The New Delivery Method for Cardioplegic Solution in Type A Aortic Dissection

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Aorta (Stamford)

Abstract

Adequate myocardial protection is crucial for a successful cardiac surgery. In type A aortic dissection, standard methods of delivery of cardioplegic solution may not be adequately effective. Ineffectiveness may happen due to both features of the anatomy of the dissection and to peculiarities of the delivery method itself. We present a new method of delivering a cardioplegic solution using a Foley catheter through the orifice of the brachiocephalic trunk or the left common carotid artery.

Keywords

- aortic dissection
- myocardial protection
- thoracic aorta

Adequate myocardial protection is crucial for a successful cardiac surgery. In type A aortic dissection, standard methods of delivery of cardioplegic solution may not be adequately effective. Ineffectiveness may happen due to both features of the anatomy of the dissection and to peculiarities of the delivery method itself. We present a new method of delivering a cardioplegic solution using a Foley catheter through the orifice of the brachiocephalic trunk or the left common carotid artery.

Technics

After a median skin incision with a slight elongation upward to the left, followed by a full sternotomy, the branches of the aortic arch are mobilized. We put purse-string sutures on the base of the left subclavian artery (LSA) and cross-clamp it at the origin and 3 cm above the ostium and then transect the artery. Under visual control, we insert an arterial cannula through the LSA ostium into the true lumen of the proximal part of the descending aorta[1] (►**Fig. 1A**).

To perform aortic branch replacement and provide cerebral perfusion we use multibranch polyester (Dacron) graft $12 \times 10 \times 8 \times 8$ (TAPP, Vascutek Ltd., Renfrewshire, Scotland, UK) and "opposite branch first" technique.[2] First made is the anastomosis of 10-mm branch and distal end of the LSA. Branch 8 mm is then connected to a side branch of the arterial line (►**Fig. 1A**). Pericardium is then opened, the right atrium cannulated by two-stage cannula or the veins cannulated separately. The cardiopulmonary bypass (CBP) and left subclavian perfusion are started.

Next, we put purse-string sutures on the orifices of the brachiocephalic trunk and the left common carotid artery and take them into the tourniquet. Using 8- and 12-mm branches of the multibranch graft we replace the transected branches of the aortic arch (left carotid artery and brachiocephalic artery) and begin perfusing these arteries (►**Fig. 1B**).

After initiation of CBP and perfusion of the aortic arch branches, we cross-clamp the aortic arch between the orifice of the brachiocephalic trunk and the left common carotid artery or more distally between the orifice of the left common carotid artery and the LSA.

Then, through the remaining stump of the brachiocephalic trunk or the left common carotid artery, we insert a Foley catheter into the ascending aorta, inflate it, tighten the tourniquet, and start the infusion of the cardioplegic solution (►**Figs. 1C**, **2A**).

When the dissection extends to the brachiocephalic trunk or the left common carotid artery, we insert the catheter into

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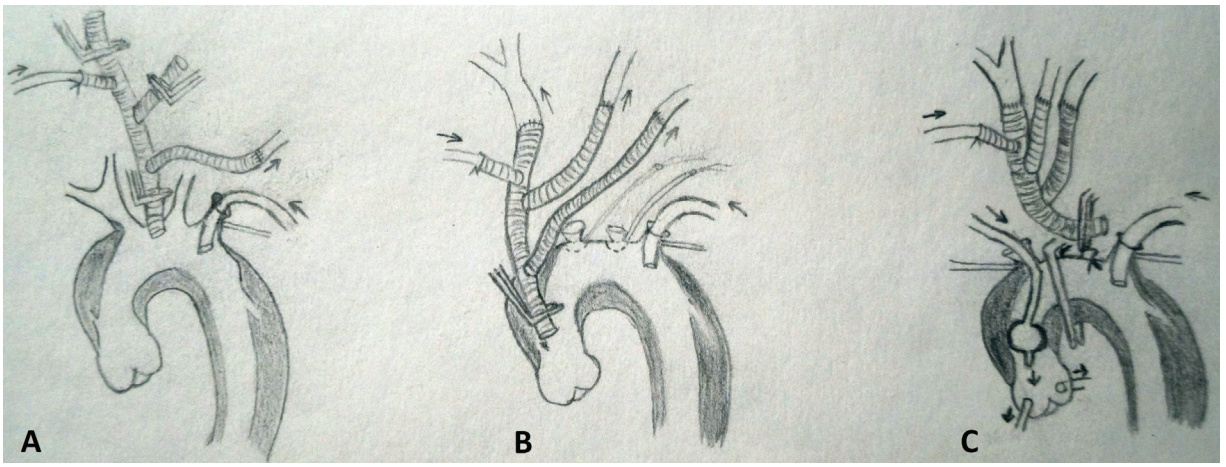

Fig. 1 (**A**) The arterial cannula is inserted through the left subclavian artery ostium into the proximal part of the descending aorta. Made is the anastomosis of 12 mm 12 × 10 × 8 × 8 Vascutek graft branch and distal end of the left subclavian artery. (**B**) Anastomoses of the aortic arch branches are completed, total cerebral perfusion is started. Origins of the left common carotid and brachiocephalic trunk secured with tourniquets. (**C**) Cross-clamping of the aortic arch. A Foley catheter is inserted into the ascending aorta through the orifice of the brachiocephalic trunk.

the true lumen under visual control into the ascending aorta. After cardioplegia, we open the aorta lumen. If there is a thrombus in the false canal, we remove it (►**Fig. 2B**).

