

## Peer Review File

Article information: <https://dx.doi.org/10.21037/jtd-23-642>

### Reviewer Comments

#### Reviewer A:

Comment 1:

Very nice article. Excellent images and legends. I have no major advice or comments to correct here. This is a technique article and as one is very well done. I would recommend acceptance of the manuscript without major revisions. Pre- and post-surgical patient images could be a little clearer with better lighting. "Down" lighting is what is typically used to highlight these defects.

Reply 1: We thank you for your time and effort in reviewing our manuscript and the compliments and comments provided. We edited the pre- and post-surgical patient images.

Changes in the text: We revised Figure 9.

#### Reviewer B:

Comment 1: The article is well written and the novel modification introduced is a great addition to current literature regarding the Abramson technique.

Reply 1: The authors would like to thank you for the compliments provided, and your time and effort in reviewing our manuscript.

Changes in the text: None

#### Reviewer C:

Comment 1: This article is very interesting because it describes a new approach to the Abramson procedure. The text describes the procedure well and the figures are relevant.

However, it would be interesting to add a description of the patients who need this technique, as the majority of young patients can only be treated by conservative techniques with excellent results. It would be useful to better describe the proportion of these patients requiring surgical treatment, with for example:

- the age of the patients (adolescent, young adult, adult)
- the type and size of the malformation
- the stiffness of the operated thorax with the pressure needed to achieve correction.

Reply 1: The authors thank the reviewer for his/her critical review of our manuscript and the comments and compliments provided. We agree that the requested information regarding the proportion of patients requiring surgical treatment would further improve our manuscript. Hence, we revised our discussion section.

Changes in the text: We have added the following sentences to our discussion section (line 231-247, page 12-13): "Surgical correction of pectus carinatum is considered the next step in the treatment algorithm for patients who are not suitable for conservative treatment or when bracing therapy fails. Adequate patient selection is therefore crucial, as incorrect usage of orthotic treatment can delay the need for surgery and increase the overall costs of treatment. Factors such as asymmetric deformations, increased age which is associated with increased chest wall rigidity, as well as poor treatment compliance are linked to high failure rates of orthotic treatment. Furthermore, recurrence is more commonly reported in younger patients before the end of their growth spurt."

The deformity can be surgically corrected by the open, modified Ravitch procedure, or the minimally invasive Abramson procedure. Nowadays, the Abramson procedure has gained worldwide acceptance as it is superior to the open Ravitch procedure for surgical correction of pectus carinatum in terms of postoperative pain, hospitalization period, and cosmetic results [9]. Therefore, the Ravitch procedure is primarily reserved for the correction of rigid or extremely severe and asymmetric deformities. The ideal age range for surgical repair by the Abramson method is during puberty, between 12 and 18 years of age, corresponding to a phase of rapid growth when the chest wall has relatively high flexibility, reducing the forces encountered during the procedure.”

Comment 2:

Finally, it would be preferable to describe whether patients need more than one bar to be properly corrected.

Reply 2: We thank you for this comment. The minimally invasive Abramson procedure is performed with the use of one bar.

Changes in the text: We have added the following words to the sentence in the step-by-step description section (line 203-204, page 11): “At this point, final correction of the deformity by the use of one bar and stable fixation of the implant has been reached.”.

#### **Reviewer D:**

Comment 1:

Have you considered using cryolysis?

Reply 1:

We thank the reviewer for his/her critical review of our manuscript and the comments provided. Intercostal nerve cryoablation is a relatively new treatment modality in postoperative pain management of chest wall surgery. Though the Abramson procedure for correction of pectus carinatum is generally associated with less postoperative pain than for example the Nuss procedure for the correction of pectus excavatum, hence we do not use it. However, we agree that this should be subject for future studies.

Changes in the text: None

Comment 2:

How many cases do you operate per year? In your opinion is there amount of cases per year that is a barrier to using this method?

Reply 2: We thank the reviewer for this comment. Currently, there is no literature available on the learning curve of the Abramson procedure. There is also no established threshold for an optimal caseload based on complication rates. However, when looking at the pectus excavatum counterparts, one article reports on the learning curve of the minimally invasive Nuss procedure. This article by De Loos et al. (2022) suggests that, after a 10-procedure proctoring period, performing at least 1 procedure every 35 days is a reasonable benchmark for the Nuss procedure. This benchmark could possibly apply to the Abramson procedure, but is subject to future studies.

Changes in the text: We have added the following sentences to the discussion section (line 307-310, page 15) to: “Currently, there is no literature available on the learning curve of the Abramson procedure. Furthermore, a threshold for an optimal caseload based on complication rates has also not

been established yet and requires further research in order to determine whether the Abramson procedure should be centralized.”.