Open stent-grafting: aborted procedure in a patient with mega aorta syndrome

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Abstract

Objective: Open stent-grafting is a recent technical modification of endoluminal stent-grafting, in which a stent-graft is inserted into the descending thoracic aorta through an opening in the aortic arch, to treat distal arch aneurysms or aortic dissection. Controversy remains as to whether patients with mega aorta syndrome, or those with very wide aneurysm necks, could be candidates for stent-graft treatment – open or endoluminal. Methods: We recently attempted open stent-grafting in a patient with mega aorta syndrome who had a distal aortic arch aneurysm. A previous attempt at surgical resection of the aneurysm through left thoracotomy ended in failure because of severe adhesion in the left lung. This time, we planned total arch replacement with open stent-graft exclusion of the aneurysm. However, open stent-grafting had to be abandoned intraoperatively due to technical difficulties as well as our lack of experience with such difficult cases. Conventional total arch replacement with elephant trunk was performed instead. Results: Due to its deep location, the distal neck of the aneurysm could not be reached through median sternotomy and, therefore, the distal aortic arch anastomosis was performed within the aneurysm cavity. Thus, the distal portion of the aneurysm was not excluded from circulation. The future treatment plan in the present case is further complicated by the fact that a second-stage surgery through left thoracotomy will not be possible. Conclusions: Conventional total arch replacement proved rather inappropriate as a treatment strategy in the present case. Open stent-grafting might have been a more useful approach in spite of the challenges posed by the aneurysm. There needs to be a consensus as to whether patients with mega aorta syndrome or those with very wide aneurysm necks could be candidates for stent-graft treatment – open or endoluminal in difficult circumstances.

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Keywords: Open stent-grafting; Mega aorta syndrome; Total arch replacement; Left thoracotomy

1. Introduction

Open stent-grafting or the frozen elephant trunk procedure represents one of the latest technical modifications of the rapidly evolving stent-grafting technology [1]. The technique involves insertion of a stent-graft into the descending aorta from the aortic arch through a median sternotomy to treat distal arch aneurysm or aortic dissection [2,3]. The main advantage of the stented graft used in this particular technique is that it obviates the need for the time-consuming and often cumbersome distal graft-to-aorta anastomosis. The proximal aortic anastomosis is, however, done by conventional method. The technique is still in its infancy and, so far, there has not been any device or insertion sheath specifically designed for it. The few centers that are practicing the technique are therefore, fabricating their own stent-graft devices and employing delivery systems that are commercially available and designed for conventional endoluminal purposes [2–4]. Less commonly, some groups have reported the use of indigenously developed unique delivery systems designed specifically for open stent-grafting [5,6]. Unlike endoluminal stent-grafting procedures, fluoroscopy is not usually used to aid device placement. Instead, device insertion is carried out under direct vision with transesophageal echocardiography serving as a guide in most situations. Although initial experiences with this technique appear to be satisfactory, it is not clear as to whether the technique can also be applied in patients with mega aorta syndrome or those with equally challenging aneurysm geometry.

2. Patients and methods

We recently attempted open stent-grafting in a 73-year-old male patient with mega aorta syndrome (Fig. 1) who had a huge distal arch aneurysm with a maximum diameter of 10 cm (Fig. 2). Two years earlier, graft replacement of the thoracic aneurysm was attempted through left thoracotomy. However, the procedure had to be abandoned due to intractable bleeding that ensued while dissecting through the severe adhesion around the left lung. This time, we planned ascending aortic and total arch replacement with open stent-grafting through median sternotomy.

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although there was concern about the fate of a mega aorta receiving a stent-graft. The site where the distal graft anchoring was planned had a diameter of 40 mm. Although it had a thin layer of thrombus over its posterior and lateral walls, as evident from the pre-operative CT scan (Fig. 3), we chose this site because of its near-circular shape and its relative proximity to the site of delivery sheath introduction. We prepared an open stent-graft device of 40 mm diameter (Fig. 4). Device over-sizing was not possible due to the unavailability of stents larger than 40 mm diameter. The device was incorporated within a commercially available 30 Fr. delivery sheath (Fig. 4).

After median sternotomy and with the patient on circulatory arrest, the aortic arch was opened. Cerebral protection was provided with antegrade selective cerebral perfusion. Unfortunately, as we were preparing for the insertion of the stent-graft, transesophageal echocardiography demonstrated accumulation of a considerable amount of mural thrombus at the stent-graft anchoring site. Comparing this finding with that of the preoperative CT scan, it was interpreted that a definitive increase in the mural thrombus had taken place. The increased thrombus as well as the lack of device over-sizing was considered unfavorable for a water-tight distal fixation. Moreover, being a group having limited experience with open stent-grafting, we did not have the necessary confidence to deal with such a difficult situation. Therefore, we gave up the idea of open stent-grafting and instead performed routine total arch replacement with elephant trunk. However, due to its deep location, we were unable to reach the distal aneurysm neck and thus the distal anastomosis had to be performed at a site that was within the aneurysm cavity. As a result, the aneurysm remains pressurized distally as is evident from the post-operative MR angiogram (Fig. 5) and perhaps the only way to exclude it is insertion of a...
transfemoral stent-graft using the elephant trunk as the proximal cuff.

3. Discussion

Patients with mega aorta syndrome are treated with replacement of the entire aorta by conventional surgical means usually in stages [7]. A staged surgical strategy, though often successful, puts the patient to a series of highly invasive and potentially hazardous procedures. Moreover, these patients often carry other co-morbid conditions that may not always permit such invasive surgery. Stent-grafts might come as an option in these patients. However, there is considerable debate as to whether patients with landing zone diameters in excess of 40 mm should receive stent-graft treatment [8]. A Medline literature search did not yield any report on endoluminal or open stent-grafting in patients with mega aorta syndrome though there have been sporadic reports on stent-grafting in Marfan patients [9,10]. Although we carried out routine total arch replacement with insertion of elephant trunk in the present case, this, admittedly, was not the most appropriate procedure for this particular patient because the second stage surgery through left thoracotomy would not be possible.

Our decision not to carry out stent-grafting in the present case stemmed from our intraoperative judgment of an increased thrombus accumulation at the anchoring site, based on the intraoperative TEE findings alone, might have been somewhat subjective. Our lack of adequate experience with open stent-grafting also played a role in the decision-making. A more experienced group having specific technical expertise with open stent-grafting might well have decided to go ahead with the procedure despite the challenges associated with it.

We believe that a stent-graft would have ensured a more definitive exclusion of the aneurysm – a goal that remains unfulfilled by the surgical treatment. Having said so, we also think that stent-grafting in mega-aorta syndrome represents an issue that deserves to be considered separately from that in most other situations. Technical skill, though an important factor, should not be seen as the whole answer to the problem. The present communication is aimed at inspiring a discussion on whether patients with mega aorta syndrome or those with a very wide anchoring zone could be candidates for stent-grafting in difficult circumstances as the one presented herein.

References


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Comment: I would like to make a few comments concerning the case report ‘Open stent grafting: aborted procedure in a patient with mega aorta syndrome’ by Bashar et al. [1].

Fig. 5. Post-operative magnetic resonance angiogram. The distal part of the thoracic aneurysm remains perfused.