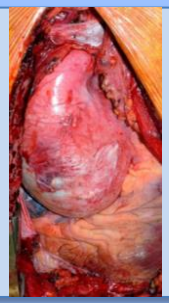
Elephant trunk technique: still a valid technique



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Elephant trunk
Reversed
elephant trunk

Elephant trunk procedure

- Indicated in extensive aortic aneurysmal disease
- Aortic arch and descending aneurysm
- Aortic arch and thoraco-abdominal aneurysm
- Not relevant in isolated arch or TAA(A)

- Open elephant trunk: part of staged plan
- Frozen elephant trunk: often as one stage


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How to do it

Extensive Aortic Replacement using "Elephant Trunk" Prosthesis

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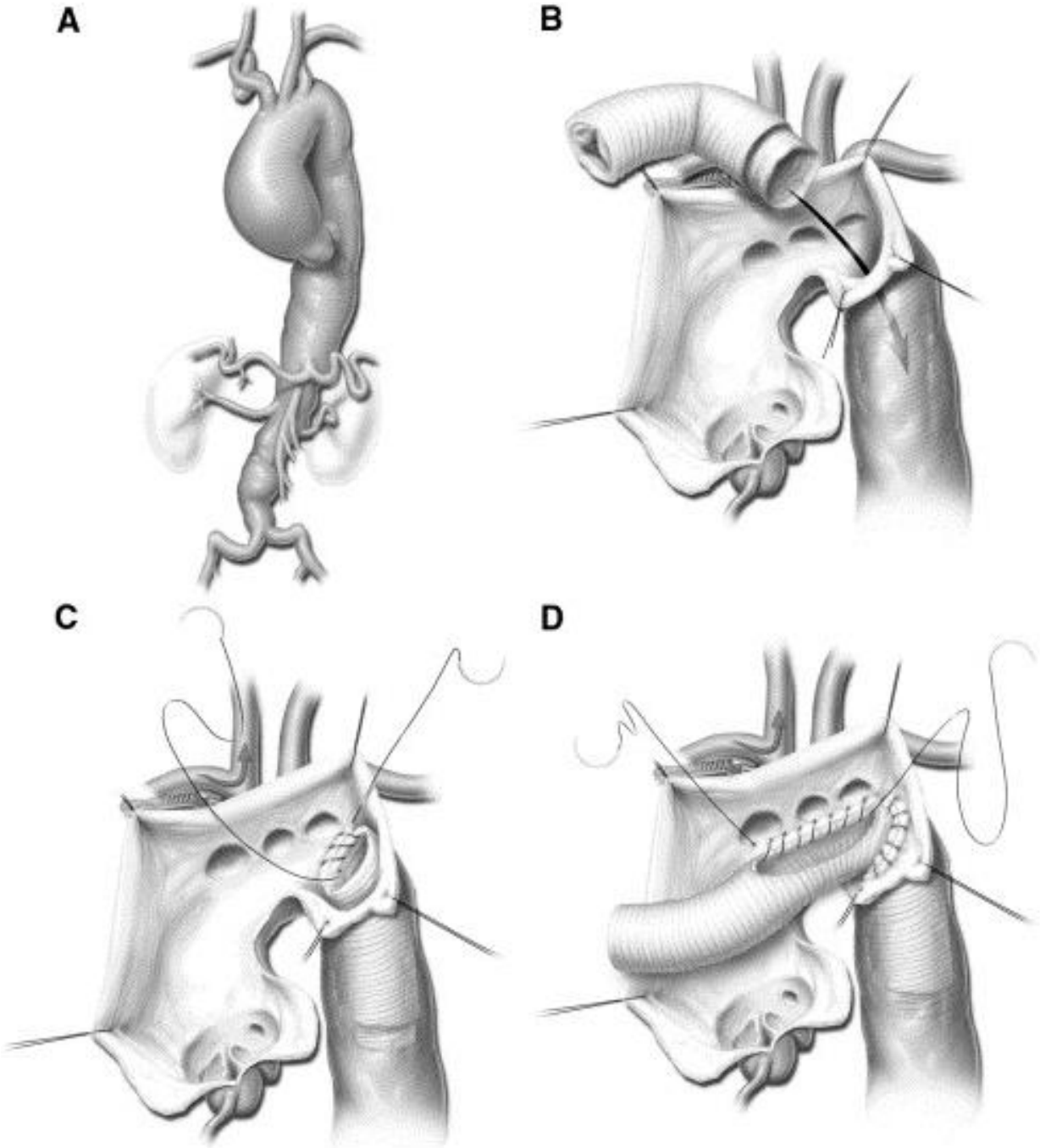
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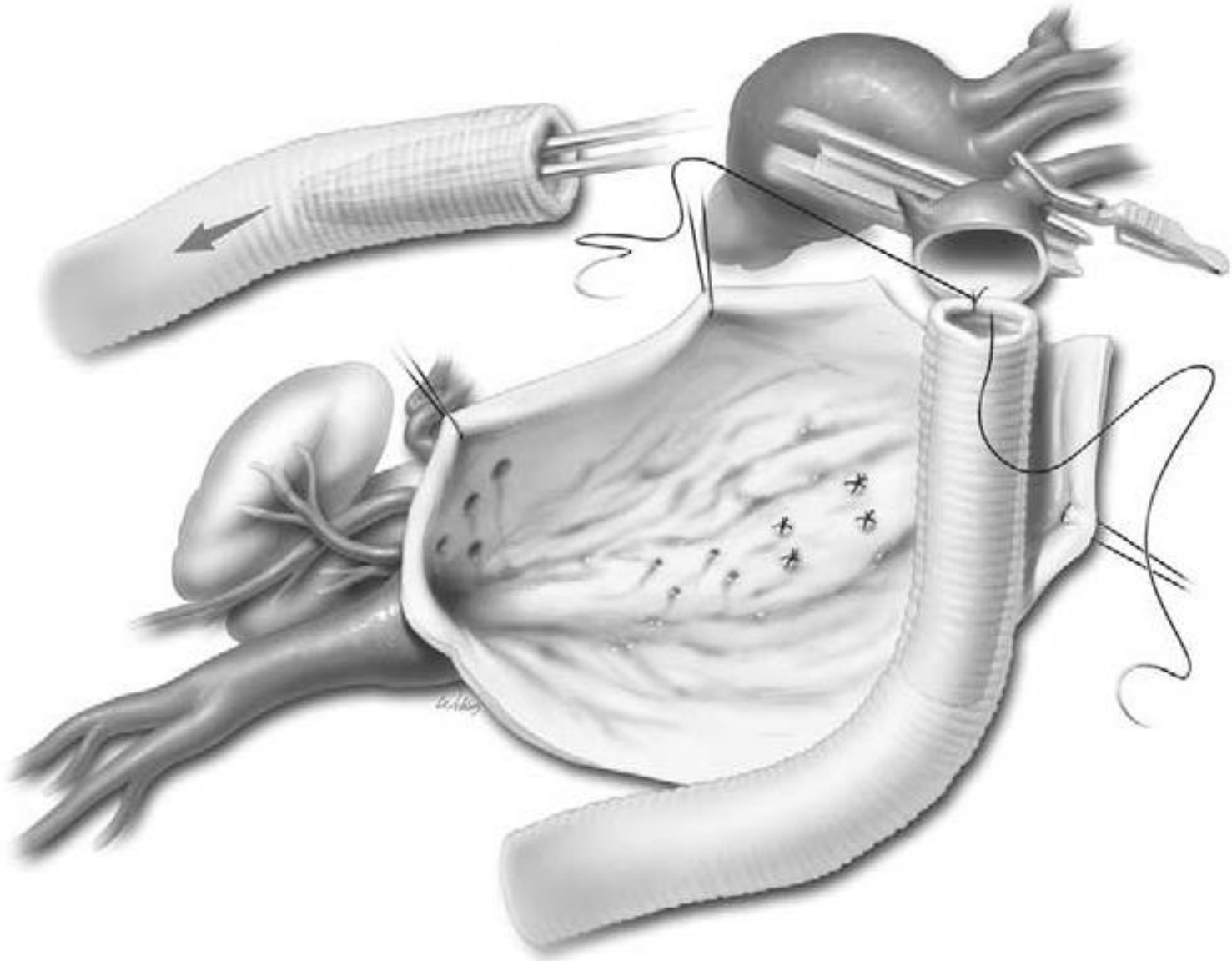

