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Endovascular conversion into aorto-uniiliac configuration of acute failed endovascular aneurysm repair is associated with better one-year survival rates compared to open conversion

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ABSTRACT

Background: Open conversions (OC) due to failed endovascular repair of infrarenal abdominal aortic aneurysms (EVAR) are technically demanding because of preexisting prostheses and advanced aortic disease. This study evaluates the feasibility and outcomes of aorto-uniiliac endografting (AUI) as an alternative treatment option in acute failed EVAR.
Methods: From March 1995 through February 2012, 26 patients underwent acute conversion of failed EVAR at our tertiary care university center. All data were prospectively entered in our institutional database. Outcomes included 30-day or in-hospital mortality, post-operative complications, and mid-term survival.
Results: During the investigation period, a total of 692 patients received EVAR at our institution, while five of the 26 patients with acute conversion (19.2%) had an initial EVAR at an outlying institution and were referred for treatment. Therefore, our estimated institutional rate of acute conversions was 3% (21 of 692 EVAR). OC were performed in 14 patients (53.8%), while 12 patients underwent AUI (46.2%). An average time of 20.3 months (median: 18.6; interquartile range Q1–Q3: 0.0–38.6) elapsed between the initial EVAR and the acute conversion. All acute AUI conversion procedures were completed successfully. The 30-day mortality following acute conversions was 42.3% and since the use of AUI, it could be reduced to 33.3%. Kaplan–Meier estimates revealed a survival advantage for AUI at one year ($p = 0.046$), but the benefit was lost by mid-term follow-up ($p = 0.103$).
Conclusions: AUI for the treatment of acute failed EVAR represents a feasible and less invasive alternative to OC, and is associated with better one-year survival rates.

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Introduction

Since the introduction of endovascular aneurysm repair (EVAR) in 1991, this less invasive method of infrarenal abdominal aortic aneurysm (AAA) exclusion has gained increased acceptance among patients and physicians. Only a few years after the procedure was introduced, Yusuf and co-workers[1] were the first who reported the ability to treat a leaking aortic aneurysm with this approach. In recent years, treating ruptured AAA with the EVAR-first concept has increased[2] and, as a consequence, mortality rates from this devastating event have decreased.[3] However, aneurysm rupture can also occur after EVAR. A systematic review of all available data regarding late aneurysm rupture after EVAR[4] revealed a treatment preference for open conversion. However, these open conversions were associated with disappointing results, and series that reported the use of endovascular treatment to treat post EVAR rupture more often also described reduced mortality rates.[5] Fortunately, late aneurysm rupture is a rare event, occurring in less than 1.5% of patients, as recently reported by an experienced center.[6] Nevertheless, open conversion in an acute setting is not solely reserved for late aneurysm rupture. Other complications leading to acute open conversion can include difficulties in device deployment, intraoperative vessel injury, endograft thrombosis, or other access-related problems.[7]

The concept of aorto-uniiliac (AUI) endografting is known since the beginning of EVAR, but the scientific activity dealing with this topic declined afterwards. Nevertheless, recognized advantages of AUI endografts include the ease of deployment[8] and the ability to achieve rapid hemorrhage control in case of ruptured AAA.[9] But based on recent publications which concluded that outcomes of newer generations of AUI devices appear similar to that after an elective bifurcated endovascular repair,[10,11] this type of AAA treatment may increasingly come into focus again. With reference to the above mentioned advantages, we hypothesized that AUI endografting may serve as a reasonable treatment option, with the potential to improve survival, compared to acute open conversion procedures. The aim of this comparative study was to determine the feasibility and evaluate the mid-term outcomes of AUI endografting as an alternative treatment approach for acute failed EVAR.

Methods

Study design

All the data from patients who had received EVAR at our tertiary care university hospital were prospectively entered into our institutional database. Since our EVAR program was established in March 1995, 692 patients had undergone endovascular exclusion of their AAA through February 2012. The date was chosen to ensure a minimum 24-month follow-up. The decision about whether endovascular exclusion of the aneurysm was technically feasible was always reached in a collaborative consensus of vascular surgeons and interventional radiologists.

Patient sample

This clinical database was retrospectively reviewed to identify all patients who had to undergo acute open conversions (group I). In addition, the database was interrogated to search for patients who received AUI endografting in an acute setting (group II). Acute conversions of either type were necessitated by difficulties in device deployment, intraoperative vessel injury, or other access-related problems during initial EVAR, as well as late aneurysm rupture. Patients who were not candidates for either type of treatment, i.e., because of endograft thrombosis, as well as patients who received merely supportive and no curative therapy for late aneurysm rupture, were not included in this analysis.

Definitions

The suspected diagnosis of late aneurysm rupture was defined as blood extravasation outside the aneurysm sac and confirmed, whenever possible, by a contrast-enhanced computed tomography scan from the celiac trunk to the common femoral arteries, followed by coronal and sagittal multiplanar reconstructions. Computed tomography scans of patients who already had the diagnosis of late aneurysm rupture made at an outlying institution and who were subsequently referred for treatment were evaluated prior to intervention. Based on the results, the decision regarding type of treatment was again reached in a collaborative consensus by an endovascular team, consisting of at least one staff vascular surgeon and one staff interventional radiologist. If the event occurred during off-hours or weekends, the vascular surgery and interventional radiology department personnel on call made the treatment decisions. Hemodynamic instability on admission was defined as either (1) a systolic blood pressure of less than 80 mm Hg, as proposed by Mehta et al.,[2] or (2) a loss of consciousness or cardiac arrest due to exsanguination. A state of hypotensive hemostasis, maintained by cautious and restrictive fluid administration, was intended to keep systolic blood pressure at around 80 mm Hg, which can help to minimize ongoing hemorrhage. Since our initially promising experience with the endovascular treatment of post EVAR rupture around the millennium, this approach was considered first in this life-threatening setting. Open conversion was reserved as a final resort when endovascular options were not feasible or in case of endograft infection.

Types of treatment

All EVAR procedures, whether primary or acute modifications into the AUI configuration, took place in a specially equipped hybrid angiography suite, following the principles of an interdisciplinary approach by a team of vascular surgeons, interventional radiologists, and anesthesiologists with specialized training in cardiothoracic and vascular anesthesia. All patients were treated with commercially available endografts. The size of the endograft was calculated from the largest diameter of the anchoring zone and an approximately 20% oversizing factor was added. Completion angiography was used to confirm successful sealing of the leaking aneurysm, to check the attachment of the endograft, and to

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