

EDITORIAL COMMENT

# Limited Intimal Aorta Tears

## Royalty Torn Asunder, and a Nation Was Created\*



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In 1760, King George II of Great Britain died from a ruptured aortic dissection, as revealed at autopsy (1). He was succeeded by his unstable grandson, King George III, who imposed various stamp and other taxes on the American colonies as part of a NAFTA-like deal. British tea shipping agents, cut out of the deal, instigated the Boston Tea Party, unleashing the New England militia and leading to the American War of Independence. Perhaps this is a stretch of the historical narrative, but aortic dissection ultimately led to the creation of the United States!

Despite our increased knowledge and understanding of the treatment of aortic dissection, its etiology, pathophysiology and classification, and detection remain a conundrum. For example, there are 3 classifications of aortic dissection extents (2,3).

The original Stanford classification, although it is often misrepresented as not including “non-A-non-B,” is the most widely used (Figure 1) (2). Type A involves the ascending aorta, whereas Type B does not, and hence includes the aortic arch (the so-called non-A and non-B). The DeBakey classification, however, divides dissection extent into type I, involving the ascending aorta and arch and beyond (2), type II, involving the ascending aorta only, and type III, involving the descending aorta. Type IIIa involves only the descending aorta, whereas type IIIb also includes dissections extending below the diaphragm. Furthermore, DeBakey told me that he included “non-A-non-B” under type I. The third classification is proximal or distal dissection to the subclavian artery (2,3). The broad consensus is that type A,

DeBakey type I and II, and proximal dissection should be treated by immediate surgical repair tempered by comorbidity risks, such as delay for catheterization for coronary artery reoperation and decision about likely survival related to, for example, gut gangrene (1). Generally, “stroke” is not an exclusion, because most comatose patients have “watershed” areas of inadequate flow related to greater vessel-associated dissection that frequently recovers with reperfusion. Many aortic surgeons use proximal or distal to the left subclavian artery extent of dissection to decide on surgery (3). Proximal dissections are immediately operated on, whereas distal ones are dependent on complications. There is, however, controversy about immediate surgery for extents involving the arch and beyond, but more often than not, the ascending aorta is involved at the time of surgery (2). Of note, apart from the issue of extent of dissection and treatment, there remains the problem of identifying tear types.

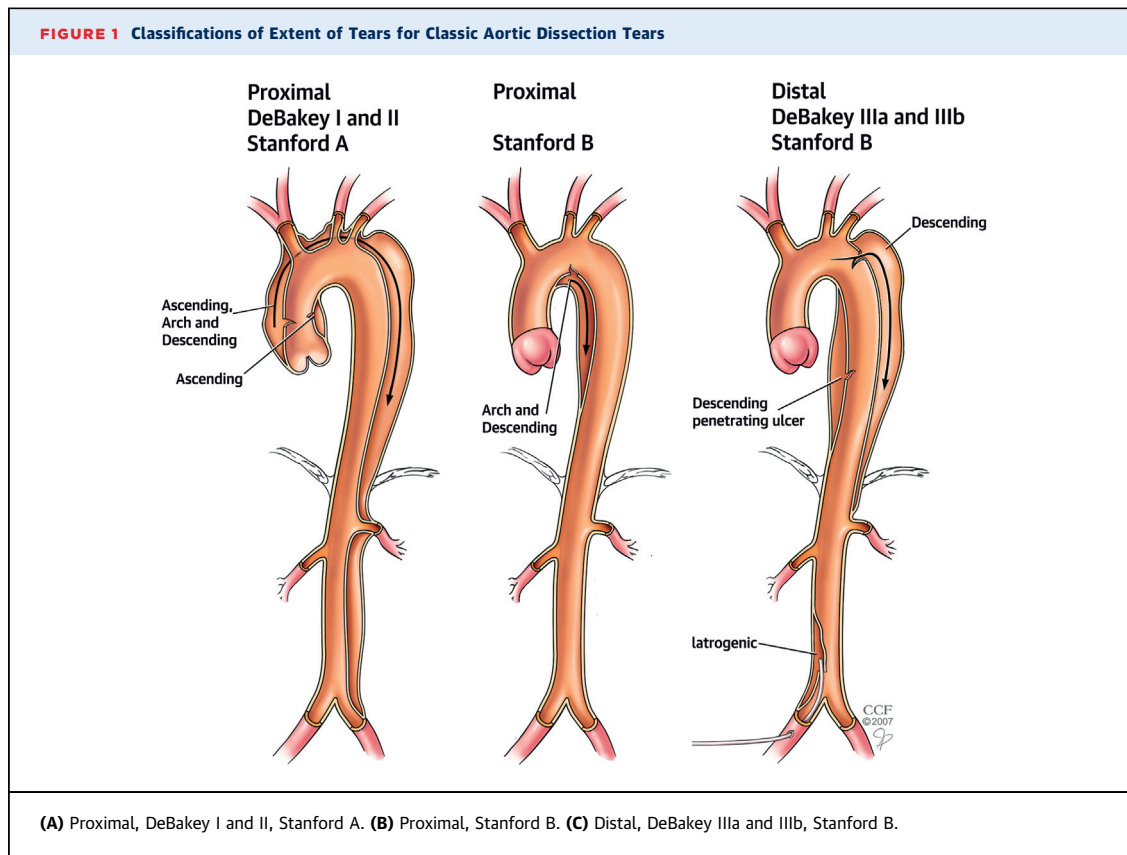
Before the advent of high-resolution 3-dimensional (3D) and axis-of-flow computed tomography (CT) imaging of the aorta, it was difficult to detect subtle forms of aortic dissection, particularly localized tears. Even multiplanar angiography often missed localized tears (4). For example, 15% of patients are said to have intramural hematomas, yet at surgery or autopsy, only 5% have no defined intimal tear.