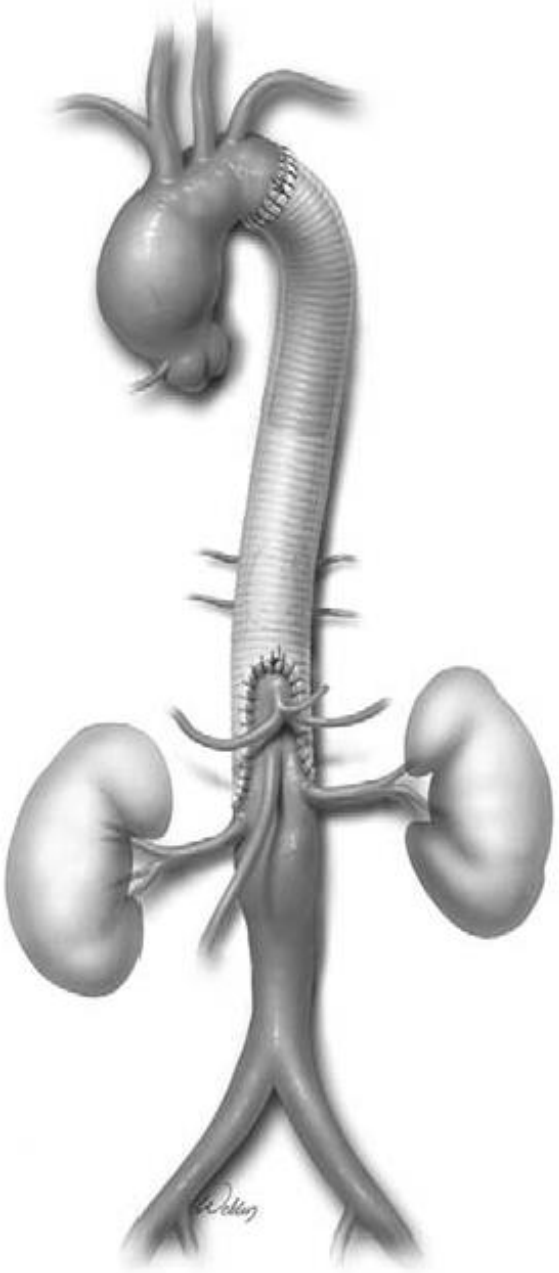


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L
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The Reversed Elephant Trunk Technique Used for Treatment of Complex Aneurysms of the Entire Thoracic Aorta

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Objective. A preferred technique for the staged treatment of patients with aneurysms involving the entire thoracic aorta is the elephant trunk technique, with replacement of the proximal (ascending and transverse aortic arch) aorta as the initial procedure. Some patients, however, need to have the distal aortic segments (descending and thoracoabdominal aorta) addressed during the first operation. We evaluated outcomes in a series of patients who underwent distal aortic replacement first using the reversed elephant trunk technique.

Methods. Thirty-eight patients underwent first-stage graft repair of the descending thoracic (n = 3) or thoracoabdominal (n = 35) aorta using the reversed elephant trunk technique. Twelve patients (32%) ultimately underwent second-stage aortic arch replacement after a mean interval of 3.9 months (range, 1.6–14 months).

Results. The operative mortality for the initial procedure was 16% (6/38 patients). One patient had a stroke (3%) and 1 patient developed paraparesis (3%). In the interval between the 2 procedures, there were 4 late deaths (4/32; 13%), 1 due to respiratory failure and 3 due to unknown causes. After the 12 completion procedures, there was 1 in-hospital death (8%) and there were no strokes. Five-year survival for the overall group was 51.3 ± 10.8%.

Conclusions. Surgical treatment of aneurysms involving the entire thoracic aorta remains challenging and is associated with substantial morbidity and mortality. The reversed elephant trunk technique facilitates staged repair in patients who require distal aortic replacement during the first operation.

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Staged repair of thoracic and thoracoabdominal aortic aneurysms using the elephant trunk technique: a consecutive series of 215 first stage and 120 complete repairs☆

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Abstract

Objectives: Repair of thoracic aneurysms (TA) involving the ascending, arch, and descending aorta results in substantial morbidity and mortality. This study evaluates outcomes with a two-stage elephant trunk (ET) technique. **Methods:** Two hundred and fifteen consecutive patients (pts) underwent total arch replacement using an ET (02/90—09/06). One hundred and thirty-nine pts (65%), group PC (planned completion; median age 68; 28—86 years), had extensive descending TA (Ø $\geq$ 5 cm) or dissections requiring complete repair. Seventy-six pts (35%), group CS (close surveillance; median age: 68; 20—87 years), had less severe distal dilatation (Ø $\leq$ 5 cm), and had close follow-up after ET rather than planned distal repair. **Results:** Hospital mortality in group PC pts (descending Ø: 6.2 $\pm$ 1.2 cm) was 6.5% (9/139) following ET. In group CS pts (descending Ø: 4.1 $\pm$ 0.7 cm), hospital mortality after ET was 5.3% (4/76); 4.7% (10/215) had strokes but survived. Eighty-six percent (112/130) of group PC pts who survived proximal repair returned for planned surgical (101) or endovascular (11) completion after a median of 56 (0—2189) days. Hospital mortality for distal repair was 7.5% (9/120); two ET stage two pts (2%) developed paraplegia. Eighty-nine percent (16/18; descending Ø: 6.9 $\pm$ 1.0 cm) of group PC pts who did not undergo planned completion died a median of 5.4 (1.2—91.1) months after ET stage one. Overall cumulative survival in group PC, which includes pts dying before or without stage two, was 69% after 1, and 55% after 5 years. Survival in group CS pts was 88% at 1, and 57% at 5 years. Eight pts in group CS subsequently underwent distal repair, but 22/76 (29%) group CS pts who survived ET stage one died during follow-up despite surveillance. **Conclusions:** The low mortality after stage one justifies liberal use of the ET technique to facilitate future open or endovascular TA repair of the distal aorta. The 5-year cumulative mortality curves, however, suggest that staged repair of extensive TA is superior to one-step repair only if stage two can be done before rupture occurs. If one-step repair is possible, it may be preferable.

