

Peer review file

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Reviewer A

The authors aim to quantify volume changes of the descending and abdominal aorta at 8 short- and mid-term follow-up after frozen elephant trunk procedure using the Thoraflex hybrid prosthesis for type A aortic dissection. The manuscript is well written and as the first study of its nature definitely provides new insight into monitoring true and false lumen progression after surgical repair. In the opinion of this reviewer the quality of the manuscript will be further enhanced if the authors address the following issues.

Comment 1: Please change the title as “Quantification of volume changes in the descending aorta after frozen elephant trunk procedure using the Thoraflex hybrid prosthesis for type A aortic dissection”

Reply 1:

We changed the title as suggested by the reviewer.

Change in the text:

Quantification of volume changes in the descending aorta after frozen elephant trunk procedure using the Thoraflex hybrid prosthesis for type A aortic dissection

Comment 2: Abstract, Methods, please rephrase the statement as “Based on computed tomography angiograms (CTAs), before surgical treatment, at discharge, at one year and two years follow-up, surface and volumetric measurements have been performed.”

Reply 2:

Change in the Abstract/methods:

We measured volumetric change before surgical treatment, at discharge, at 12 and at 24 months based on CTAs (Computed tomography angiography).

Comment 3: Please avoid using abbreviations in the abstract. Define TL as true lumen when first used. Same applies to all other abbreviations.

Reply 3:

We avoided abbreviations in the abstract as suggested by the reviewer.

Changes in the Abstract:

Background - Computed tomography (CT).

Methods - CTA (Computed tomography angiography).

Results - true lumen (TL)

Comment 4: Background, line 37, please change freedom of aortic reoperation to freedom from aortic reoperation

Reply 4:

Thank you for your comment.

Change in the main document – background – line 37:

Promising results in terms of reduced perioperative mortality, freedom from aortic reoperation and recurrent nerve palsy have been published.

Comment 5: Methods, line 63 please change 4,8% to 4.8%

Reply 5:

Change in the main document – methods – line 63:

30-day-mortality was 4.8%.

Comment 6: Methods, line 64 & 65, please rephrase the statement as “The remaining 20 patients, 18 males and two females (mean age 57 ± 17 years), were included in this study.”

Reply 6:

We rephrased the sentence.

Change in the main document – methods – line 64 & 65:

Therefore, 20 patients, i.e. 18 male and two female patients with a mean age 57 ± 17

years old, were included in this study.

Comment 7: Methods: Was the diameter of the true and false lumen edited manually from the left subclavian artery to the celiac trunk on each slice by the same individual or different individuals? If different individuals were involved in determination of this measurement then inter-observer variation remains a limitation of this study and must be acknowledged.

Reply 7:

The diameter of the true and false lumen were edited manually from the left subclavian artery to the celiac trunk on each slice by two experienced colleagues of the department of vascular and endovascular surgery with the 'four-eyes' principle in order to reduce bias.

Change in the main document – Methods/ Volume rendering and measurement – line 92 and following:

All steps of volume rendering were performed by two experienced colleagues of the department of vascular and endovascular surgery with the 'four-eyes' principle in order to reduce bias.

Comment 8: Discussion, line 143, please change type b dissections to type B dissections#

Reply 8:

Change in the main document – discussion – line 143:

[...] for Type B dissections.

Comment 9: Discussion, line 147, please rephrase To the best of our knowledge,

Reply 9:

Change in the main document – discussion – line 147:

As far as we know, [...]

Comment 10: Discussion, lines 171 & 172, please rephrase as “This can be attributed

to an extended repair of the aorta in the descending section.

Reply 10:

Change in the main document – discussion – line 171 & 172:

This may be due to an extended repair [...]

Reviewer B

The authors analyze the change in volume of true and false lumen of descending aorta following frozen elephant trunk. The particularity is that the measurement are made through 3D quantification of volume, that means much more precise of the standard of care (2D quantification). The major limitation of the manuscript is that it does not have a significant impact on the clinic. There is no correlation with an outcome of clinical interest (e.g. death? organ perfusion?), but only with progression of the lumens in MDCT.

Minor corrections:

- please in abstract cite only the patients included in the study (that means 20, not 21).

Reply: as 21 were included (but one patient died within 30 days), we adapted this line in the abstract as follows.

Change in the text – Abstract/ methods:

Between April 2015 and March 2018, 20 patients who underwent surgical repair of AADA using the Thoraflex™ Hybrid Plexus (Vascutek, Terumo Aortic, Scotland) were included in this study

- who performed the measurements?

