Previous Stroke and Carotid Stenting Predict Periprocedural Risk of Symptomatic Carotid Intervention Complications in a Large Community Hospital Vascular Registry

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Introduction

Published analysis of the NASCET (The North American Symptomatic Carotid Endarterectomy Trial)[1] and ECST (The European Carotid Surgery Trial)[2] studies indicate the significant impact of the timing of surgery from symptomatic event, type of symptomatic event, history of diabetes, gender, and age on patient outcomes.

Hypothesis: Identified periprocedural risks of age, gender, timing, type of symptomatic event as well as type of procedure will predict complications in a large community hospital vascular registry.

Methods

The Providence Carotid Registry is a prospectively collected database that includes all patients who underwent carotid revascularization from January 2005 to June 2012. Patients had post-procedure follow-up, including 30 days post-procedure assessment. Carotid Intervention patients diagnosed with stroke or TIA or other stroke-like symptoms prior to carotid intervention were included in the analysis. Asymptomatic patients were excluded. Procedural complication was defined as stroke, MI, or death post-operatively or death within 30 days after the procedure. A priori identified predictor variables were age (<65, 65-74, 75 or greater), gender, symptomatic event (diagnosed stroke, TIA or ocular only symptoms), intervention type (stent versus endarterectomy), history of diabetes and time from symptomatic event to intervention (<1 week, 2-4 weeks, >4 weeks). We also included an indicator that identified patients considered higher risk of any surgical complication for endarterectomy to control for surgical selection bias. Univariate analyses were conducted to determine the relationship between the dependent and independent variables. Backward multiple logistic regression was conducted to predict CVA, MI or death post-operatively or death within 30 days using age, gender, time to intervention, intervention type and symptomatic event as predictors.

TABLE 1: DEMOGRAPHICS OF PATIENTS WITH SYMPTOMATIC CAROTID DISEASE BY INTERVENTION TYPE (n=701)

VARIABLE	ALL PATIENTS (n=701) N	%
Gender		
Male	444	63.3
Female	257	36.7
Age (years)		
<65	188	26.8
65-74	231	33.0
>75	282	40.2
Time of Symptom Onset to Intervention		
>4 weeks	230	32.8
2-4 weeks	250	35.7
<2 weeks	221	31.2
Diabetes		
No	463	66.0
Yes	238	34.0
High Risk Criteria Met		
No	386	55.1
Yes	315	44.9
Symtomatic Event		
Ocular Only	257	36.7
TIA	194	27.7
Stroke	250	35.7
Intervention Type		
Endarterectomy	608	86.7
Stent	93	13.3
Periprocedural Complication		
No	673	96.0
Yes	28	4.0

Note: TIA=Transient Ischemic Attack, Periprocedural Complication=stroke, myocardial infarction (MI), or death within 30 days of the procedure.

TABLE 2: PEARSON CHI-SQUARE RESULTS FOR RISK OF PERIPROCEDURAL COMPLICATION

VARIABLE	NO COMPLICATION (N=673) n	%	COMPLICATION (N=28) n	%	χ^2, df	P-VALUE
Gender						
Male	426	63.3	18	64.3	.011, 1	.92
Female	247	36.7	10	35.7		
Age (years)						
<65	182	27.0	6	21.4	.43,2	.81
65-74	221	32.8	10	35.7		
>75	270	40.1	12	42.9		
Time of Symptomatic Onset to Intervention						
>4 weeks	223	33.1	7	25.0	.81,2	.67
2-4 weeks	239	35.5	11	39.3		
<2 weeks	211	31.4	10	35.7		
History of Diabetes						
No	448	66.6	15	53.6	2.03,1	.12
Yes	225	33.4	13	46.4		
High Risk Criteria Met						
No	372	55.3	14	50.0	9.31,2	.01
Yes	301	44.7	14	50.0		
Symptomatic Event						
Ocular Only	250	37.1	7	25.0	9.81, 2	.01
TIA	244	36.3	6	21.4		
Stroke	179	26.6	15	53.6		
Intervention type						
Endarterectomy	588	87.4	20	71.4	5.94, 1	.02
Carotid Stenting	85	12.6	8	28.6		

