Conclusions: Quantifiable and reproducible radiation scatter is created during interventional procedures. Radiation doses vary widely around the perimeter of the angiography table and may be referred to as "scatter cloud." This "scatter cloud" differs from the levels predicted by the inverse square law. Knowledge of the actual exposure levels within the endovascular environment may help in mitigating these risks.

Comparative Analysis of Endarterectomy and Stenting For the Treatment of Carotid Stenosis in Women

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Introduction and objectives: Although large randomized studies have established the efficacy and safety of carotid endarterectomy (CEA) and stenting (CAS), the under-representation of women leaves the comparison of risks to benefits of performing these procedures on women an open question. To address this issue, we delineated patient characteristics predicting outcomes in women undergoing carotid interventions.

Methods: We analyzed in-hospital mortality, postoperative stroke, and the composite end points of stoke or death in 20,620 hospitalizations in New York and Florida for 2007 to 2009. Univariate and multivariable logistic regression analyses were performed.

Results: CEAs were performed in 16,576 asymptomatic and in 1744 symptomatic women and CAS in 1948 asymptomatic and in 352 symptomatic women. Compared with CAS, CEA rates were significantly lower for in-hospital mortality, stroke, and combined stroke/mortality (Table). Cardiac complication rates did not differ among asymptomatic women, but cardiac complications were more frequent among symptomatic women with CAS (10.5% vs 6.5%, $P = .008$). Among symptomatic women, the presence of renal disease, CAD, or age ≥80 years increased the risk of CAS over CEA threefold for the composite end point of stroke or death. For asymptomatic women, only in those with CAD or diabetes, there was a significant difference in the mortality/stroke rates favoring CEA. After adjusting for relevant clinical and demographic risk factors, CAS increased the risk for the composite end point of stoke or death in both symptomatic and asymptomatic patients.

Conclusions: These databases reflect real-world practice performance of the management of carotid disease in women and suggest that CEA has better perioperative outcomes in women. Importantly, CAS is associated with significant morbidity in certain clinical settings, and this should be taken into account when choosing a revascularization procedure.

In-hospital outcomes after carotid endarterectomy (*CEA*) and carotid artery stenting (*CAS*) in asymptomatic and symptomatic women

Table.

	Asymptomatic			*Symptomatic*		
Outcome	*CEA, %*	*CAS, %*	*P*	*CEA, %*	*CAS, %*	P
Mortality	0.3	0.8	.0007	0.4	3.4	<.0001
Post-op stroke	1.5	2.6	.0004	3.5	9.7	<.0001
Stroke/ mortality	1.7	3.1	<.0001	3.8	11.1	<.0001

Comparison of Carotid Endarterectomy and Stenting in Real-World Practice Using a Regional Quality-Improvement Registry

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Introduction and objectives: Carotid artery stenting (CAS) remains controversial despite recent randomized controlled trials. This study compared the outcomes of CAS and carotid endarterectomy (CEA) in real-world practice.

Methods: This was a retrospective analysis of 7649 CEA and 430 CAS procedures performed at 17 centers from 2003 to 2010 within the Vascular Study Group of New England. Two primary outcome measures were (1) any in-hospital stroke or death, and (2) any stroke, death, permanent cranial nerve injury (CNI), or myocardial infarction (MI). Combined coronary artery bypass grafting and CEA procedures were excluded. Multivariate analysis was performed to identify predictors of in-hospital stroke/death in patients undergoing CAS.

Results: Patients undergoing CAS had increased prevalence of coronary artery disease, congestive heart failure, diabetes mellitus, and prior ipsilateral CEA. CAS was performed in six centers by 30 surgeons and 8 interventionalists with a case volume per operator ranging from 1 to 137. Embolic protection was used in 97% of CAS. Shunts were used in 48% of CEA. The overall in-hospital stroke/death rate was higher among patients undergoing CAS (2.3% vs 1.1%, $P = .028$), which was due to an increased risk of stroke/death in symptomatic patients. Asymptomatic patients had similar rates of stroke/death with CEA and CAS. Overall rates of stroke, death, MI, and CNI were not different between CEA and CAS. Cortical symptoms (odds ratio [OR]; 7.3; 95% confidence interval [CI], 1.8-29.3), age >70 years (OR, 5.3; 95% CI, 1.1-26.3), and CHF (OR, 3.9; 95% CI, 1.0-15.0) were predictors of stroke/death in patients undergoing CAS (Table).