The Elephant Trunk Technique for Staged Repair of Complex Aneurysms of the Entire Thoracic Aorta

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Background. Extensive thoracic aortic aneurysms that involve the ascending, arch, and descending segments require challenging repairs associated with substantial morbidity and mortality. The purpose of this report is to evaluate contemporary outcomes after surgical repair of extensive thoracic aortic aneurysms using a two-stage approach with the elephant trunk technique.

Methods. During a 15½-year period, 148 consecutive patients underwent total aortic arch replacement using the elephant trunk technique. Seventy-six of these patients (51%, 76/148) returned for second-stage repair of the descending thoracic or thoracoabdominal aorta 4.9 ± 7.5 months after the first stage.

Results. Operative mortality after the proximal aortic stage was 12% (18/148). Seven patients (5%) had strokes. Among the patients who subsequently underwent distal aortic repair, operative mortality was 4% (3/76). Two patients (3%) developed paraplegia. Long-term survival after completing the second stage of repair was 70 ± 6% at 5 years and 59 ± 7% at 8 years.

Conclusions. Contemporary management of extensive thoracic aortic aneurysms using the two-stage elephant trunk technique yields acceptable short-term and long-term outcomes. This technique remains an important component of the surgical armamentarium.

(Ann Thorac Surg 2006;81:1561–9)

Elephant Trunk Procedure: Newer Indications and Uses

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The classic elephant trunk technique for staged thoracic and thoracoabdominal aortic repair: Long-term results

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Objective: The classic elephant trunk (ET) technique has become the standard approach for patients with diffuse aortic disease requiring a staged thoracic and thoracoabdominal aortic repair. The aim of this study was to assess long-term outcomes and predictors for survival after surgical repair of extensive thoracic aortic disease with the ET technique.

Methods: Between 1984 and 2013, 248 consecutive patients were treated in our institution and analyzed retrospectively. Follow-up consisted of outpatient clinic visits including postoperative computed tomography imaging at 3 months and annually thereafter. Second-stage intervention was indicated if the diameter of the descending or thoracoabdominal aorta was greater than or equal to 60 mm, in case of a rapidly growing aneurysm and/or symptoms.

Results: Mean age was 65 ± 10 years; 44% were male. After first-stage ET, in-hospital mortality was 8% and permanent neurologic deficits were observed in 2% of patients. Median follow-up after the first stage was 48 months (range, 1-210 months). One hundred twelve patients (45%) underwent second-stage ET. Overall survival after first-stage ET was 75% and 67% at 5 and 10 years, respectively. Survival in patients with second-stage ET was 87%, compared with 65% in the group who did not undergo second-stage ET at the 5-year follow-up ($P < .001$) and 67% compared with 36% at the 10-year follow-up ($P < .001$). Predictor for mortality was the absence of second-stage ET ($P = .044$).

Conclusions: A 2-stage approach for diffuse aortic disease is a safe method. The acceptable mortality at the first stage justifies the use of the classic ET technique and allows subsequent repair of the distal aorta. Long-term survival is increased when both stages are completed. (J Thorac Cardiovasc Surg 2014;■:1-7)

A systematic review and meta-analysis on the safety and efficacy of the frozen elephant trunk technique in aortic arch surgery