Reply: Please see our reply to reviewer A.

The diameter of the true and false lumen were edited manually from the left subclavian artery to the celiac trunk on each slice by two experienced colleagues of the department of vascular and endovascular surgery with the 'four-eyes' principle in order to reduce bias.

Change in the main document – Methods/ Volume rendering and measurement – line 92 and following:

All steps of volume rendering were performed by two experienced colleagues of the department of vascular and endovascular surgery with the 'four-eyes' principle in order to reduce bias.

- it is unclear - or could be better explained - why from 20 patients were obtained 158 measurements;

Reply: For every patient, we performed a volumetric reconstruction of true, false, and total aortic volume at the different time points. However, not every patient had all ct scans at every time point. Hence, overall we were able to obtain 158 measurements.

Change in the main document – methods - line 82 and following:

For every patient, we performed a volumetric reconstruction of true, false and total aortic volume at the different time points. Unfortunately, 9 patients were lost to follow up in the first year and 12 patients in the second year. In case of missing or inconsistent data scans were not included. Overall we were able to obtain 158 measurements.

- please provide some detail about the MDCT instrument, acquisition protocol, etc.

Reply and change in text – methods - line 97 following:

Acquisition protocol

After a survey scan, a region of interest (ROI) was placed in the aorta for bolus tracking at a threshold of 100 HU. The ROI was placed in the aortic arch. Application of contrast medium (100-150 ml, depending on weight and constitution of each) patient was applied. An injection rate of 5 ml/s with a delay of 10s was chosen. Following contrast media injection, a bolus of 50 ml sodium chloride was applied.

- Line 63: it is "4,8%" or "4.8%"?

Reply and change in the main document – methods – line 63:

30-day-mortality was 4.8%.

- please provide some information about study population (e.g. malperfusion before surgery?)

Based on laboratory-chemical examinations and CT scans there was no sign of

malperfusion or organic ischemia in any patients prior to surgery.

Change in the main document – methods – line 65:

Based on laboratory-chemical examinations and CT scans there was no sign of malperfusion or organic ischemia in any patients prior to surgery.

Reviewer C

The objective of this study was to quantify volume changes of the descending and abdominal aorta at short-and mid-term follow-up after after frozen elephant trunk implantations with the Thoraflex hybrid prosthesis for type A aortic dissection.

Minor comments:

Comment 1: One hundred fifty-eight volumetric measures were obtained from the left subclavian artery to the celiac trunk. The authors should clarify in how many patients a complete assessment could be performed at the different time points. It is not entirely clear where the number of 158 comes from.

Reply 1:

Please see our previous reply to Reviewer B:

Change in the main document – methods - line 82 and following:

For every patient, we performed a volumetric reconstruction of true, false and total aortic volume at the different time points. Unfortunately, 9 patients were lost to follow up in the first year and 12 patients in the second year. In case of missing or inconsistent data scans were not included. Overall, we were able to obtain 158 measurements.

Comment 2: The authors should clarify whether this is a retrospective cohort study in the true sense of the word. In a retrospective cohort study, the data are prospectively collected but the study design is defined a posteriori (prospective data collection, retrospective analysis). In line 192, the authors mention retrospective data collection. I suppose that the analysis can only be done on an existing database, in other words the raw data were collected prospectively.

Reply 2: Thank you very much for your comment. It is true that line 192 is misleading. This study is a retrospective cohort study in the true sense of the word. Data collection was indeed performed prospectively while study design is defined a posteriori.

Change in the main document – line 192:

This study is limited by the small sample size

Comment 3: The number of non-standard abbreviations is way too high. Abbreviations like TL and FL and other are simply not required at all.

Reply 3: Thank you very much for your comment. However, we kindly disagree as most of the abbreviations facilitate reading and understanding. Therefore, we did only change a few abbreviations as follows.

Changes in the main document – line 126, 119, 104

Comment 4: What would be the concrete impact of the volumetric approach on clinical practice, on clinical decision making compared to standard clinical practice?

Reply 4: As we stated in the discussion, lines 150 - 160 the current measurement, follow up approach and subsequent procedure planning is based on planar diameter measurement. However, this clinical practice can be prone to error as the precise dimensions of the aortic remodeling (including the true and false lumen) can be under- or overestimated. Therefore, the volumetric measurement approach aims to improve shortcomings by a more elaborate measurement method. This on the other hand (if further studies confirm our findings), can change clinical practice from planar evaluation towards volumetric measurement after Thoraflex hybrid prosthesis implantation and might also influence follow up intervals.