



The impact of an interventional vascular specialty team on institutional endovascular aneurysm repair outcomes

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Abstract

Background: Endovascular aortic aneurysm repair (EVAR) is a technically demanding, resource-intensive procedure associated with a significant learning curve. In July 2002, the Department of Defense allocated nearly \$5,000,000 for “Advances in Medical Practice” (AMP) and EVAR within the six major military medical centers in the United States Army. We sought to determine the impact of several institutional changes associated with the use of these funds.

Methods: We performed a single-institution, retrospective comparison of our early EVAR outcomes in physiologically similar patients before and after the use of AMP capital and the acquisition of a trained and equipped endovascular operative team. Morbidity, mortality, and operative variables were the main outcomes. Mean follow-up interval was 17.6 months.

Results: As of November 2004, a total of 114 conventional open and endovascular AAA repairs were performed at our institution since our first EVAR in May 2000. Ten of 51 (20%) total AAA patients were treated with EVAR by a general vascular surgical team before the addition of an endovascular specialty team to the service in July 2002. An additional 28 of 63 (44%) patients have been treated with EVAR since that time for a total of 38 repairs. During the first year evaluated, 20% of aneurysms were repaired with EVAR versus 83% during the most recent year. Devices from four different manufacturers were used during the study interval. Patients treated by the endovascular team had significantly less mean estimated blood loss (EBL), packed red blood cells (PRBCs) transfused, intravenous (IV) contrast used, and shorter operative times. Morbidity, mortality, endoleaks, and other variables were similar. In linear regression analysis adjusting for complex, time-consuming repairs that required adjunctive procedures outside the realm of normal EVAR, endovascular team EVAR was independently associated with decreased mean operative time, EBL, PRBCs transfused, and IV contrast used.

Conclusions: At a major military medical center, EVAR has become the preferred technique for the repair of abdominal aortic aneurysms. EVAR by a dedicated endovascular surgical team favorably impacts several important operative variables and may improve overall outcomes. Some of these operative variables may be device specific. © 2005 Excerpta Medica Inc. All rights reserved.

Keywords: Abdominal aortic aneurysm; Endovascular aneurysm repair; Outcomes; Vascular surgery; Endovascular surgery; Endovascular team; Military

In 1990, Dr Juan Carlos Parodi et al [1] implanted the very first custom-made aortic stent graft in a patient harboring an abdominal aortic aneurysm in Buenos Aires, Argentina. Fourteen years later, endovascular aneurysm repair (EVAR) has been increasingly used as a primary approach to any patient with an infrarenal aortic aneurysm. This is based, in

part, on magnificent technological improvements such as advanced imaging, improved stent-graft design, smaller delivery systems, and technically skilled operators. Recently, in a prospective head to head comparison with open surgical repair, EVAR proved superior with regard to operative mortality and severe complications, for use as a primary modality in the majority of patients presenting with infrarenal aortic aneurysms [2]. Not surprisingly, early functional outcomes have been shown to be markedly improved with endovascular repair, whereas no difference in late

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functional outcomes between endovascular and open repair has been noted [3].

In 2002, the Department of Defense (DOD) allocated nearly 5 million dollars to the six major United States Army Medical Centers to purchase equipment and put in place a program for EVAR at each institution. This was part of a program called “Advances in Medical Practice” (AMP). These funds were allocated to each medical center over a 4-year period. We sought to determine the impact of several institutional changes associated with the use of this capital.

Methods

This is a single institution cohort analysis of our prospectively maintained vascular registry. We studied all patients undergoing primary surgical therapy for an abdominal aortic aneurysm from May 2000 to November 2004. There were 114 patients in the cohort. These aneurysms were managed with either open ($n = 76$) or endovascular repair ($n = 38$). No patients undergoing aneurysm repair at our institution were excluded from analysis. Operative procedures for open and endovascular repairs were performed in accordance with standard of care practice and used widely accepted vascular and endovascular surgical techniques. In some complex cases involving EVAR, additional adjunctive procedures were required including bilateral femoral artery access site repairs (ie, nontotally percutaneous EVAR cases), coil embolizations of collateral vessels (ie, hypogastriacs), and femoral-femoral bypass grafting.

Among the 38 total EVAR procedures in the cohort, we compared our 30-day perioperative outcomes before and after the use of DOD AMP capital and the acquisition of a trained and equipped endovascular operative team in May 2002. At this time, a specialized C-arm, imaging table, and power injector as well as \$100,000 worth of sheaths, wires, catheters, balloons, and stents were purchased (Fig. 1). This initial investment amounted to \$500,000. Additionally, a board-certified and endovascular subspecialty-trained full-time vascular surgeon (BWS) was hired by our institution, and a dedicated endovascular team with consistent surgical technologist and nursing ancillary staffing was assembled. We compared the outcomes of our EVAR cases before and after this intervention in May 2002. The primary study outcomes evaluated were morbidity, mortality, and operative variables including mean estimated blood loss (EBL), units of packed red blood cells (PRBCs) transfused, operative time (minutes), intravenous contrast used (mL), and length of hospital stay (days). Mean follow-up interval was 45.2 months for the 10 repairs performed by the general vascular surgery team, 7.8 months for the 28 repairs performed by the dedicated endovascular team, and 17.6 months for the entire cohort.

Continuous data were compared with independent Student *t* tests and categorical proportions with chi-square analysis or a Fisher exact test as appropriate. Because com-



Fig. 1. Dedicated endovascular team C-arm and other equipment purchased with Department of Defense “Advances in Medical Practice” capital.

plex repairs requiring adjunctive procedures were performed more frequently by the endovascular compared with the general vascular team, a linear regression analysis adjusting for this covariate was performed on the primary operative study variables (operative time, EBL, units of PRBCs transfused, and length of hospital stay) and qualified with 95% confidence intervals (CIs). Significance was set at $P < .05$ and reflected two-tailed distributions in all cases. Statistical analysis was performed by using commercially available software (SPSS Windows version 11; SPSS Inc, Chicago, IL).

Results

As of November 2004, a total of 114 conventional open and endovascular AAA repairs were performed at our institution since our first EVAR in May 2000. During the first year evaluated, 20% of aneurysms were repaired with EVAR versus 83% during the most recent year. Devices used included Ancure 34% (Guidant, Santa Clara, CA, 13/38), Aneurix 5% (Medtronic, Minneapolis, MN, 2/38), Zenith 50% (Cook, Bloomington, IN, 19/38), and Excluder 11% (Gore, Flagstaff, AZ, 4/38).

Patients treated by the endovascular team had significantly less mean EBL, PRBCs transfused, intravenous (IV) contrast used, and shorter operative times (Table 1). Morbidity, mortality, endoleaks, and other variables were similar. Complex repairs requiring adjunctive procedures outside the realm of normal EVAR were performed more frequently by the endovascular team (36% versus 20%) and were associated with increased mean operative times (286 ± 28 versus 189 ± 11 minutes, $P < .01$). Adjusting for this confounder with linear regression, endovascular team EVAR was independently associated with decreased mean operative time (-99 ± 21 minutes [95% CI -142 to -57 minutes, $P < .01$]), EBL

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