AANS/CNS Joint Cerebrovascular Annual Meeting

February 20-21, 2017
Houston, TX

Carotid Angioplasty and Stent. A Single Center Experience using a 6 Fr Technique

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Introduction

The results of the Carotid Revascularization Endarterectomy versus Stenting Trial (CREST) indicate that revascularization using Carotid Endarterectomy (CEA) results in increased Myocardial Infarction (MI) while Carotid Artery Angioplasty and Stenting (CAS) results in higher rates of stroke*. In CREST, large bore guide sheaths were used to access the common carotid artery. Often this required selective catheterization of the ECA to obtain stiff wire access for guide sheath placement. Strokes can occur before the internal carotid stenosis is instrumented due to tortuous brachiocephalic anatomy with atheroma. We describe a 6 Fr guide catheter technique that minimizes trauma to the brachiocephalic vasculature and does not require any manipulation of the carotid bifurcation prior to crossing with a distal protection device.

Methods

We performed a retrospective chart review of 223 consecutive CAS procedures of the cervical carotid bifurcation form 2006-2015 at a single center with a single surgeon. Inclusion and exclusion criteria are described in Table 1. Inclusion criteria were extrapolated from The North American Symptomatic Carotid Endarterectomy Trial (NASCET)**. Primary composite endpoints included stroke, MI, or death. Secondary endpoints include transient ischemic attack (TIA) and restenosis requiring intervention by angioplasty or CAS. All endpoints were analyzed at 30 days and 1 year after CAS. Carotid Doppler studies were performed at 1, 6, and 12 months and then yearly thereafter. Dual antiplatelet therapy was monitored with P2Y12 and aspirin sensitivity tests. Twelve procedures were excluded from the analysis. Five were acute stroke treatments and 7 were not located at the cervical carotid bifurcation.

Table 1 - Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria

• Symptomatic Stenosis
  • Male > 50% Stenosis
  • Female >70% Stenosis
• Asymptomatic Stenosis (Male or Female) > 80%
	• Acute Stroke, Stroke in evolution
	• Resistance or Allergy to antiplatelet therapy
	• Documented Chromium, Cobalt, Titanium or Nickle allergy

Technique:

1. Patients were awake under neuroleptanalgesia.
2. 6Fr Codis Envoy XB (Hialeah, FL) SIM2 guide catheter attached to continuous heparinized saline flush with rotating hemostatic adaptor
3. EPI EZ filter wire (Boston Scientific, Natick, MA)
4. Intravenous heparinization to ACT of 250-300

Results:

A total of 211 procedures were included in the analysis in 206 patients. 8 (3.8%) patients were lost to follow-up. Mean age was 68.9 years. 105 (49.8%) procedures had left carotid artery stenting. More than 96.7% of patients were maintained under dual antiplatelet therapy using Aspirin and Plavix. In our population, there were no strokes in the first 30 days. There was only 1 epiode of TIA in the first 30 days (0.47%). There was 1 stroke in the first year post-stenting (0.47%). A total of 3 TIA events occured (1.42%). Death attributable to CAS happened once in the first 30 days (0.47%) and a total of 2 deaths in the first year post-CAS (0.95%) (Table 4).

