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Review Article

Single Center Experience with Periprocedural Safety in Stenting Cervical and Intracranial Atherosclerotic Disease

Hugo H Cuellar*, Benjamin L Brown and Sudheer Ambekar

Department of Neurosurgery, Louisiana State University, USA

***Corresponding author:** Hugo H Cuellar, Department of Neurosurgery, Louisiana State University Health Sciences Center, Shreveport, Louisiana, USA, 1501 King's Highway, PO Box 33932, Shreveport, LA 71130, USA, Tel: 318-675-8921; Fax: 318-675-6867; Email: hcuell@lsuhsc.edu

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Abstract

Introduction: We reviewed our institutional experience to compare our single institution, single surgeon results to larger published series.

Methods: This is a retrospective review of 51 consecutive patients treated from March 2010 through November 2013 by a single surgeon at LSUHSC-Shreveport. The procedures included were all stents placed for the treatment of both cervical carotid and intracranial atherosclerotic occlusive disease. All cervical carotid procedures were performed with cerebral protection when anatomically possible. Intracranial stenosis was treated with angioplasty and stent and no distal protection.

Results: Of our 51 patients 33 were male (64.7%), 18 were female (35.3%). The mean age was 58.2. The 51 patients represented 52 procedures with 52 different lesions treated with angioplasty and stenting. All patients included had symptomatic disease. Primary endpoint for poor outcome was symptomatic stroke, death, or myocardial infarction within 30 days. There was no incidence of symptomatic stroke, death, or myocardial infarction. Non-stroke morbidity was 5.4%. These included groin hematoma and acute stent thrombosis.

Conclusions: The periprocedural results of our institution with regard to cervical carotid and intracranial angioplasty and stenting of atherosclerotic disease indicate comparable safety in these procedures to internationally published figures.

Keywords: Carotid Stenting; Intracranial atherosclerosis; Endovascular; Carotid angioplasty, Intracranial stenting; Carotid atherosclerosis

Introduction

Cerebrovascular disease has enormous medical and financial toll on the United States each year. Every year it is estimated 795,000 people experience a new or recurrent stroke in the United States. Approximately 610,000 of these are first attacks. The estimated direct medical cost of stroke for the year 2007 was $25.2 billion [1]. While medical and open surgical therapies have been the mainstay of treatment for years, the use of endovascular techniques is a growing and has been the focus of many recent studies [2-8]. The purpose of this study is to compare the periprocedural safety of cervical carotid and intracranial angioplasty and stenting for atherosclerotic disease between our single surgeon experience and larger multicenter trials.

Methods

Patient selection

We retrospectively reviewed the charts of consecutive patients from March 2010 through November 2013 who received cervical carotid or intracranial angioplasty and stenting for symptomatic atherosclerotic disease. All procedures were performed by the corresponding author at Louisiana State University Health Sciences Center (LSUHSC) in Shreveport, LA. Angioplasty and stenting procedures for pathology other than atherosclerotic disease were excluded. Other reasons for exclusion were age < 18 and acute stroke intervention. These criteria yielded a total of 51 patients representing 37 and 15 discrete extracranial and intracranial lesions, respectively. All cervical carotid patients were symptomatic and referred for stenting [CAS] over endarterectomy [CEA] due to presence of co-morbidities, failure of prior CEA, radiation to the neck, or anatomy not conducive to open surgery. All intracranial stenting patients were referred for treatment of symptomatic stenosis that had failed medical management.

Technique

Patients were treated with preoperative aspirin (ASA) 325 mg and Plavix 75 mg for three days if not already on these medications. The common femoral artery was accessed using a 7F sheath for cervical carotid and a 6F sheath for intracranial lesions. A 7F VBL guiding catheter was used for all cervical lesions and a 6F Envoy or Neuron guiding catheter for all intracranial procedures.

Cervical carotids

The procedures were performed under monitored anesthesia care (MAC). This facilitated intermittent neurologic exams during the procedure. The guiding catheter was placed in the proximal common carotid artery. Cerebral protection devices were used in all cases

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where it was possible anatomically to deploy the device distal to the stenosis. All lesions were treated with stenting and angioplasty. Pre-stent angioplasty was employed in cases where the stenosis was too great to traverse with the stent.

Intracranial lesions

The intracranial stenting procedures were performed under general anesthesia in order to have the patient completely immobilized during navigation of the intracranial vasculature. The guiding catheter was placed in the cervical segment of the internal carotid artery. Wingspan intracranial stents were used in combination with balloon angioplasty for all lesions.

