Bailed out by TEVAR in a horrendous bleeding aortic arch cannulation site

Joseph Motshedisi Sekgololo a,*, Risenga Frank Chauke a, Peter Shere Ramoroko a, Alireza Dehghan-Dehnavi b

a Cardiothoracic Surgery Department, Sefako Makgatho Health Sciences University, Dr George Mukhari Academic Hospital, Pretoria, South Africa
b Radiology Department, Sefako Makgatho Health Sciences University, Dr George Mukhari Academic Hospital, Pretoria, South Africa

1. Background

Thoracic Endovascular Aortic Repair (TEVAR) offers many advantages compared to conventional open surgery for specific aortic disease. It is currently the gold standard for conditions such as complicated Type B aortic dissection. Other indications include thoracic aortic aneurysm and proximal descending aortic disruption. In this case report, TEVAR was used, for first time to bailout surgeons for horrendous bleeding from behind distal aortic arch cannulation site following composite ascending aortic replacement with a size 23 mm stentless valve and Dacron tube graft in a Hemi-arch procedure for Debakey type II dissection in patient with a Bovine trunk arch. TEVAR was used for first time for aortic arch cannula site bleed in the literature; hence, this was an interesting write-up to embark on. More importantly, a favourable anatomy of type B bovine trunk allowed this bailout intervention

2. Case report

This report, done in compliance with SCARE criteria (Agha et al. [1] is of a 72-year-old African female with a background of systemic hypertension on treatment. She complained of a sharp anterior chest pain, which radiated to the back and shortness of breath. The patient was acutely ill and generally frail with tachypnea (31 breath/minute), tachycardia (108 beat/minute), saturating at 98% on oxygen supplementation and had a high blood pressure (140/80 mmHg). She was fully conscious with no neurological deficits. Cardiovascular examination revealed a hyperdynamic apical impulse, which was not displaced and a cooing early diastolic murmur heard best on the left sternal edge. Bloodlines were all normal. The patient was admitted to ICU with anti-impulse therapy (analgesia, anti-hypertensives, beta-blockers and anti-angiotyics) while waiting for a completion of the other investigations.

* Corresponding author at: Cardiothoracic Surgery Department, Sefako Makgatho Health Sciences University, P.O Box 124, MEDUNSA, South Africa.
E-mail address: motshedisi.sekgololo@gmail.com (J.M. Sekgololo).

https://doi.org/10.1016/j.jsct.2021.105768
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A chest X-ray (CXR) demonstrated mediastinal widening with enlarged ascending, arch and descending aorta. Cardiopulmonary index was also enlarged, suggestive of cardiomegaly [Fig. 1]. Computed tomography angiogram (CTA) showed dissection involving the ascending aorta with intimo-medial flap, bivane aortic arch and bilateral pleural effusions. [Fig. 2A–B]. A transthoracic echocardiogram (Echo) showed dissecting ascending aneurysm with an involvement of sinotubular junction, resulting with severe aortic valve regurgitation. A diagnosis of DeBakey II dissecting aortic aneurysm with severe aortic regurgitation was confirmed.

The patient underwent composite ascending aortic replacement with a size 33 mm stentless valve and Dacron tube graft for hemi-arch replacement via median sternotomy a week after admission. The operation was delayed, because the patient was reluctant to consent. Arterial cannulation was planned for right axillary site, but due to intra-operative instability of the patient, the anterior distal aortic arch site was directly cannulated with the aid of an epiaortic ultra-sound, using a size 22 F DLP straight arterial line. A single two stage venous cannula in the right atrium was used for venous drainage. The monitoring of the patient was standard for arch surgery. A Freestyle composite valve was used to replace the aortic root, which was subsequently anastomosed to the Dacron graft, the Hemi-arch replacement was undertaken [Fig. 3A]. A Freestyle valve was chosen in this case, because the patient was an elderly, frail; and she had history of poor compliance to the medications. The immediate post-operative results were satisfactory; however, the patient continued to bleed from the arch cannulation site, which
Fig. 4. A–C: CT angiogram of the chest post-surgery shows Coronal (a), (Maximum Intensity Projection) MIP sagittal (b), and axial (c) images demonstrating aortic arch post-surgery extravasation (→) and mediastinal hematoma (←).

