surgery? Is there a role for resection and open drainage or VAC dressing?

Again, it would be helpful to have a table highlighting the pros and cons of the different rigid reconstruction methods (autologous grafts, cadaveric / allografts , etc) In some of the sections (ie cryopreserved rib), the authors also refer to their own experience. Can they add photos/ figures to the article to improve reader interest?

The length, width , preparation, how they are secured, and even the material are different between Stratos, Sternalock and Matrixrib. Can the authors elaborate.

Apart from plating systems such as Strato, Sternlock and Matrixrib , some companies offer custom- made (made to measure) titanium implants , but not 3D printed . Worth mentioning .

There are minor spelling errors / syntax errors.

Reply 1: Flow diagrams

Changes in the text: operability workup text has been shortened so probably a diagram would not add much. Regarding resectability, our intention is not to make a precise

indication for each evaluation technique, but to briefly describe the main advantages or disadvantages of the different options available. For this same reason, we have not considered including any specific picture of any particular imaging technique.

Reply 2: Image technique pictures

Changes in the text: Answered in reply 1

Reply 3: Sternoclavicular joint infection

Changes in the text: none. Of course, in these type of disease our first choice would be antibiotic conservative therapy if possible directed by antibiogram from collection culture. As previously answered to reviewer D, we do agree that VAC could be performed in such a type of infections; in fact, we have used wide debridement plus VAC therapy in some cases with excellent results. However, trying to stick to the aspect of sternal resection and not overcharging the text, we did not consider to elaborate on this topic although a short comment about VAC has now been included.

Reply 4: Table with pros/cons of different reconstruction methods

Changes in the text: a new table has now been included with such information

Reply 5: Differences in Stratos, Sternalock and MatrixRib

Changes in the text: none. We decided to list these three systems as the most available and commonly used on the market, but due to our Hospital's internal policy, we only have some experience with Sternalock. The differences in length, width, preparation, clamping, and material between these three systems are vast and easily beyond the scope of this document.

Reply 6: Made to measure titanium implants

Changes in the text: a mention to this is now included in the text

Reviewer G

The article reviews all the aspects for surgery of the sternum and is covering pathology, indication, surgical technique, prosthesis, complication and outcome of treatment.

I just noticed that the authors did not describe anterior mediastinal tumors invading the sternum. I request a comment on thymic malignancy, especially combined resection of the sternum in surgery for thymic carcinoma, although it is rare.

Reply 1: Sternal resection in thymic malignancy

Changes in the text: As the same reviewer points out, the need for sternal resection in the context of thymic carcinoma is rare. It is clear that among secondary sternal tumoral diseases we find both invasion from adjacent tumors such as breast, thymic carcinoma or germ cell tumors as well as purely metastatic lesions and that the and that the surgical approach should be different in cases of local involvement (aggressive resection as in primary tumors) versus a possibly more conservative approach in purely metastatic tumors. We have introduced some paragraphs and sentences in the text trying to point

out this difference

Reviewer H

Review of the paper entitled: "STERNAL RESECTION AND RECONSTRUCTION" by Jose L. Aranda et al. Thoracic Surgery Unit. Salamanca University Hospital, Spain. the authors reviewed the literature on a rare topic such as sternectomy analyzing all the known arguments. To improve the paper I suggest performing some statistical analyses such as metaanalysis on post-operative and oncological results which could add some important findings. The language should be modified because in some sentences it seems quite colloquial. The post-operative results should be placed before the oncological results. I suggest a deep language revision for the presence of some typos.

Reply 1: Metaanalysis , oncological results placement

Changes in the text: none. We are very grateful to the reviewer for the suggestion to perform a meta-analysis but this study is a simple literature review thus a different methodological approach would be necessary to adequately select the most appropriate publications to be included in such a study.

Postoperative results are now placed before the oncological results.

Reviewer I

I would like to congratulate the authors with their manuscript entitled "Sternal resection and reconstruction". The manuscript is well-written and provides an excellent overview of current literature and treatment options for this rare entity. This work is of great value for JTD's special series on chest wall resections and reconstructions.

