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Bentall and Bono Surgery, Placement of Endoprosthesis in the Descending Aorta with Exlcusion of the Left Subclavian Artery and Hybrid Management of Supra-Aortic Trunks with Type I Debranching as Surgical Treatment in Aortic Dissection Stanford A/ DeBakey IA: Case Report

Jorge Eduardo EDU Rodríguez-Delgado [1]*, Cristhoper Jesús López-Hernández [1], José Luis Aceves-Chimal [1], Adrián Romero-Pérez [1], Athenea Nieves-Arellano [1], Guillermo Díaz-Quiroz [1]

[1] Department of Cardiac Surgery, National Medical Center ¨20 de Noviembre¨ ISSSTE, Mexico City, Mexico.

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ABSTRACT

Introduction: Bentall and Bono surgery is the procedure used in cases of aortic dissection type A of Sanford/DeBakey classification. It involves replacing the aortic root and aortic valve, placing a stent in the descending aorta, excluding the left subclavian artery, and performing hybrid management of the supra-aortic trunks with type I debranching to repair the aortic dissection and restore adequate blood flow to the aorta and the arteries that supply blood to the brain and neck.

Case Report: A 49-year-old male with a history of multivalvular cardiopathy presented with NYHA functional class I impairment. A transthoracic echocardiogram reported moderate aortic and mitral insufficiency, reduced left ventricular ejection fraction, and a thoracic aortic dissection. It was decided to perform a Bentall and Bono surgery.

Discussion: The hybrid management of supra-aortic trunks with type I debranching involve revascularization of the carotid and subclavian arteries using a technique that combines open surgery and endoprosthesis placement.

Conclusion: These procedures, although complex, allow surgeons to address both the ascending and descending aorta, preserving blood perfusion to the supra-aortic arteries and avoiding complications such as aortic rupture and heart failure.

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Introduction

Aortic dissection represents a medical emergency in which the internal wall of the aorta tears, allowing blood to flow between the layers of the aortic wall and causing separation of its layers (1,2). Bentall and Bono surgery refers to the surgical treatment of Stanford/ DeBakey type A aortic dissection. This surgery involves replacing the aortic root and aortic valve with a tubular prothesis (tube) that connects to the ascending aorta and coronary arteries, left and right respectively (3,4).

* Corresponding authors: Dr Rodríguez-Delgado Jorge Eduardo, Department of Cardiac Surgery, National Medical Center ¨20 de Noviembre¨ ISSSTE, Mexico City, Mexico. E-mail : drrodriguez1990@gmail.com

In addition, if the path to the descending aorta is affected or dissected, a stent is placed in that area of the descending aorta, which involves the use of a flexible tubular prosthesis (stent) that is usually inserted invasively through the femoral arteries and placed within the descending aorta to seal the dissection and restore normal blood flow (3,4). However, in this case it is performed anterogradely by direct vision from the supra-aortic trunks.

Exclusion of the left subclavian artery involves surgically closing or disconnecting it, which may be involved in the aortic dissection. This is done to prevent spreading of the dissection or to allow better access and placement of the stent (3,4).

Hybrid management of the supra-aortic trunks with type I debranching refers to the surgical technique in which, through surgical access to the supra-aortic trunks (arteries that supply blood to the brain and neck) and in our case brachiocephalic trunk, to perform different procedures such as reconstruction or revascularization of these arteries. Type I debranching involves disconnecting the supra-aortic trunks from the aorta to further reconnect them to a prosthesis or vascular graft; in this case to the carotid artery (3,4,5).

In summary, the surgical treatment we mentioned involves replacing the aortic root and the aortic valve, placing a stent in the descending aorta, excluding the left subclavian artery, and performing hybrid management of the supra-aortic trunks with type I debranching. These procedures seek to repair the aortic dissection and restore adequate blood flow to the aorta and the arteries that supply blood to the brain and neck (3,4,5, 6).

Case Report

We describe the case of a 49-year-old man with a history of multivalvular cardiopathy: severe aortic valve insufficiency ACC/AHA C2, moderate mitral insufficiency ACC/AHA C2, thoracic aortic dissection, decompensated chronic heart failure with a recovered LVEF (44%) NYHA I ACC/AHA. His clinical condition began in March 2023 with a NYHA functional class I impairment with orthopnea, requiring the use of three pillows, walking limited by medium effort dyspnea, fatigue while climbing stairs and bimalleolar edema. He was hospitalized in April and a transthoracic echocardiogram was performed reporting data compatible with moderate aortic and mitral insufficiency and reduced left ventricular ejection fraction .

Based on all the previously mentioned information, it was decided to perform a Bentall and Bono surgery.