Fig. 5. A, B: Digital subtraction angiogram (DSA) images of thoracic aorta shows a (a) bovine arch (←), (b) Stent graft (→) deployed distal to the brachiocephalic artery and covering the left subclavian artery (←).

did not stop despite several attempts to secure it. The aorta was quite friable, which made the situation worse. The bleeding site was then packed with swabs and the alternative plan was to bypass the bleeding area with Thoracic Endovascular Aortic Repair (TEVAR) stent, which was an unplanned and desperate measure. Vascular surgeons were consulted, and they did an on-table angiogram, which failed to diagnose the bleeding site. TEVAR was then abandoned and the patient was transferred to ICU with swabs insitu and closed sternum. A CTA was repeated day two post-surgery and it revealed contrast extravasation on the arch suggesting the leak with mediastinal hematoma [Fig. 4A–C]. The patient underwent a planned TEVAR plus swabs removal, the following day in an angiography theatre.

At TEVAR left subclavian artery was covered due inadequate landing zone three. The stent was deployed in zone two. The left common carotid was not compromised, because of adequate landing zone one and bovine type two configuration. A left subclavian artery was occluded, with an endovascular occluder to prevent ‘steal effect’. Due to the frailty of the patient, the decision was taken not to do left common carotid or brachiocephalic artery to the left subclavian bypass. A post-TEVAR angiogram was satisfactory [Fig. 5A–B]. The patient was transferred to ICU in a stable condition and subsequently to recovery Wards. She was discharged to home eight days post-surgery. On her first month follow-up, she had recovered very well. Control CTA, Echo and electrocardiogram (ECG) were all satisfactory. The next follow-up with cardiothoracic team will be after 6 months and then yearly.

3. Discussion

The case reported above is complex, unique and unprecedented in as far as its nature is concerned. The bovine arch served as an advantage for avoidance of left common carotid artery occlusion in this case. Bovine arch is divided into two subtypes, which are type A and type B [2–4]. Type A comprises of trifurcation of innominate artery into left common carotid, right carotid and right subclavian
artery. Type B is found in approximately 20% [2–4] of population and it involves common origin of innominate and left subclavian artery. The case reported here is of type B bovine arch. Both subtypes are common in the black population [2]. The arch in this case had inadequate landing zone three, hence the left subclavian artery was covered with the stent. Left common carotid was not covered due to type B bovine trunk configuration. Landing zone three involves proximal descending thoracic aorta, zone two is proximal to the left common carotid artery and distal to left subclavian artery. Landing zone one is distal to innominate artery and distal to left common carotid artery [5]. It should be noted that the above classification applies to the normal arch.

TEVAR is an emerging gold standard treatment modality for specific aortic disease [5]. In this case report, it was used as a staged hybrid procedure following failure to control bleeding on an arch cannula site, which has not been reported before. However, as mentioned above the challenge was inadequate landing zone, which led to occlusion of left subclavian artery. In this case, TEVAR saved the patient from another possible major surgery, which could have involved going on cardiopulmonary bypass again. The indications for TEVAR in normal circumstances include thoracic aortic aneurysm, type B aortic dissection and traumatic aortic injury. Other additional uncommon indications include fistula between aorta and other structures e.g. aortobronchial fistula [6,7]

4. Conclusion

TEVAR for uncontrolled bleeding aortic arch cannulation site was never reported before; hence, this was important case report to embark on. The bovine trunk configuration, in this instance served as an advantage, because the surgeons were sure of patency of the left common carotid artery post-TEVAR. A call for TEVAR in the case of, this patient bailed out the surgical team and saved life, indeed.

Declaration of Competing Interest

The authors report no declarations of interest.

Sources of funding

None.

Ethical approval

Sefako Makgatho University Research Ethics Committee (SMUREC) approved the publication of this case report.

INSTITUTIONAL REVIEW BOARD (SMUREC/M/338/2020).

Consent

Written informed consent to publish this case report and images was obtained from the patient. The copy of written informed consent will be available for Editor-in-Chief on request.

Author contribution

All authors wrote the case report.

Dr. J.M. Sekgololo organized the manuscript and critically revised the paper.

Registration of research studies

Not applicable.

Guarantor

Dr. J.M. Sekgololo.

Provenance and peer review

Not commissioned, externally peer-reviewed.

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