



## A New Classification of Aortic Dissection: Apropos of a Non-A Non-B Case

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### Abstract

We present the case of a patient with cardiovascular risk factors admitted to the ICU after diagnosis of non-A non-B type aortic dissection, affecting only the aortic arch, with initial conservative medical management with restricted control of arterial hypertension. Deferred to urgent surgery in the first days with prosthesis implantation in the aortic arch and reconstruction of supra-aortic trunks with good subsequent evolution.

We carry out a narrative review of recent years articles dealing with the actual need of modifying current traditional classifications, in order to emphasizing a new use with a view to staging severity and prognosis and, above all, to help treatment decision management, whether to choose conservative or urgent surgical intervention.

**Keywords:** Aortic dissection; No A no B; Aortic surgery

### Introduction

Acute Aortic Dissection (AAD) is a pathology encompassed within the acute aortic syndrome together with other entities such as intramural hematoma or penetrating ulcer, with an approximate annual incidence of 2–15/100,000 inhabitants and a high mortality rate. AAD occurs as, a result of a tear between the intima and media layers, creating a false lumen, where blood flows between the media and adventitial layers. It is associated with several cardiovascular risk factors such as advanced age, male gender, hypertension, previous aortic aneurysm, connective tissue diseases, and bicuspid aortic valve [1]. It can progress rapidly with the risk of rupture, cardiac tamponade, myocardial ischemia or aortic insufficiency and can cause involvement of its main branches with ischemia of distant organs (kidney, brain, intestine, etc.), the so-called malperfusion syndrome.

It has traditionally been classified according to De Bakey and Stanford, and taking into account, the involvement or not of the ascending aorta. However, in recent years the involvement or not of the aortic arch from where the supra-aortic trunks depart has been increasingly taken into consideration. These two categorization systems are easy to use and have significantly helped in improving patient's management, independently from, whether they had a surgical or medical indication. However, as new therapeutic strategies have increased, those have become increasingly limited as they do not include factors that predict results and that could influence the decision-making process, particularly in patients with arterial branch involvement.

In untreated acute type "A" aortic dissection, mortality in the first 48 h is greater than 50%, and open surgical treatment is indicated. In contrast, the course of acute type "B" dissection is usually without complications, and medical treatment is widely accepted as the first option, with the endovascular technique (TEVAR) being the treatment of choice if complications develop [2,4].

In this sense, non-A non-B aortic dissection is characterized by being limited only to the aortic arch, or that it is affected by retrograde propagation starting distal to the left subclavian artery, without extension to the ascending aorta, which it is not included any of the traditional classifications.

Arch involvement is defined as retrograde extension of an intimal tear in the descending aorta (sparing the ascending aorta) or an intimal tear located in the aortic arch. In 1994, Von Segesser et al. were the first to highlight the failure of traditional DAA classifications to adequately account for the aortic arch; proposed the term "no A no B" to refer to the involvement of the aortic arch in

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**Figure 1:** Angio-CT with axial and lateral cut at the level of the aortic arch where the entry and exit gate of the dissection is observed, between the exit of the brachiocephalic trunk and the left carotid artery.



**Figure 2:** Postoperative lateral CT angiography with resolution of the defect.

dissections [5]. Four years later, Lansman et al. suggested a modified Stanford classification by adding a subcategory of aortic arch to type A and B dissections [6]. Since then, several studies have debated how to classify retrograde extension of a descending aortic dissection; however, the primary involvement of the aortic arch remained unresolved. Recently, Rylski et al. established a new classification that divided “non-A non-B” into downward entry and arch entry types [7]. This definition was based on the location of the entry tear; the descending artery would be located distal to the left subclavian artery; which happens to be located between the brachiocephalic trunk and the left subclavian artery from the arch.

Currently, there is not enough scientific evidence about its natural history, indications for surgery or treatment results. In fact, the latest guide for the management of aortic disease of the European Society of Cardiology does not mention this type of dissection [8]. Nowadays, treatment options are open surgery (with replacement of the standard aortic arch or frozen elephant trunk), endovascular repair of the thoracic aorta (with chimney stent graft or extrathoracic surgical transposition of supra-aortic branches), or a hybrid procedure (with debranching of the supra-aortic vessels next to a stent).

In this article we present the case of a patient with non-A non-B aortic dissection treated in our intensive care unit, commenting on his management and carrying out a brief narrative review of the literature.

## Case Presentation

We present the case of a 56-year-old male, obese, smoker and active drinker with hepatic steatosis, without other known cardiovascular risk factors. He went to the emergency room due to stabbing central chest pain radiating to the back and high blood pressure of up to 200 mmHg systolic, accompanied by nausea. Urgent chest CT angiography was performed, where an aortic dissection of about 5 cm was observed, restricted to the aortic arch, between the exit of the brachiocephalic trunk and the left carotid artery, without

extension to the ascending or descending aorta, classified as “no A, no B.”, with no signs of rupture, dilatation or signs of malperfusion. He was admitted to the ICU where continuous perfusion of labetalol was started to control blood pressure and cardiac surgery was discussed, which decided on initial conservative management.

