

# Thoracic Aortic Perforation by Endovascular Graft Stent Struts: Design Flaw or Inadvertent Procedural Risk?

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## Background

Perforation of the wall of the thoracic aorta by components of thoracic endografts or delivery systems has been reported anecdotally, and bare stent struts have been implicated by some as the major etiologic factor. This study was undertaken to analyze the range of causes of iatrogenic aortic wall injury associated with endovascular graft treatment of thoracic aortic lesions, with particular reference to whether device design may be an important risk factor for these problems. Trauma to the aortic wall may also result in other important clinical sequelae such as aortic dissection, conversion of type B dissection into retrograde type A, embolic stroke, hemodynamic instability, false aneurysm formation, and branch vessel ischemia.

## Methods

A retrospective review of 60 consecutive patients entered into a prospective database at our hospital, as well as a survey of thoracic endograft companies, users, and regulatory agencies. Identified incidents were classified as device-related or procedure/physician related where possible. A related case of endograft infolding in the arch region was also analyzed. Root cause analysis was discussed with the device companies.

## Results

Thoracic arch perforation, false aneurysm formation, or retrograde type A dissection related to endograft deployment has occurred in 4 patients of our own series and has been reported in more than 20 cases in the literature to date. The majority of these cases appear related to device design (bare or rigid stent struts), and the aortic arch or proximal descending aorta is most commonly involved. Stent rigidity or expansile force may be contributing factors, especially in the treatment of acute dissections. Embolic stroke occurred in 5 of our patients and appeared to be related more to procedural/physician factors. Endograft infolding within the distal arch has been reported in more than 12 cases to date. Mechanisms of lesser degrees of aortic wall trauma included guidewire and catheter manipulations, sheath insertion and navigation through tortuous anatomy, delivery system and nose-cone abrasion to the outer curve of the aortic arch, balloon dilatations, and device migration.

## Conclusion

Thoracic endograft trauma to the aortic wall is more common than previously realized and particularly involves the curved segments of the arch. There are important implications for device design, preclinical testing, and implant tracking.