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We previously categorized tear types (Figure 2) into 5 classes (4): 1) classic, with 2 lumens and blood flow in both; 2) intramural hematoma with clot in the aortic wall; 3) intimal tears without dissection propagation, often with rolled intimal edges (Figure 3); 4) penetrating ulcers associated with atherosclerosis or infection; and 5) traumatic or post-catheterization or intervention tears, typically of the root. In this issue of the *Journal*, the Stanford group (5) examined all of their aortic dissection patients for

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the tear classes and found that 4.8% had Class 3 intimal tears (limited intimal tears). They also found a high prevalence of missed diagnoses. As they point out, an advance since our report was published is that modern CT studies should now be able to pick up these more subtle tears. Nonetheless, we recently operated on an airline pilot with aortic dissection-type chest pain who twice presented at an emergency department with pain and was sent home. He sent his CT scans to us for review, and we immediately asked him to come in for surgery, which he underwent successfully.

Although such events are not common, physicians should be aware of these less common entities and look carefully for localized tears on the CT scans of patients with classic pain symptoms. Indeed, in a recent study of Medicare claim patients, 4.5% of aortic dissections were missed in the emergency department (6). Unfortunately, these localized tears are frequently not picked up on echocardiography. Even more concerning, particularly when the results of surgery have considerably improved (7), are those cases of classic aortic dissection that are missed because of lack of awareness in emergency departments. Nonetheless, prophylactic surgery, like

aortic root implantation for enlarged aortic roots to prevent aortic dissection, has considerably improved for the prevention of aortic dissection (8).

The key to more accurately diagnosing aortic dissection, particularly localized tears, is to ask oneself if despite preliminary tests, and if a patient has typical symptoms, “Is this a limited type of dissection?” The symptoms can be classic chest pain, a fact, unfortunately, not available in this excellent study from Stanford (5). However, a number of findings may also be suggestive. These include a systolic regurgitation murmur from a disrupted commissure, a rub or muffled heart sounds from a pericardial effusion, including from localized tears, or signs of an unexplained pleural effusion. At this time, we do not have reliable blood markers, particularly for localized tears, because there is little or no intra-aortic clot formation. The best evidence is an electrocardiogram-gated 3D CT scan that eliminates motion artifact from aortic pulsation and permits 3D reconstruction of the intimal surface of the aorta. Although highly selective, multiplanar angiography may identify bulging of the aorta, this takes time, extra dye load, and experience, and hence our best current option is gated 3D CT. With the increasing accuracy of CT for diagnosis

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