The patient had a stable evolution during the first days prior to surgery performed 72 h later, consisting of clamping of the proximal brachiocephalic trunk and the left carotid artery, excision of the proximal aortic arch and ascending aorta up to a couple of centimeters distal to the sino-tubular junction and 26-mm branched tube end-to-end anastomosis. He leaves the pump in sinus rhythm, with a time of 283 min, anoxia time of 63 min, and a thermographic cerebral perfusion circulatory arrest of 54 min and total circulatory arrest of 5 min. He received a transfusion of red blood cells and from the recuperator and was transferred to the ICU with dobutamine, milrinone and norepinephrine at medium doses due to the development of biventricular dysfunction, especially the right one.

As incidents in the postoperative period, he developed left hemiplegia with hemineglect, with multiple ischemic foci in the right hemisphere of probable cardioembolic origin being observed on cranial CT, which progressively improved with antiplatelet therapy and rehabilitation, as well as acute renal parenchymal dysfunction, also improving.

Once on the floor, control CT angiography is performed; persistence of a penetrating ulcer is observed at the exit of the left common artery, assessed by vascular surgery, with conservative management.

The patient was discharged home a month after admission with only one admission a month later due to post-cardiotomy chest pain and moderate pleuropericardial effusion that resolved with corticosteroids and colchicine.

## Discussion

In a meta-analysis, 88% of patients with non-A non-B dissection had a complicated course, which is a considerably higher proportion than that observed in type B dissection, signs of poor perfusion; defined as loss of blood supply to vital organs resulting in target organ ischemia; they were present in 29% of patients at admission, while 6% presented signs of contained rupture [2]. Additionally, 53% showed signs of poor perfusion and/or disease progression within 2 weeks of diagnosis.

Medically treated patients had a 30-day mortality of 14%, which is significantly higher than type B dissection. Despite the limitations of high heterogeneity and relatively small sample size, there are important differences in the natural history of type B dissection and non-A non-B dissection.

The studies we found in the literature show that patients with non-A non-B dissections are more likely to require intervention to treat dissection-related complications. These results suggest that early intervention may be indicated in non-A non-B dissections.

It should be noted that the treatment of non-A non-B dissection poses some specific challenges for cardiac and vascular surgeons. Several studies show that the TEVAR techniques with extra thoracic surgical transposition of the supra-aortic branches or stack stent grafting were frequently adopted solutions (18% and 36%, respectively). However, other studies have proposed adopting surgical treatments for “non-A, non-B” aortic dissections; which

showed that conservative treatment was associated with a higher mortality rate [4].

In the analyzed studies, patients without poor organ perfusion, without aneurysm, and without aortic rupture were admitted to the intensive care unit for blood pressure control, hypertension, and pain management according to type B aortic dissection guidelines [9].

However, those who presented poor organ perfusion according to clinical data (cold and Pulseless extremities, severe abdominal pain), laboratory data (elevated serum lactate) or imaging data (collapsed true aortic lumen, dissected visceral arteries with a significantly narrowed true lumen due to thrombosed false lumen) or rupture were treated endovascularly or openly on an emergent basis.

Endovascular treatment involved endovascular thoracic aortic repair (TEVAR) with (TEVAR Zone 2) or without (TEVAR Zone 3) carotid-subclavian bypass or transposition of the left carotid and left subclavian arteries (TEVAR Zone 1), as well as isolated stent placement in dissected visceral arteries. The hybrid approach included sternotomy for supra-aortic vessel debranching with Dacron shunts anastomosed in the ascending aorta and TEVAR with stenting in the distal ascending aorta (TEVAR Zone 0) [10]. Open surgery included replacement of the aortic arch, generally using the frozen elephant trunk technique, or revascularization of poorly perfused organs with arterial bypasses.

For all these reasons, it is urgently necessary to project a new updated classification on the indication for surgical management of a dissection that only affects the aortic arch, and to carry out new studies to evaluate short- and long-term mortality.

## Conclusion

- Non-A non-B aortic dissection is a rare entity within acute aortic syndrome, around 10%, where in the majority, the tear begins in the aortic arch.
- It is necessary to increase the implementation of new classifications of aortic dissection in order to plan therapeutic measures and evaluate the prognosis.
- Malperfusion syndrome, rupture and other complications

are more frequent than in type B dissection, so most require emergent surgical intervention. Most patients require aortic repair within the first few days.

- Overall hospital mortality in patients with non-A non-B dissection is higher than in type B dissection but lower than in type A dissection, especially higher in those with emergent surgery.

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