

Surgical or Endovascular Therapy of Abdominal Penetrating Aortic Ulcers and Their Natural History: A Systematic Review

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ABSTRACT

Little is known regarding the outcomes of endovascular and surgical treatment of penetrating ulcers in the abdominal aorta. The potential benefit of conservative management of asymptomatic disease is also debatable. A systematic review of the literature was undertaken to investigate these issues.

ABBREVIATIONS

aPAU = abdominal penetrating aortic ulcer, IMH = intramural hematoma, PAU = penetrating aortic ulcer, SA = saccular aneurysm

Penetrating aortic ulcers (PAUs) constitute a distinct, potentially life-threatening clinical condition. A PAU is defined as an ulceration of an atherosclerotic plaque that penetrates through the intima, resulting in a variable amount of hematoma within the aortic wall (1,2). These early descriptions were supported by histologic examination of surgical specimens, but, since that time, descriptions in the literature have evolved from pathologic to radiologic diagnosis of PAUs. The appearance of a PAU on contrast-enhanced computed tomography (CT) or digital subtraction angiography is of a well defined ulcer confined to the aortic wall, a subadventitial saccular aneurysm (SA) that extends beyond the aortic

wall, or a transmural rupture with an extra-aortic hematoma (1) (Fig 1).

In contrast to the thoracic aorta, the abdominal aorta is rarely affected by PAU (3,4). Interventional treatment of PAU accounts for approximately 3.5% of all aortic procedures and 4.8% of all procedures performed to treat aortic aneurysms (5–7).

Surgical and endovascular repair have been described as effective methods to treat penetrating ulcers that affect the thoracic aorta (8). Conversely, endovascular treatment of abdominal PAUs (aPAUs) has not been adequately investigated. In a literature review published in 2005 (5), only nine patients were reported to have been treated with endovascular stent-graft repair. Analysis of that study (5) demonstrated that surgical and endovascular repair of aPAUs were effective methods of treatment, and showed low interventional morbidity and mortality rates. However, other studies have suggested that major aortic surgery in such a patient population characterized by increased atherosclerotic burden, advanced age, and poor general health may not be the most appropriate treatment method, and less invasive endovascular techniques have been proposed (9).

The natural course of patients with asymptomatic PAUs is ill defined. Conservative management has been suggested as an alternative treatment for certain patients with asymptomatic disease. However, some evidence obtained from clinical studies suggests the natural course of PAU is that of ongoing progression resulting in SA formation in