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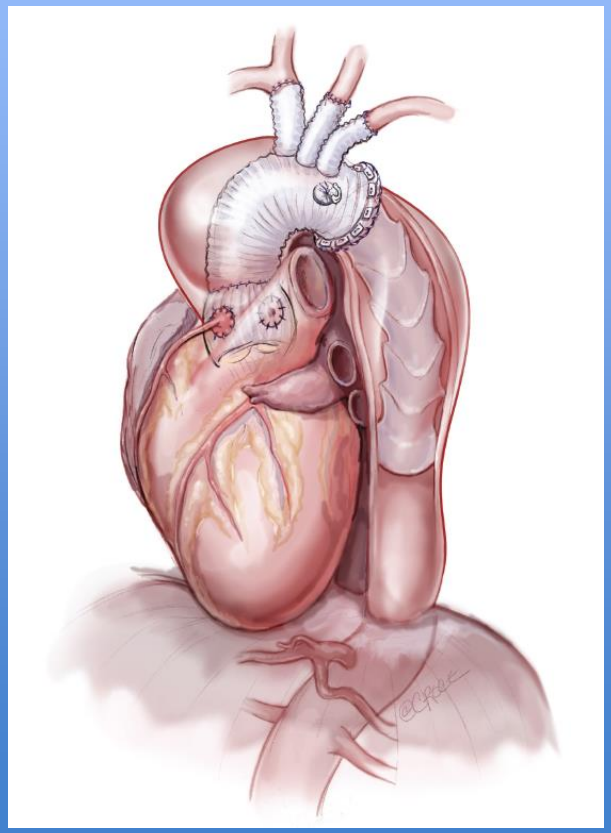

Ann Cardiothorac Surg 2013;2(5):581-591

Aortic arch and frozen elephant trunk

- 17 studies, 1,675 patients
- Acute (51.9%) and chronic (21.1) type A
- Acute (2.4%) and chronic (3.1%) type B
- Aneurysm 19.1%
- Pooled mortality 8.3%
- Stroke 4.9%, spinal cord injury 5.1%
- 5 year survival 63-88%

J Cardiovasc Med (Hagerstown). 2014 Nov;15(11):803-9. doi: 10.2459/JCM.0b013e328364559c.

Conventional versus frozen elephant trunk surgery for extensive disease of the thoracic aorta.

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Author information

Abstract

OBJECTIVE: To compare early and mid-term outcomes after repair of extensive aneurysm of the thoracic aorta using the conventional elephant trunk or frozen elephant trunk (FET) procedures.

METHODS: Fifty-seven patients with extensive thoracic aneurysmal disease were treated using elephant trunk (n=36) or FET (n=21) procedures. Patients with aortic dissection, descending thoracic aorta (DTA) diameter less than 40mm, and thoracoabdominal aneurysms were excluded from the analysis, as were those who did not undergo antegrade selective cerebral perfusion during circulatory arrest. Short-term and mid-term outcomes were compared according to elephant trunk/FET surgical management.

RESULTS: Preoperative and intraoperative variables were similar in the two groups, except for a higher incidence of female sex, coronary artery disease and associated procedures in elephant trunk patients. Hospital mortality (elephant trunk: 13.9% versus FET: 4.8%; P=0.2), permanent neurologic dysfunction (elephant trunk: 5.7% versus FET: 9.5%; P=0.4) and paraplegia (elephant trunk: 2.9% versus FET: 4.8%; P=0.6) rates were similar in the two groups. Follow-up was 100% complete. In the elephant trunk group, 68.4% of patients did not undergo a second-stage procedure during follow-up for a variety of reasons. Of these patients, the DTA diameter was greater than 51mm in 72.2% and two (6.7%) died due to aortic rupture while awaiting stage-two intervention. Endovascular second-stage procedures were successfully performed in all FET patients with residual DTA aneurysmal disease (n=3), whereas nine of 11 elephant trunk patients who returned for second-stage procedures required conventional surgical replacement through a lateral thoracotomy. Kaplan-Meier estimate of 4-year survival was 75.8±7.6 and 72.8±10.6 in elephant trunk and FET patients, respectively (log-rank P=0.8).

CONCLUSION: In patients with extensive aneurysmal disease of thoracic aorta, elephant trunk and FET procedures seem to be associated with similar satisfactory early and mid-term outcomes. The FET approach leads to single-stage treatment of all aortic disease in most patients, and facilitates endovascular second-stage treatment in patients with residual DTA disease. The elephant trunk staged-approach appears to leave a considerable percentage of patients at risk for adverse aortic events.

Considerations

- The elephant trunk technique is a safe technique to treat extensive aortic aneurysms (arch and TAA(A))
- In open surgery it is part of a staged procedure, followed by open or endo
- The frozen ET technique is often single stage but carries higher paraplegia rates
- The period between two stages is critical