Percutaneous thoracic endovascular aortic repair is not contraindicated in obese patients

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Objective: **There are limited data describing the preclose technique with the Perclose ProGlide device (Abbott Vascular, Redwood City, Calif) in percutaneous thoracic endovascular aortic repair (P-TEVAR), particularly in obese patients, in whom use of this technique is thought to be relatively contraindicated. The purpose of this analysis was to describe our experience with P-TEVAR and to compare outcomes in patients with or without obesity.**

Methods: **All TEVAR procedures at a single institution from 2005 to 2011 were reviewed, and P-TEVAR patients were stratified by body mass index (obesity ≥ 30 kg/m^2). Preoperative computed tomography scans were analyzed for access vessel depth, calcification, and morphology. Technical success was defined as the ability to achieve hemostasis and to maintain limb perfusion without the need for common femoral artery exposure or obligate surgical repair of the vessel within a 30-day postoperative period. Generalized estimating equations and stepwise logistic regression were used to develop prediction models of preclose failure.**

Results: **The review identified 536 patients, in whom 355 (66%) P-TEVAR procedures were completed (366 arteries; n = 40 [11%] bilateral). Compared with nonobese patients (n = 264), obese patients (n = 91) were typically younger (59 ± 16 years vs 66 ± 16 years; $P = .0004$) and more likely to have renal insufficiency (28% vs 17%; $P = .05$) or diabetes mellitus (19% vs 9%; $P = .02$). The number of Perclose deployments was similar between groups (P = NS). Mean sheath size (25.4F vs 25.0F; $P = .04$), access vessel inner diameters (8.5 ± 1.9 mm vs 7.9 ± 2.0 mm; $P = .02$), and vessel depth (50 ± 20 mm vs 30 ± 13 mm; $P < .0001$) were greater in obese patients. Adjunctive iliac stents were used in 7% of cases (10 [11%] in obese patients vs 16 [6%] in nonobese patients; $P = .2$). Overall technical success was 92% (92% for nonobese patients vs 93% for obese patients; $P = .7$). Three patients required subsequent operations for access complications, two obese patients (2%) and one nonobese patient (0.4%) ($P = .3$). Independent predictors of failure were adjunctive iliac stent (odds ratio [OR], 9.5; 95% confidence interval [CI], 3.3-27.8; $P < .0001$), more than two Perclose devices (OR, 7.0; 95% CI, 2.3-21; $P = .0005$), and smaller access vessel diameter to sheath size ratio (OR multiplies by 1.1 for each .01 decrease in ratio; 95% CI, 1.02-1.2; $P = .007$) (area under the receiver operating characteristic curve = .75).**

Conclusions: **Obesity is not a contraindication to P-TEVAR. P-TEVAR can be performed safely, despite the need for larger diameter sheaths. However, patients predicted to need adjunctive stenting or possessing smaller access vessel diameter to sheath size ratios are at highest risk of preclose failure with the Perclose ProGlide device, and selective use of this technique is recommended. (J Vasc Surg 2014;60:921-8.)**

Thoracic endovascular aneurysm repair (TEVAR) is increasingly performed for a variety of thoracic aortic diseases.[1-3] Thoracic endografts tend to be larger in diameter than those used in the abdominal aorta and require larger sheaths for delivery, some up to 27F in outer diameter. Consequently, TEVAR procedures are often performed by delivery of the endograft through open femoral exposure or creation of an aortic/iliac conduit in 20% to 30% of cases.[4,5] Because of the success of the preclose technique for aortic endograft placement,[6,7] our practice has evolved to implement this access strategy in the majority of TEVAR patients (P-TEVAR), despite the need for larger sheath sizes.

In addition to shorter operative times,[7] potential advantages of percutaneous access include reduced discomfort, earlier ambulation, and lower rate of wound complications.[8,9] Wound complications with open femoral exposure in endovascular aortic repair (EVAR) have been reported in 3% to 5% of patients, despite efforts to reduce this risk by making limited transverse or oblique incisions.[10] Obesity is a known risk factor for groin wound morbidity,[10,11] and this patient population potentially stands to benefit the most from percutaneous access for endovascular aortic procedures. However, in initial reports