Reply 1: thank you very much for your comment

Reviewer J

1. English must be reviewed, since it often appears to be poorly fluent:

- Abstract, line 32: please remove "of the patient", since it is a repetition.
- Introduction, lines 48-49: please change "a large variety of highly heterogeneous options" with "a large variety of options".
- Introduction, line 51: please change "the available conclusions" with the "available knowledge"
- Introduction, line 53: please change "the objective of this article is none other than to offer" with "the objective of this article is to offer"
- Line 78: please change "has" with "have"
- Line 113: please change "what" with "that"
- Line 117: please change "for signs and symptoms signs" with "for signs and symptoms"
- Line 285: please change has with have
- Line 289: please change ranges with range

2. Why are the references (lines 93, 146) included in the subtitle?
3. Line 105: please, provide references.
4. Lines 124-128 are not so interesting to the surgical scope of the review.
5. Paragraph 3.2 should be rewritten, by analyzing in a different manner the benign and the malign pathologies (eg. The benign pathology such as osteomyelitis requires a different preoperative evaluation and diagnostic pathway including the isolation of a pathogen, the tentative medical treatment etc; while the approach to a malignant neoplasm must include preoperative diagnosis with biopsy, accurate staging etc and different resection margin as according to guidelines)
6. Line 201: some form of synthetic skeletal reconstruction (35). Please provide a more extensive explanation on the type of reconstructions available.
7. Reconstruction techniques (paragraph 5) as well as resection and reconstruction outcomes (paragraph 6) are too much narrative and not so flowing during the reading: some schematic tables including the cited studies and collecting the most important results may help to the scope of this review.
8. Something should be added in regard of the new available materials for reconstruction: the mention of 3D printed prostheses is too much vague and some recent experiences should to be cited (e.g. Wang H, Liu Z, Chen C, Liu M, Xiao Y, Zhang J, Yu G, Jiang G. Sternal Resection and Reconstruction With a Novel Modularized Prosthesis. *Ann Thorac Surg.* 2020 Oct;110(4):1412-1416. doi: 10.1016/j.athoracsur.2020.05.048. or Kamel MK, Cheng A, Vaughan B, Stiles B, Altorki N, Spector JA, Port JL. Sternal Reconstruction Using Customized 3D-Printed Titanium Implants. *Ann Thorac Surg.* 2020 Jun;109(6):e411-e414. doi: 10.1016/j.athoracsur.2019.09.087.)

Reply 1: English review

Changes in the text: all the suggested changes are made

Reply 2: References in subtitle

Changes in the text: These references have been eliminated

Reply 3: Reference request

Changes in the text: this paragraph has been deleted

Reply 4: Lines 124-128 are not so interesting

Changes in the text: these lines have been eliminated

Reply 5: Paragraph 3.2 rewritten

Changes in the text: We have rewritten the paragraph trying to clarify the suggested ideas.

Reply 6: Synthetic skeletal reconstruction

Changes in the text: expression changed to “prosthetic reconstruction”. General description of different types of prosthesis is included in the text.

Reply 7: Reconstruction techniques and outcomes table

Changes in the text: a new table has been included with this information

Reply 8: 3D printed new references

Changes in the text: reference from Wang H et al (Ann Thorac Surg 2020) is related to a modularized prosthesis which is not a 3D printed device, as the authors themselves declare in the abstract that it is made of “standardized components of different types and sizes”; although we admit this is a new type of device, it is almost impossible to include in the text all the possible variations for available standardized titanium devices. We thank the reviewer for the suggestion of the paper from Kamel MK et al, now included as a reference.

Reviewer K

Congratulations to the authors for this good review.

I have a few recommendations:

Major comments:

1. This reviewer suggests that the reference numbers should not be located in the titles but at the end of the quoted sentence or at the end of the paragraph in case it is not something specific. Specially, when there is more than one reference in a paragraph.
2. Line 178: when the authors wrote: “a positive surgical margin (R1) is allowed”, the message could be misinterpreted. The affirmation of the consensus that was referenced is controversial and refers to chest wall tumors located next to vital organs like great vessels or the heart.

Minor comments:

3. Line 69: Please include that prior to surgical management, malignancy must be ruled out (Induced radiation soft tissue sarcoma). I know that this was mentioned below but it is more important to include it in this section.
4. Line 79: The authors described Primary sternal tumors and Secondary sternal tumors. What about the local invasion of adjacent tumors: local relapses of breast cancer, squamous cell carcinoma of the skin, rib sarcomas that also require sternal resection to achieve adequate margin resections. Those are different malignancies that should be

mentioned.