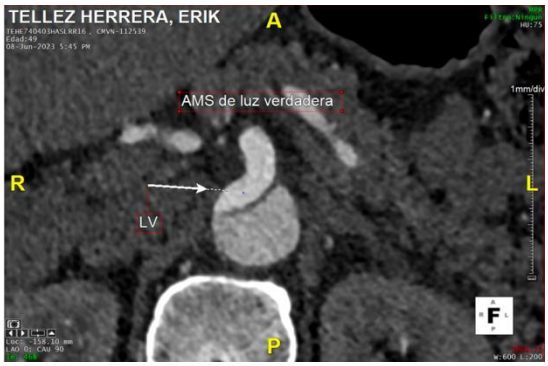

Figure 1. Dissection that includes the aortic root, supra-aortic trunks and descending aorta.

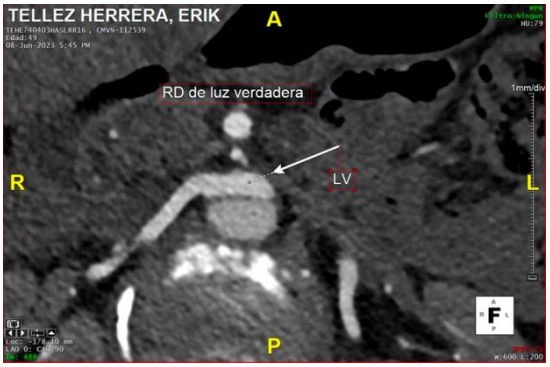

Figure 2. False and true lumen in ascending aorta and supra-aortic trunk, right carotid artery.

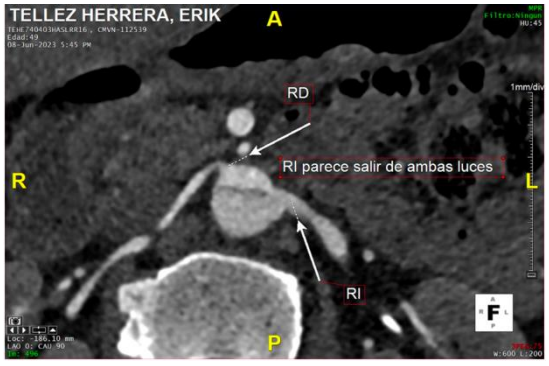

Figure 3. Dissection that extends from left subclavian artery to descending aorta.

Bentall and Bono surgery included the placement of an endoprosthesis in the descending aorta (known as "elephant trunk"), as well as the surgical exclusion of the left subclavian artery. Additionally, a hybrid type I debranching technique is used to manage the supra-aortic trunks.

Figure 4. Aortotomy. The flap of the intima and adventitia encompassing the false lumen.

Figure 5. Radiated points in aortic ring with pledgets.

Figure 6. 23 mm valved graft descent.

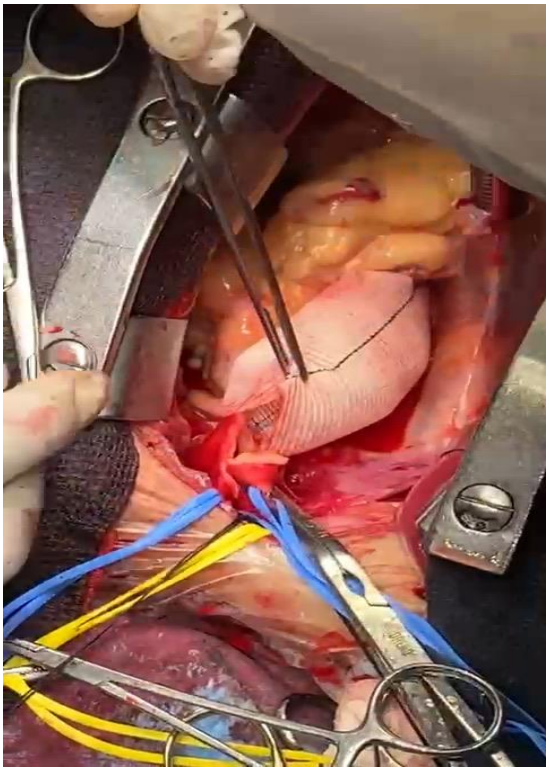

Figure 7. Proximal anastomoses of the transverse aorta and supra-aortic trunks to the valved graft.