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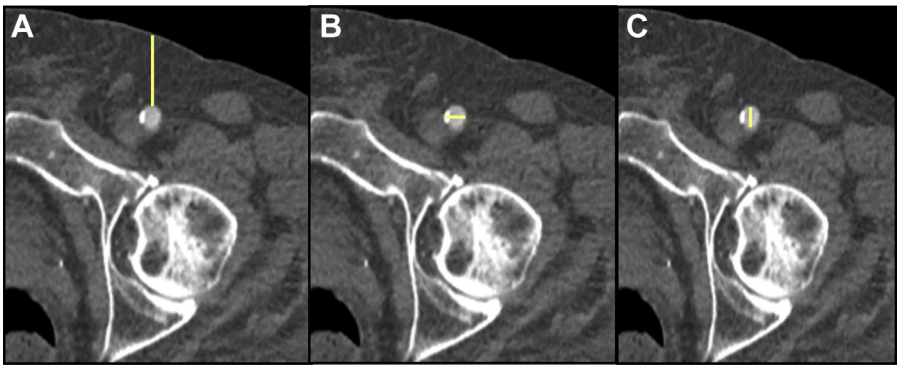

Fig 1. Method of femoral access vessel assessment. The common femoral artery (CFA) was located at the mid–femoral head, and a measurement from the skin to the anterior vessel wall was obtained to determine access vessel depth **(A)**. The left-right **(B)** and anterior-posterior **(C)** inner vessel diameters as well as plaque morphology and calcium score were obtained for each vessel accessed with a sheath that was 20F outer diameter or larger.

of the preclose technique, obesity was thought to be a relative contraindication because of concerns about access vessel depth and suture capture.[7,12]

Currently, there are limited data analyzing P-TEVAR, and no publications specifically examine the impact of obesity on procedural safety and success. The purpose of this analysis was to describe our experience with P-TEVAR and to compare outcomes in obese and nonobese patients.

METHODS

Approval for this study was obtained from the University of Florida College of Medicine Institutional Review Board. A waiver of informed consent was granted because all collected data pre-existed in medical records and no study-related interventions or subject contact occurred. Therefore, the rights and welfare of these subjects was not adversely affected.

Database and subjects. All patients undergoing TEVAR for any indication at the University of Florida between 2005 and 2011 were prospectively entered into an endovascular database. This database was queried for demographics, comorbidities, indications, and postoperative complications. Confirmation of patient- and procedure-specific outcomes was verified with retrospective review of the electronic medical record. Comorbidities and procedure-related outcomes were defined and graded by Society for Vascular Surgery reporting guidelines.[13] Patients undergoing percutaneous access and closure of a common femoral artery (CFA) who received thoracic endograft delivery were identified and further reviewed. Subjects undergoing femoral exposure or open conduit placement for device insertion were excluded. Preoperative computed tomography (CT) angiograms were examined to determine anatomic and morphologic data that were not routinely entered in the database, including access vessel depth, degree of femoral plaque burden, and calcification.

Definitions. Patients were dichotomized as obese or nonobese, and outcomes were further analyzed. Obesity was defined as a body mass index (BMI) $\geq$30 kg/m^2 (World Health Organization definition: www.who.int/mediacentre/factsheets).[14] Technical success of the preclose technique during TEVAR was defined as the ability to achieve hemostasis and to maintain limb perfusion without the need for CFA exposure or obligate surgical repair of the vessel for 30 days postoperatively. Any access-related complications identified in the electronic medical record or on postoperative CT review were also considered failures. These events were tabulated even if they were conservatively managed. Complications that were categorized as a preclose technical failure included development of lower extremity emboli, surgical site infection (deep or superficial requiring antibiotics or surgical débridement), de novo access vessel lesions such as hematoma (which was clinically diagnosed and treated either conservatively or with surgical evacuation), flow-limiting dissections, clinically significant stenosis (eg, new-onset claudication/limb ischemia, $\geq$50% cross-sectional diameter reduction, or vessel occlusion), pseudoaneurysms, arteriovenous fistulas, or documented Perclose device malfunction requiring arterial repair.

Access vessel evaluation. CFA depth and cross-sectional diameter were measured from a predefined anatomic reference point. The reference point was chosen in the mid-femoral head and measured in a straight line from the anterior vessel wall to the skin surface immediately overlying the artery. This was thought to be the most consistent anatomic marker for analysis of vessel depth and morphology, and it is typically above the CFA bifurcation (Fig 1). Per our protocol, the caudal extent of all CT scans extended below the femoral head, and the entire femoral bifurcation was visualized for any anatomic variation for each patient. If a patient's femoral artery bifurcation was located cranial relative to the femoral neck, the vessel depth was measured at the location of the bifurcation.

CFA calcification and morphology were scored on the basis of presence or absence of atherosclerotic plaque from the superficial epigastric artery to the femoral bifurcation