Next, we open the true lumen (►**Fig. 2C**), deflate the Foley catheter, remove the tourniquet, and remove the catheter itself (►**Fig. 2D**).

Discussion

Antegrade nonselective cardioplegia through the aortic root is simple and represents the most commonly used method for delivering cardioplegic solution in cardiac surgery.[3] However, in type A aortic dissection, the use of this method

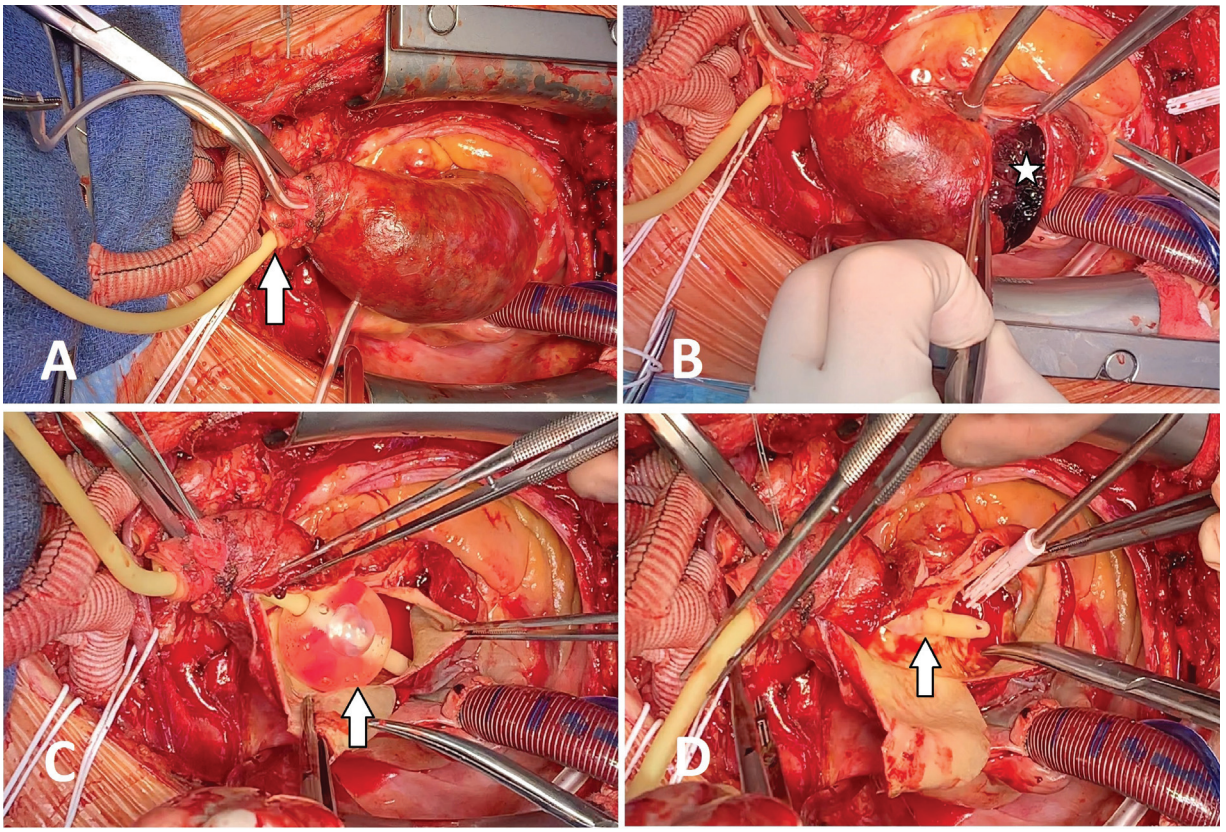

Fig. 2 (**A**) A Foley catheter is inserted into the ascending aorta through the orifice of the brachiocephalic trunk (arrow). (**B**) The false canal is opened. In the false lumen, there is a large thrombus (asterisk). (**C**) After removal of the thrombus, the true lumen is opened, in which the inflated Foley catheter is located (arrow). (**D**) The Foley catheter is deflated and removed through the orifice of the brachiocephalic trunk (arrow).

is limited by the presence of two lumens in the ascending aorta, one of which (false) is often thrombosed. Opening a dissected aortic wall for selective cardioplegia through the orifices of the coronary arteries may be associated with fragmentation of the thrombus and the migration of its fragments into the left ventricle.

In addition, dissection often extends to the orifices of the coronary arteries, and the placement of cardioplegic cannulas into the orifices of the coronary arteries can lead to trauma and dissection.

Another potential risk is the perfusion of the left anterior descending artery only or the circumflex artery in the short trunk of the left coronary artery.

Retrograde delivery of cardioplegic solution through the coronary sinus eliminates the risk of damage and dissection of the orifices of the coronary arteries and the migration of a thrombus from the thrombosed pseudocanal to the left ventricle. However, the limitation to the use of retrograde cardioplegia is the risk of coronary sinus rupture, inadequate protection of the right ventricle, and the posterior wall of the left ventricle due to shunting of the solution through the Thebesian veins and connections between the great cardiac vein and the anterior cardiac vein, due to deep insertion of the cannula into the coronary sinus below the confluence of the large cardiac vein.[4]

Our proposed method of delivering cardioplegic solution using a Foley catheter through the orifice of the brachiocephalic trunk or the left common carotid artery allows us to avoid the above "pitfalls" of myocardial protection in type A aortic dissection. The only limitation of the method is the impossibility of its use in moderate and severe aortic valve insufficiency.

Conflict of Interest
None declared.

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