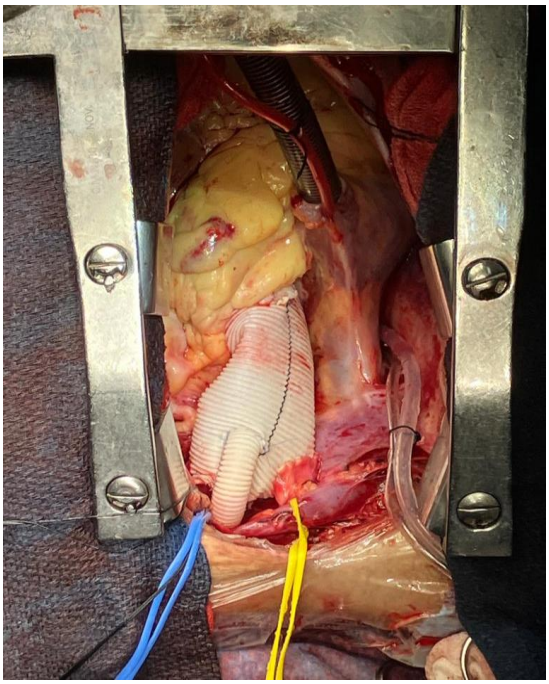

Figure 8. Proximal and distal anastomosis of hybrid right coronary artery + brachiocephalic trunk anastomosis with a 12 mm dacron graft.

Figure 9. 3D reconstructed post-surgical control CT angiography of the aorta and its course. The placement of anterograde endoprosthesis in true lumen draws attention.

Discussion

The use of stimulant drugs such as methamphetamine can have adverse effects on the cardiovascular system, including an increase in blood pressure, tachycardia, vasoconstriction and stress. These effects can have a negative impact on long-term cardiovascular health. Although the consumption of crystal drugs, as well as methamphetamine, can cause serious health problems and affect the cardiovascular system, a specific relationship with aortic dissection has not been established in scientific literature. This invites future research in order to find the pathophysiological correlation between these substances and changes in connective tissue.

Stanford A/ DeBakey IA aortic dissection is a medical emergency characterized by a separation of the layers of the ascending aorta, which results in a weakening of the arterial wall and can lead to serious complications, like aortic rupture and heart failure (1,2). Surgical management of this condition is crucial to avoid life-threatening complications and improve the patient´s prognosis. In high-risk and complex cases, such as Stanford Type A aortic dissection, surgical strategies have evolved to incorporate more innovative and less invasive approaches (4,5).

The Bentall and Bono surgery is a procedure that combines the replacement of the aortic root and aortic valve with the implantation of a valved tube. This approach seeks to correct both aortic dissection and possible valve complications, providing an integral solution to the problem (4,6). Additionally, stenting of the descending aorta, excluding the left subclavian artery, is a strategy to reduce the risk of distal complications and improve blood flow to the arterial branches (4,6).

The hybrid management of supra-aortic trunks with type I debranching implies the revascularization of the carotid and subclavian arteries with a technique that combines open surgery and endoprosthesis colocation (4). This approach allows the supra-aortic trunks blood flow preservation, which is essential to prevent ischemic events in the brain and other regions dependent on these arteries. Debranching type I implies the creation of a connection between supra-aortic arteries and a vascular graft, allowing continuous blood flow (4).

In terms of mortality, an overall mortality rate of 25% was observed; however, in the present case, total recovery was achieved after 30 days with an estimated survival rate of 15 years.

The combination of the Bentall and Bono surgery, the endoprosthesis placement in the descending aorta and the hybrid

management of the supra-aortic trunks with debranching type I procedure represents a multifaceted and highly specialized approach to Stanford Type A/ DeBakey IA aortic dissection (4,6). This strategy seeks to address both the ascending and descending parts of the aorta, protecting against its rupture and improving blood perfusion in the supra-aortic arteries. Although some complications were observed, the overall results suggest an improvement in cerebral blood perfusion and an overall success rate in correcting aortic dissection.

Conclusion

These procedures, although complex, allow surgeons to address both the ascending and descending aorta, preserving blood perfusion to the supra-aortic arteries and avoiding complications such as aortic rupture and heart failure. The synergy of these surgical approaches reflects the constant evolution of medicine in its search for more precise and safer solutions for critical situations.

However, it is important to highlight that the successful implementation of these approaches requires the collaboration of highly specialized and experienced medical teams. Each patient presents unique characteristics, which emphasizes the importance of a thorough and personalized clinical evaluation to determine the most appropriate strategy. As medical research and technology continues to advance, the effectiveness and safety of these surgical approaches for the treatment of DeBakey IA/ Stanford Type A aortic dissection will likely continue to improve, providing hope and solutions to those affected by this critical condition.

Conflict of Interest

The authors declare that the research was conducted without any commercial or financial relationships that could be seen as a potential conflict of interest.

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