Table. Outcomes of carotid endarterectomy (*CEA*) and carotid artery stenting (*CAS*) within the ascular Study Group of New England

		Overall (n = 8,079), %		*Asymptomatic (n = 5,316), %*		*Symptomatic (n = 2,761), %*	
Variable	*No.*	*Stroke, death*	*Stroke, death, CNI, MI*	*Stroke, death*	*Stroke, death, CNI, MI*	*Stroke, death*	*Stroke, death, CNI, MI*
CEA	7649	1.1	4.1	0.89	3.6	1.6	5.0
CAS	430	2.3	2.8	0.73	1.1	5.1	5.8
P		.028	0.183	.784	.027	.001	.654

CNI, Cranial nerve injury; myocardial infarction; *MI,* myocardial infarction.

Conclusions: In our regional vascular registry, CAS is performed in patients at high operative risk. The overall outcomes of CAS and CEA are similar when accounting for permanent CNI and MI. However, symptomatic patients treated with CAS are at higher risk stroke or death. CAS may be best suited for asymptomatic patients.

Patients Considered "High Risk" For Carotid Endarterectomy are at Increased Risk of Adverse Events After Carotid Artery Stenting

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Introduction and objectives: Current guidelines allow stenting as an alternative in patients considered "high risk" for carotid endarterectomy (CEA). There is conflicting evidence regarding high-risk criteria for CEA and the safety of stenting in these patients. Using CMS inclusion criteria for carotid artery stenting (CAS), we stratified patients that underwent CAS or CEA by risk status and compared their outcomes.

Methods: A retrospective record review of all CAS and CEA procedures from 2001 through 2010 at a tertiary medical center was performed. Patients were identified using International Classification of Diseases, 9th Revision, Clinical Modification codes and stratified according to Centers for Medicare and Medicaid Services high-risk status and adjusted for symptom status. We compared differences in outcomes among each subgroup of patients that underwent CAS or CEA. Multivariable logistic regression was used to determine predictors of death alone or combined 30-day adverse events of cerebrovascular accident (CVA) or transient ischemic attack (TIA), myocardial infarction (MI), or death.

Results: We identified 307 CAS patients (61.9% high-risk) and 1018 CEA patients (25.8% high-risk). Complications occurred in 18 of 190 high-risk CAS patients (9.5%), including 9 CVAs (4.7%), 4 TIAs (2.1%), 3 MIs (1.6%), and 4 deaths (2.1%). Complications occurred in 14 of 263 high-risk CEA patients (5.3%), including 10 CVAs (3.8%), 3 TIAs (1.1%), 1 MI (0.4%), and 1 death (0.4%; Table). Physiologic high-risk status predicted adverse events after CAS (odds ratio [OR] 2.54; 95% confidence interval [CI], 1.01-6.42; $P = .047$) but not after CEA (OR, 0.89; 95% CI, 0.59-2.16; $P = .36$). Controlling for physiologic high-risk and symptom status revealed CAS had an increased risk of death over CEA (OR, 10.13; 95% CI, 1.07-95.61; $P = .04$).

Table.

Variable	*No.*	*Symptomatic (%)*	*CVA (%)*	*TIA (%)*	*Death (%)*	*MI (%)*	*Combined (%)*
CAS risk							
High	190	35.2	4.7	2.1	2.1	1.6	9.5
Low	117	24.8	0.0	3.4	0.0	0.0	4.3
CEA risk							
High	263	41.4	3.8	1.1	0.4	0.4	5.3
Low	755	36.7	2.8	1.2	0.0	1.1	5.1

CAS, Carotid artery stenting; *CEA,* carotid endarterectomy; *CVA,* cerebrovascular accident; *MI,* myocardial infarction; *TIA,* transient ischemic attack.