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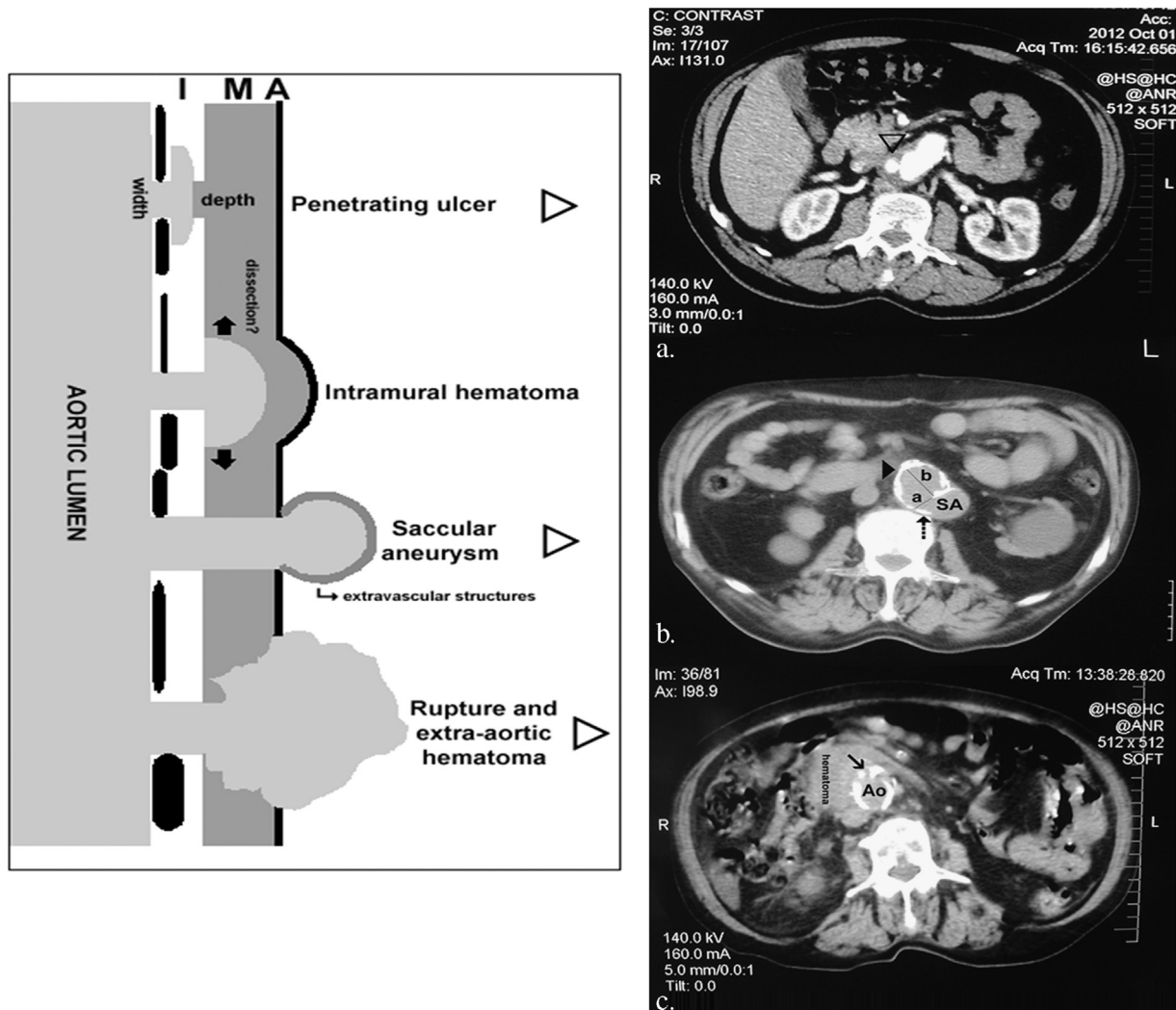


Figure 1. PAUs and their potential complications. Left: Schematic representation (I, intima; M, media wall; A, adventitia). Right: (a) Computerized axial tomography scan in a 66-year-old man shows an atherosclerotic PAU in the angulated infrarenal aorta, with protrusion of the contrast agent-filled outpouching just below the right renal artery (arrowhead). Note that the PAU wall with the contrast-enhanced lumen is typically located off center, contrary to abdominal aortic aneurysms. (b) Non-contrast-enhanced CT scan of the abdomen shows an infrarenal SA arising from a ruptured PAU. Note the heavily concentric calcified aneurysmal (~40 mm) aortic wall (arrowhead) and the break of the calcification at the left posterior aortic wall level (ie, focal rupture). This displaced, calcified part of the intima (arrow) eventually penetrated the posterior aortic wall (a, PAU neck; b, aortic diameter). (c) Transverse CT scan in a female patient shows a large extra-aortic hematoma from a ruptured PAU. Note the multiple displaced intimal calcifications depicting the lesion (arrow). The extensive aortic calcification reflects the actual aortic diameter (Ao).

30%–50% of patients (1,3,4). Still, the specific indications for intervention have not been not specified (3,4). Our objective was to perform a systematic review of the literature and to conduct an outcome analysis of the surgical and endovascular treatment of aPAUs. In addition, a critical overview of the natural history and medical treatment of the untreated disease was performed.

MATERIALS AND METHODS

Search Strategy

A literature search was performed to identify studies on patients with aPAUs treated with surgical or endovascular methods. In addition, the literature was searched for

studies describing the natural course of asymptomatic disease in patients receiving medical treatment. Our search was confined to studies published in the English language, and the search period was between July 1974 (first report of aPAU treatment [10]) and January 2013. The Medline, Scopus, and Embase databases were interrogated. In addition, individual websites of leading vascular surgery or intervention journals, or both (*Annals of Vascular Surgery*, *Cardiovascular and Interventional Radiology*, *Catheterization and Cardiovascular Interventions*, *European Journal of Vascular and Endovascular Surgery*, *International Angiology*, *Journal of Endovascular Therapy*, *Journal of Vascular and Interventional Radiology*, *Journal of Vascular Surgery*, *The Journal of Cardiovascular Surgery*, *Perspectives in Vascular Surgery and Endovascular Therapy*,

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