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Total arch replacement versus proximal aortic replacement in acute type A aortic dissection: Aggressive versus conservative

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Abstract

Background: Acute type A aortic dissection (ATAAD) is a life-threatening medical condition requiring urgent surgical attention. It is estimated that 50% of ATAAD die within 24 hours of onset, with the mortality rate is increasing by 1-2% every additional hour without prompt intervention. A variety of ATAAD surgical repair techniques exist which has sparked controversy within the literature, with the main two strategies being proximal aortic replacement (PAR) and total arch replacement (TAR). Nevertheless, the question of which of these two strategies if the more optimal is still debatable. Aims: This commentary aims to discuss the recent study by Sa and colleagues which presents a pooled analysis of Kaplan-Meier-derived individual patient data from studies with follow-up comparing aggressive (TAR) and conservative (PAR) approaches to manage ATAAD patients. Methods: A comprehensive literature search was performed using multiple electronic databases including PubMed, Ovid, Google Scholar, EMBASE and Scopus in order to collate the relevant research evidence. Results: The more aggressive TAR approach for treating ATAAD seems to yield more favourable results including more optimal long-term survival as well as a lower need for reoperation. The frozen elephant trunk (FET) technique can be considered the mainstay TAR technique. Conclusion: It is valid to conclude that TAR with FET is the superior strategy for managing ATAAD patients.

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Running title: Total arch vs. proximal aortic replacement

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Keywords: Acute type A aortic dissection (ATAAD), aortic arch, total arch repair (TAR), proximal arch repair (PAR), frozen elephant trunk (FET), hemiarch.

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Abstract

Background : Acute type A aortic dissection (ATAAD) is a life-threatening medical condition requiring urgent surgical attention. It is estimated that 50% of ATAAD die within 24 hours of onset, with the mortality rate is increasing by 1-2% every additional hour without prompt intervention. A variety of ATAAD surgical repair techniques exist which has sparked controversy within the literature, with the main two strategies being proximal aortic replacement (PAR) and total arch replacement (TAR). Nevertheless, the question of which of these two strategies if the more optimal is still debatable.

Aims : This commentary aims to discuss the recent study by Sa and colleagues which presents a pooled analysis of Kaplan-Meier-derived individual patient data from studies with follow-up comparing aggressive (TAR) and conservative (PAR) approaches to manage ATAAD patients.

Methods : A comprehensive literature search was performed using multiple electronic databases including PubMed, Ovid, Google Scholar, EMBASE and Scopus in order to collate the relevant research evidence.

Results : The more aggressive TAR approach for treating ATAAD seems to yield more favourable results including more optimal long-term survival as well as a lower need for reoperation. The frozen elephant trunk (FET) technique can be considered the mainstay TAR technique.

Conclusion : It is valid to conclude that TAR with FET is the superior strategy for managing ATAAD patients.

Acute type A aortic dissection (ATAAD) is a life-threatening medical condition requiring urgent surgical attention. It is estimated that 50% of ATAAD patients die within 24 hours of onset, with the mortality rate is increasing by 1-2% every additional hour without prompt intervention [1]. Although surgical intervention is well-established as being the gold standard approach for treating ATAAD, a variety of surgical techniques exist which has sparked controversy within the literature. The main two strategies for ATAAD surgical repair are proximal aortic replacement (PAR), either limited to the ascending aorta or extending to include the lesser curvature of the aortic arch (i.e. hemi-arch), and total arch replacement (TAR) using the elephant trunk technique (conventional or frozen) [2]. Nevertheless, the question of which of these two strategies if the more optimal is still debatable, which was addressed in a recent meta-analysis by Sa et al. [2].

