Percutaneous versus femoral cutdown access for endovascular aneurysm repair

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Objective: **Prior studies suggest that percutaneous access for endovascular abdominal aortic aneurysm repair (pEVAR) offers significant operative and postoperative benefits compared with femoral cutdown (cEVAR). National data on this topic, however, are limited. We compared patient selection and outcomes for elective pEVAR and cEVAR.**
Methods: **We identified all patients undergoing either pEVAR (bilateral percutaneous access, whether successful or not) or cEVAR (at least one planned groin cutdown) for abdominal aortic aneurysms from January 2011 to December 2013 in the Targeted Vascular data set from the American College of Surgeons National Surgical Quality Improvement Program database. Emergent cases, ruptures, cases with an iliac conduit, and cases with a preoperative wound infection were excluded. Groups were compared by χ^2 test or t-test or the Mann-Whitney test where appropriate.**
Results: **We identified 4112 patients undergoing elective EVAR, 3004 cEVAR patients (73%) and 1108 pEVAR patients (27%). Of all EVAR patients, 26% had bilateral percutaneous access; 1.0% had attempted percutaneous access converted to cutdown (4% of pEVARs); and the remainder had a planned cutdown, 63.9% bilateral and 9.1% unilateral. There were no significant differences in age, gender, aneurysm diameter, or prior open abdominal surgery. Patients undergoing cEVAR were less likely to have congestive heart failure (1.5% vs 2.4%; $P = .04$) but more likely to undergo any concomitant procedure during surgery (32% vs 26%; $P < .01$) than patients undergoing pEVAR. Postoperatively, pEVAR patients had shorter operative time (mean, 135 vs 152 minutes; $P < .01$), shorter length of stay (median, 1 day vs 2 days; $P < .01$), and fewer wound complications (2.1% vs 1.0%; $P = .02$). On multivariable analysis, the only predictor of percutaneous access failure was performance of any concomitant procedure (odds ratio, 2.0; 95% confidence interval, 1.0-4.0; $P = .04$).**
Conclusions: **Currently, one in four patients treated at Targeted Vascular National Surgical Quality Improvement Program centers are getting pEVAR, which is associated with a high success rate, shorter operation time, shorter length of stay, and fewer wound complications compared with cEVAR. (J Vasc Surg 2015;62:16-21.)**

For patients with an anatomically suitable abdominal aortic aneurysm (AAA), endovascular aortic aneurysm repair (EVAR) has become the preferred choice of treatment during the past decade.[1] Percutaneous access (pEVAR) further minimizes invasiveness compared with femoral cutdown access (cEVAR). A recently published American multicenter randomized trial with 151 patients in centers of excellence with one stent graft reported high success rates in selected pEVAR patients compared with cEVAR.[2] Several small single-center studies using a variety of grafts showed a reduction in total operative time[2-8] and length of hospital stay.[3,6,9,10] In addition, access-related complication rates were lower with pEVAR compared with cEVAR.[2,4,6-12] Despite these promising results, the possibility of publication bias should be considered. Therefore, a larger scale study of contemporary management of AAA comparing pEVAR and cEVAR is needed to see if the results from the prior randomized controlled trial and single centers may be generalizable. We analyzed national outcomes of pEVAR and cEVAR for AAA repair. We aimed to analyze patient selection, anatomic variation, and outcomes for elective pEVAR and cEVAR.

