Too Big to Fail? – An Aggressive Strategy For a Dire Problem

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Abstract

Tracheo-innominate fistula (TIF) is a reported complication of tracheostomy that typically presents with a herald bleed. The phenomenon of an aorto-tracheal fistula has similar pathology and presentation to TIF, but no standard surgical repair. In the manuscript by Musgrove et al. in the Journal of Cardiac Surgery the authors propose a surgical treatment, that is reproduceable for the correct anatomic configuration - an ascending and aortic arch replacement, pericardial patch of the tracheal defect, and omental flap coverage to prevent infection. While this intervention seems a large undertaking for a small defect, it is a safe and durable repair.

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Commentary: Too Big to Fail? – An Aggressive Strategy For a Dire Problem

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Abstract:

Tracheo-innominate fistula (TIF) is a reported complication of tracheostomy that typically presents with a herald bleed. The phenomenon of an aorto-tracheal fistula has similar pathology and presentation to TIF, but no standard surgical repair. In the manuscript by Musgrove et al. in the *Journal of Cardiac Surgery* the authors propose a surgical treatment, that is reproduceable for the correct anatomic configuration - an ascending and aortic arch replacement, pericardial patch of the tracheal defect, and omental flap coverage to prevent infection. While this intervention seems a large undertaking for a small defect, it is a safe and durable repair.

A known complication of tracheostomy is a tracheo-innominate fistula (TIF). The incidence of this complication is estimated as 0.1-1%, with the most common presenting symptom being hemorrhage.[1]A less frequently described, but similar anatomic entity, is the aorto-tracheal fistula. These are also rare, and can occur after

radiation or prior aortic replacement. This almost uniformly fatal pathology has a similar presentation to TIF, although the options for repair are not well described.

Musgrove et al. report a unique case in which a 48-year-old patient presents with small volume hemoptysis in the setting of prior radiation.[2] Bronchoscopy revealed a small defect in the trachea near the carina. They describe a technique whereby a patient undergoes a zone 1 arch replacement for the infected aorta and a combination pericardial patch and omental flap to cover the tracheal defect. While the patient in this example did suffer one complication, twisting of the omental flap resulting in gastric outlet obstruction, the concept of the repair is clear and reproducible. It seems that the procedure could be readily utilized in the appropriate patient. The authors perform an ascending and arch replacement with innominate artery debranching using hypothermic circulatory arrest, antegrade cerebral perfusion, and both antegrade and retrograde cardioplegia.[2]

Three concerns arise in this type of case, touched on by the authors. First, the defect in the aorta. In this report the tracheal defect is described as 3 mm. Fortunately the patient had a small defect and was able to present in stable condition for further work-up of hemoptysis. Larger, more hemodynamically significant defects likely result in poor early survival. Mortality from a tracheo-arterial fistula based on case reports in the literature (that is, aorta or innominate fistula) is approximately 75%.[3] There is no mention of endovascular temporization, but one could imagine a role this may play when the anatomy allows for it. Second, a major concern of the operation is the infected field and suitable choice of aortic and arch replacement. The authors note they could have used a homograft. Rifampin soaked Dacron is another option. The addition of the omental flap likely played a large role in the success of the case. Third, the location of the fistula with respect to the great vessels; in this scenario the authors use a multibranch device and only needed to debranch the innominate artery. However, when faced with a larger defect, or where infected aortic tissue spans the takeoff of the great vessels, a total arch replacement may be necessary. In the particular presentation described by Musgrove et al[2], their technique of repair is both large in size and scope but also appropriate for the given pathology.

While the significance of this nearly uniformly fatal pathology cannot be minimized, this is a particularly large operation to address the repair of a small hole. The location of the fistula in the posterior arch makes a less invasive operation challenging, especially in an irradiated field with active infection. Similarly, operating in a redo chest with a previously placed aortic graft would pose a problem when attempting to isolate the fistula without the adjunct of cardiopulmonary bypass or circulatory arrest. A side biting clamp and patch repair of the hole might be sufficient, but may not result in a durable repair. Endovascular stent grafting has been used for treatment of TIF[4], however when applied to a fistula to the aortic arch, infection of the stent graft poses a prohibitive risk. Moreover, seal is not possible at the takeoff of the great vessels.

A key lesson in this paper is that rather than trying to patch or inadequately treat the 3 mm tracheal defect, the authors successfully used a safe method to resect all infected tissue and replace the aorta with a graft that is protected from infection by an omental patch. We (Figure 1) commend the authors for performing a well planned and executed repair of an aorto-tracheal fistula. Not only did the patient survive beyond one year, but suffered no infectious complications. The authors have provided a valuable tool for treatment of a rare, deadly, and daunting complication efficiently, effectively, and in a straightforward manner.

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Figure 1: Jennifer L. Perri, MD/MBA (left) and Ryan P. Plichta MD (right)