Note: Periprocedural Complication=stroke or myocardial infarction (MI) ; $\chi2$ = Pearson Chi-Square; df=Degrees of Freedom, a=.05

Results

Of the 1,716 patients in the registry, 701 (40.9%) patients with symptomatic carotid disease were included in the analysis. Over 60% were male and the mean age was 71.2 years (Table 1). Time of symptom onset to carotid revascularization was as follows: 31.2% at <2 weeks, 35.7% at 2-4 weeks and 32.8% at >4 weeks. A majority of the patients underwent an endarterectomy (86.7%) versus stent (13.3%). Less than thirty percent of patients had TIA symptoms prior to revascularization, while 35.7% had diagnosed stroke symptoms and 36.7% had only ocular symptoms. Thirty-four percent of patients had a history of diabetes and 45.0% met the criteria for surgical high risk Twenty-eight patients (4.0%) had post-operative stroke or death within 30 days. No patients experienced an MI.

Univariate analyses showed significant relationships (Table 2) between periprocedural complications and symptomatic event (p=.007) and intervention type (p=.015). Multiple logistic regression results (Table 3) indicate that the symptomatic event of stroke (n=194) compared to only ocular symptoms (n=257) (Odds Ratio (OR) =2.70, p=.04) was a significant predictor of periprocedural complications at α=.05. Carotid stenting (n=93) versus carotid endarterectomy (n=608) (OR=2.36, p=.05) approached significance as a predictor of periprocedural complications. Timing, gender, age, history of diabetes, risk for surgery and TIA symptom event were not significant predictors.

TABLE 3. MULTIVARIABLE LOGISTIC REGRESSION RESULTS FOR RISK OF PERIPROCEDURAL COMPLICATION (N=701)

VARIABLE	ODDS RATIO	95% CI	P-VALUE
Female	1.01	(0.45, 2.26)	.98
Age (years)			
≤64 (ref)	1.00		.72
65-74	1.41	(0.49, 4.05)	.52
>75	1.50	(0.54, 4.17)	.43
Time of Symptom Onset to Intervention			
>4 weeks (ref)	1.00		.52
2-4 weeks	1.47	(0.54, 4.02)	.49
<2 weeks	1.77	(0.66, 4.77)	.26
History of Diabetes	1.36	(0.62, 2.97)	.45
High Risk Criteria Met	.92	(0.39, 2.16)	.85
Carotid Stenting	2.36	(.990, 5.61)	.05
Symptomatic Event			
Ocular Only (ref)	1.00		.02
TIA	.855	(0.28, 2.57)	.78
Stroke	2.70	(1.07, 6.84)	.04

Note: TIA= Transient Ischemic Attack, Periprocedural Complication= stroke or myocardial infarction (MI). No deaths were reported within 30 days of procedure, CI= Confidence Interval, a=.05

Conclusions

- Our study of symptomatic carotid disease showed that patients with a qualifying symptom of stroke and those undergoing carotid stenting were at higher risk of periprocedural complications.
- Although in our analysis we included an indicator for surgical risk, we were not able to capture the proportion of patients that specifically met the high risk CMS criteria for carotid revascularization which may explain the higher complication rate in those patients undergoing carotid stenting.
- Unlike prior clinical trial studies, timing of the intervention was not significantly related to complications. Age, gender, history of diabetes, risk for surgery and diagnosed TIA symptom events also did not have an effect.
- Future analyses will include other potential procedural risk factors and focus on the risk and benefit of these procedures on long-term functional outcomes.

References

[1] Rothwell, PM et al, Endarterectomy for symptomatic carotid stenosis in relation to clinical subgroups and timing of surgery. Lancet. 2004 Mar 20; 363 (9413):915-24.

[2] Rothwell, PM et al Clinical and angiographic predictors of stroke and death from carotid endarterectomy: systematic review *BMJ* 1997;315:1571–7.

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