We read with great interest the above study which comparatively investigated the effects of both strategies on the all-cause mortality risk and need of reoperation over time. The authors performed a pooled analysis of Kaplan-Meier-derived individual patient data (IPD) from studies with follow-up comparing aggressive (TAR) and conservative (PAR) approaches to manage ATAAD patients. The study benefits from a highly robust methodology including a thorough literature search strategy, effective inclusion/exclusion criteria, assessment of risk of bias and advanced comprehensive statistical analyses, all of which have led to a well-written and very impactful research piece. A total of 18 studies were included in the meta-analysis comprising 5243

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patients with follow-up (conservative: 3676 patients; aggressive: 1567 patients). It is worth noting that this study can be considered the first of its kind using reconstructed time-to-event data and Kaplan-Meier-derived IPD to directly compare PAR and TAR. The authors concluded that TAR seems to be the more favourable approach for treating ATAAD due to improved long-term survival and lower risk of need of reoperation [2].

Several cohort studies have compared PAR and TAR for ATAAD, with the majority of results aligning with those of Sa et al. [2] suggesting TAR's superiority over PAR (with or without hemiarch). In the 14-year study of 213 ATAAD patients by Vendramin et al. [3], Group 1 consisted of 138 patients who underwent PAR while Group 2 included 75 TAR patients. Overall hospital mortality was 12% and 5% in Group 1 and 2, respectively, whilst survival at 5 and 10 years was 72 ± 4% and 49 ± 5% in Group 1 and 77 ± 6% and 66 ± 9% in Group 2 (P = 0.073). Furthermore, freedom from reoperation at 5 and 10 years was 92 ± 2% and 89 ± 3% in Group 1 and 98 ± 1% at both follow-up points in Group 2 (P = 0.068) [3]. In their 21-year experience, Ok et al. [4] operated on a total of 365 ATAAD patients using hemiarch replacement technique in 248 and TAR in 117. Both early and late mortality rates were lower in the TAR group than the hemiarch group (early: 6.8% vs 9.3%, P = 0.56; late: 22.2% vs 27.4%, P = 0.35). On the other hand, a higher proportion of TAR patients required late reintervention (17.9% vs 12.5%, P = 0.22) [4]. Additionally, out of the 253 ATAAD patients in Uchida et al. [5], 169 underwent PAR and 84 TAR. Similar to the above results, the TAR group experienced lower mortality (6% vs 7.1%). Similarly, freedom from all-cause mortality at 9-years of follow-up was 84.5% with TAR compared to 80.5% with PAR. Moreover, only 6% of TAR patients required reparative surgery whilst this was needed in 13.6% of PAR patients [5]. All the aforementioned evidence, in addition to the results of Sa et al. meta-analysis, prove that TAR is the more effective treatment for ATAAD.

The frozen elephant technique (FET) has become the mainstay approach for TAR in a range of thoracic aortic pathologies not limited to ATAAD, predominantly phasing out conventional elephant trunk techniques. This is due to the superior clinical outcomes it can achieve as evident across the literature [6-8]. FET has been demonstrated to yield excellent survival, both on the short- and long-term, as well as a low incidence of postoperative complications and, in turn, minimal need for reintervention. A recent meta-analysis of 85 studies totalling 10960 patients revealed a pooled in-hospital mortality rate of 7% (95% CI 0.05-0.09; I2=76%), 12% for renal failure (95% CI 0.09-0.15; I2=88%), 3% (95% CI 0.02-0.04; I2=0%) for paraplegia and 6% (95% CI 0.05-0.08; I2=73%) for cerebrovascular accidents [9]. Furthermore, a study of 931 patients who underwent TAR with FET using the Terumo Aortic Thoraflex Hybrid prosthesis lends further evidence to support TAR's high efficacy. To note, ATAAD accounted for 17.5% of the total cases. The authors reported a 0.6% 30-day mortality rate and a 7-year survival rate of 99%. Additionally, freedom from adverse events at 84 months was 95% [10]. Lastly, a recent review by Geragotellis et al. [11] showcased the favourable reintervention rates associated with TAR using FET.

In conclusion, TAR with FET should be considered the gold-standard management strategy for ATAAD as it has shown to yield more optimal long-term survival as well as a reduced need for reoperation.

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