Post-operative care

Following stenting, patients were monitored for 24 hours in the neurosurgical intensive care unit and maintained on a heparin drip until the following morning. Upon discharge, patients were maintained on Plavix 75 mg for 6 months and on ASA 325 mg indefinitely.

Data collection

Patient charts were reviewed for age, comorbidities (hypertension, diabetes mellitus, hyperlipidemia, coronary artery disease, previous coronary artery bypass, and peripheral arterial disease). Reason for CAS over CAE was recorded. Location of lesions as well as type of stent, presence of cerebral protection, need for pre-angioplasty and procedural complications were recorded. Primary endpoints were presence of stroke, myocardial infarction, or death within 30 days of the procedure. Secondary endpoint was success of procedure defined as < 30% residual stenosis on control digital subtraction angiography (DSA).

Results

There were 51 patients: 33 male and 18 female. The mean patient age was 58.2 +/- 7. Comorbidities are listed in Table 1. 37 patients had cervical carotid lesions and 18 had intracranial lesions. In total there were 52 discrete lesions: 37 - cervical carotid, and 15 intracranial. Of the cervical carotid lesions 21 were right sided, 14 were on the left and one bilateral. Of these lesions 35 of 37 were treated using distal cerebral protection. 30 patients were deemed high surgical candidates, 4 had history of previous endarterectomy and 2 had previous radiation to the neck. Of the intracranial lesions, 6 were of the anterior circulation and 9 were of the posterior circulation. All lesions were treated successfully, defined as < 30% of residual stenosis. Primary outcome measure was the periprocedural (30 day) incidence of stroke, myocardial infarction and/or death. There was no incidence of stroke, myocardial infarction, or death within the periprocedural period. In the cervical carotid group there was one groin hematoma that resolved without intervention and one acute stent thrombosis requiring thrombolytic. The acute stent thrombosis was in a patient that did not adhere to postoperative antiplatelet regimen. This did not result in permanent neurologic deficit. The total periprocedural morbidity for cervical carotid stenting was 5.4%. There were no periprocedural complications for the intracranial stenting group.

Table 1:

Patient Comorbidities		Percentage
Hypertension	37	72.5%
Hyperlipidemia	28	54.9%
Diabetes Mellitus	17	33.3%
Coronary Artery Disease	15	29.4%
Coronary Artery Bypass	7	13.7%
Peripheral Arterial Disease	6	11.7%

Table 2: Summary of periprocedural outcomes in three noted trials.

Trial	Stroke	Death	MI	Use of embolic protection device:
SPACE	7.51%	0.67%	N/A	27%
EVA-3S	8.8%	0.4%	0.4%	91%
CREST	4.1%	0.7%	1.1%	96%

Discussion

Several large international, multicenter trials have reported periprocedural complication rates for cervical carotid stenting. These include the SPACE, EVA-3S, and CREST trial [2,6,7, 9-18] The incidence of periprocedural stroke, death, and MI were 4.1-8.8%, 0.4-0.67%, and 0.4-1.1%, respectively. These results are summarized in Table 2. The periprocedural results of our small series are comparable with these numbers. We did not have any incidence of stroke, death or MI in the 36 patients undergoing cervical carotid stenting. Had one of these patients had a primary endpoint it would have increased the percentage to approximately 2.7% for that category, which would be close to the CREST trial in stroke, probably because in our series 94.5% of the lesions were treated using cerebral protection device as in the CREST trial, but it would have been higher if it had been a death or myocardial infarction.

A recent multicenter analysis of intracranial stenting investigated 30 –day periprocedural complication rates [5]. They found rates for periprocedural stroke and death at 6.4% and 0.94%, respectively. We were fortunate in our small number of patients to not encounter a stroke or death.

The above results are obtained by large institutions with higher number of patients than treated thus far at our institution. Our results indicate that the safety data obtained in these trials may be applicable to single surgeon experiences in institutions with smaller volume of stent procedures. Further analysis of our data will be necessary to establish continued safety at longer follow-up.

Limitations

This is a single institution retrospective observational series with a small number of patients. Because we did not have the presence of a primary endpoint we are unable to determine the true incidence of these events in our institution, but at this time it appears within the safety parameters set by the above studies.

Conclusion

Cervical carotid artery and intracranial periprocedural safety data can be replicated in single surgeon series at institutions with smaller volumes. Further studies with larger series will be needed to confirm this finding.

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