Figure 1 - Retroscpective Criteria Distribution

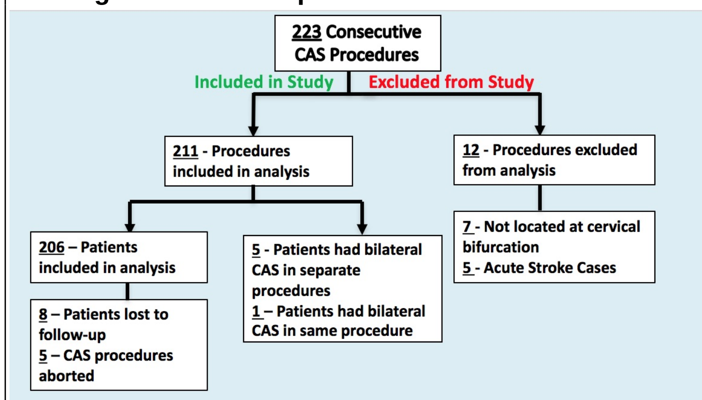

Table 2 - Baseline Characteristics of Study Population

A. Patient Characteristics (N=206)	Patients N (%)#	B. Procedural Characteristics (N=211)	Procedures N (%)#
Age (years) (Mean ± SD)	68.9 ± 9.3	Stenosis Characteristics:	
Male Sex	121 (58.7%)	Percent Stenosis (Mean ± SD)	80.7 ± 8.1
White Race	201 (97.6%)	Moderate Stenosis (≤70%)	29 (13.7%)
Risk Factors:		Severe Stenosis (>70%)	182 (86.3%)
Diabetes	74 (36.0%)	Left Sided Artery (% of patients)	105 (49.8%)
Hypertension	166 (81.0%)	Medical Treatment (% of patients):	
Dyslipidemia	27 (13.1%)	During Procedure	
Hyperlipidemia	86 (41.7%)	Heparin	208 (98.6%)
Atrial fibrillation	17 (8.3%)	After Procedure	
Coronary Artery Disease	84 (40.8%)	Aspirin	209 (99.1%)
Heart Failure	15 (7.3%)	Plavix	204 (96.7%)

- Number and Percentages were provided for all the variables except for Age and Percent of Stenosis where mean and standard deviation were provided

Table 3 - Stent Types Compatible with 6Fr Guide Catheter

Stent Type (N=211)	N(%)
Percise (Cordis, Hialeah, FL)	115 (54.5%)
Nextstent (Boston Scientific, Natick, MA)	48 (22.8%)
Wallstent (Boston Scientific, Natick, MA)	41 (19.4%)
Aborted (No Stent Used)	5 (2.4%)
Acculink (Abbott, Abbott Park, IL)	1 (0.5%)
Cobalt Chromium (Medtronic, Dublin, Ireland)	1 (0.5%)

Table 4- Primary and Secondary Endpoints

Primary and Secondary CAS Endpoints at 30 Days and 1 Year (N=211)		
	30-Day Period	1-Year Period (Including 30-Day period)
Primary Endpoints	Patients N (%)	Patients N (%)
Stroke	0 (0%)	1 (0.5%)
Myocardial Infarction	1 (0.5%)	1 (0.5%)
All–Cause Death	1 (0.5%)	10 (4.7%)
Death - Attributable to CAS	1 (0.5%)	2 (1.0%)
Secondary Endpoints		
TIA	1 (0.5%)	3 (1.4%)
Re-Angioplasty	0 (0%)	6 (2.8%)
Re-CAS	0 (0%)	1 (0.5%)

Conclusions

The CREST Trial results indicated a higher rate of perioperative stroke for CAS when compared to CEA. We feel the use of large bore guide sheaths in tortuous brachiocephalic anatomy was one cause. We have introduced a 6 Fr guide catheter technique using a SIM2 shape that obviates the need to instrument the cervical carotid bifurcation or the external carotid for placement. Our patient demographics were similar to CREST. Our 30 day and 1 year MI, stroke, death rates are far below CREST. We attribute this to the 6Fr SIM2 guide catheter technique.

References

* Brott, Thomas G., et al. "Stenting versus endarterectomy for treatment of carotid-artery stenosis." New England Journal of Medicine 363.1 (2010): 11-23.

** North American Symptomatic Carotid Endarterectomy Trial Collaborators. "Beneficial effect of carotid endarterectomy in symptomatic patients with high-grade carotid stenosis." N engl j Med 1991.325 (1991): 445-453.

***Brott, Thomas G., et al. "Long-term results of stenting versus endarterectomy for carotid-artery stenosis." New England Journal of Medicine 374.11 (2016): 1021-1031.