5. Line 91: Usually multidisciplinary board includes thoracic surgeons, pneumologist, oncologist, radiotherapist, reconstructive and microvascular surgeons.
6. Line 103: please include the definition of the abbreviation: BMI.
7. Line 127: please include the definition of the abbreviation: ERAS.
8. Line 142-143: Please explain in which cases the authors recommend each of these: fine needle aspiration, core needle biopsy and incisional or excisional biopsies.
9. I believe, it deserves a few words in the Resectability workup section, what the authors think about in bloc resection (lung, breast, diaphragm) and also what are the relative and absolute contraindications of sternal resections?
10. Line 151: Please include in the description of the procedure: division of the clavicle, (distance 2-3 cms?)
11. Line 160: Please check grammar
12. Line 168: the definition of subtotal or partial was according to the classification described by Butterworth? (Reference 35 in the manuscript) or which classification?
13. Line 168: what the authors mean when they write: “tumors that involve more than one part of the bone” because usually the extent of the resection depends on the size and histology of the lesion.
14. Line 229: meshes sometimes cannot guarantee chest wall stability either.
15. Line 281: “bone scintygrapy” chek grammar.
16. Figure 1: titanium mesh and what other material showed in the figure? Titanium bars?

Reply 1: reference numbers not in the title

Changes in the text: references have been eliminated from the titles

Reply 2: positive R1 surgical margin allowed

Changes in the text: Expression has been clarified in order to refer it to tumors located next to vital organs

Reply 3: exclude malignancy in irradiated fields

Changes in the text: as you mentioned, it is already included in the text

Reply 4: invasion from adjacent tumors

Changes in the text: the section has been modified to differentiate between purely metastatic tumors and adjacent tumoral diseases

Reply 5: Multidisciplinary board

Changes in the text: as we include in the text, AT LEAST should include some specialists. We admit that the board composition could greatly differ between centers.

Reply 6 and 7: definition of BMI and ERAS

Changes in the text: both terms have been eliminated from the text

Reply 8: Type of biopsy

Changes in the text: as presented in the text (reference 33), we adhere to the principles recommended by Shah and DÁmico in their paper from JAm Coll Surg 2010; however, we have added a newer reference (95) from Gonfiotti et al (2022) where they state that “ core needle biopsy in bone tumors has an accuracy comparable to that of incisional biopsy. However, the small amount of tissue obtained with fine-needle aspiration is often insufficient in order to achieve a definitive diagnosis. When the tumor has a size greater than 5 cm, an incisional biopsy can be performed. An excisional biopsy can be planned in the case of a small lesion (<2 cm), and wide negative margins must be guaranteed (at least 2 cm)”

Reply 9: En bloc resections. Contraindications for sternal resection

Changes in the text: none. We already mention in the text that radicality is necessary in order to guarantee a correct oncological resection, encompassing not only the tumor but all the affected surrounding structures (if possible, an en bloc resection should be performed). Since the preoperative assessment includes operability, resectability, and possibilities of reconstruction, we believe that it goes without saying that if a patient is inoperable, unresectable, or reconstruction is impossible, surgery should be questioned although we admit that multiple factors such as surgeon experience may affect this assessment thus leading to different “indications” or “contraindications” for sternal resection.

Reply 10: Division of the clavicle

Changes in the text: None. We were not able to find in the literature a precise indication for clavicular resection margins thus it is not included in the text. As with other bony structures, a 3 cm free resection margin is probably correct.

Reply 12 and 13: Subtotal /partial resection

Changes in the text: this is now clarified in the text, considering a division of the sternum into manubrium plus medial third of the clavicles, middle sternal body and lower third of the sternal body plus xiphoid

Reply 14: Chest wall instability with meshes

Changes in the text: none. We do agree that meshes neither guarantee 100% chest wall stability nor ever provide enough protection for vital organs.

Reply 15: Bone scintigraphy

Changes in the text: grammar corrected

Reply 16: Figure 1

Changes in the text: This figure has been eliminated due to possible copyright issues