METHODS

Data source. We identified all patients undergoing either pEVAR (bilateral percutaneous access, whether successful or not) or cEVAR (at least one planned groin cutdown) for AAAs from January 2011 to December 2013 in the Targeted Vascular data set from the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database. This is a multiinstitutional, risk-adjusted database with 83 participating hospitals in the United States that collects prospective clinical data of patients undergoing vascular surgery. Data are recorded on preoperative, operative, and postoperative patient-level variables after the index procedure. All data collection is performed by trained clinical nurse reviewers

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Table I. Baseline characteristics of patients with abdominal aortic aneurysms (AAAs) undergoing percutaneous access for endovascular aneurysm repair (*pEVAR*) vs femoral cutdown (*cEVAR*)

Variable	*pEVAR (n = 1108)*	*cEVAR (n = 3004)*	P *value*	*Total cohort (N = 4112)*
Male gender	81	81	.10	82
Race or ethnic group			<.01	
Other/unknown	5.1	6.8		6.3
White	84	87		86
Black	7.0	4.1		4.9
American Indian/Alaska Native	0	0.1		0.1
Native Hawaiian/Pacific Islander	0.2	0		0.1
Asian	4.2	1.7		2.4
Age, mean, years	74	74	.08	74.1
Age category, years			.10	
18-59	6.1	5.1		5.3
60-69	25	23		23
70-79	42	42		42
80-89	25	29		28
90+	1.7	1.5		1.6
Prior open abdominal surgery	22	25	.07	24
ASA class 4	21	22	.23	22
Aneurysm diameter, cm	5.7	5.7	.82	5.7
Coexisting conditions				
Congestive heart failure	2.4	1.5	.04	1.8
Hypertension	81	81	.74	81
Diabetes	16	16	.82	16
History of severe COPD	16	19	.08	18
Dialysis (preoperative)	1.4	1.2	.47	1.2
Obesity	30	33	.07	32

ASA, American Society of Anesthesiologists; *COPD,* chronic obstructive pulmonary disease.
Data are presented as percentages unless otherwise indicated.

to ensure quality. These variables being collected were chosen by vascular surgeons and are specific to the index operation (eg, AAA diameter, indication for surgery, and attempt at percutaneous access). Definitions of the variables and details of data collection are available on the ASC NSQIP website.[13] NSQIP does not identify the site of surgery in any way, thus precluding volume-outcome analyses as well as outcomes comparison between sites. Emergent cases and ruptures were excluded. Cases with an iliac conduit or with a preoperative open or infected wound were also excluded. As this study contained only de-identified data without any protected health information, the study is not considered human research and therefore is not subject to Institutional Review Board approval or patient consent.

Clinical and outcome variables. Data were collected on relevant patient demographics, including gender, age, history of prior abdominal operations, American Society of Anesthesiologists classification, and aneurysm diameter. Intraoperative data were compared, including indication for surgery, anatomic details, graft type, and operative time. To rule out the effect of additional interventions on the mean total operation time, we excluded patients who had a concomitant intervention or a fenestrated graft for the analyses of operative time.

Postoperative outcomes were also compared, including death, rupture, bleeding requiring transfusion, reintubation, return to the operating room, surgical site infections, any wound complications, and overall length of stay. Multivariable logistic regression was used to determine independent predictors of percutaneous access failure, adjusted for potential confounders. Multivariable logistic and linear regressions were used to identify predictors of operative time and length of stay. In addition, we compared patients with attempted pEVAR converted to cutdown with those with successful pEVAR to identify possible associations with failure. To check for homogeneity within the cEVAR group, we compared the patients with bilateral groin cutdown to one groin cutdown within the cEVAR cohort.

For obesity, we used the cutoff body mass index >30 kg/m^2. Any wound complication includes wound dehiscence and superficial, deep, and organ space surgical site infection.

Statistical analyses. Categorical variables were compared by χ^2 test, and continuous variables were compared by the Student *t*-test or the Mann-Whitney test where appropriate. Statistical significance was defined as $P < .05$. All statistical analyses were performed with SPSS statistical software (version 20; IBM Corp, Armonk, NY).

RESULTS

We identified a total of 4479 patients who underwent elective EVAR, of which 4112 patients remained after exclusion of iliac conduits (n = 367; 8.2%) and prior wound infections (n = 39; 0.9%). There were 3004 (73%) cEVAR patients and 1108 (27%) pEVAR patients. Of all cEVAR patients, 88% had bilateral groin cutdown