Stenting Cerebral Arteries with Emboli-Protection Device: Report of 5 Cases and Six-Month's Follow-Up

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Abstract

Background- Carotid endarterectomy is superior to medical management for the prevention of stroke in patients with carotid and vertebral artery stenosis, but stenting with the use of emboli-protection devices is less invasive. We report our results with carotid artery stenting in five patients.

Methods- Stenting was done in five symptomatic male patients (mean age = 66.8 years), 20% and 40% of whom were diabetic and hypertensive, respectively, and 60% had coronary artery involvement. Indications for stenting were prior stroke in one, vertigo in one and transient ischemic attack in three patients.

Results- Stenting with self-expandable stents was technically successful in all the cases. No stroke, restenosis or death occurred.

Conclusion- Stenting cerebral arteries are feasible with a high degree of technical success ***(Iranian Heart Journal 2005; 6 (1,2): 60-63).***

Key words: carotid artery stenosis ■ vertebral artery stenosis ■ stenting ■ stroke ■ prevention

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Atherosclerotic stenosis of the carotid artery causes about 20% of all ischemic strokes and transient ischemic attacks.[1] The advantage of carotid endarterectomy over medical therapy in patients with significant carotid stenosis has been established in several clinical trials.[2, 4] Shorter hospitalization, avoidance of anesthesia and surgical incision make carotid angioplasty and stent placement attractive.[3] Over the past decade, carotid angioplasty with stenting has been used to treat high surgical risk patients.[4] But an important concern is intra-procedural embolization. Emboli-protection devices have been developed to reduce this problem.[4]

We report our experience of carotid and vertebral artery stenting with the emboli-protection device in five patients and their follow-up for a period of six months.

Methods

From March 2003 to March 2004, five male patients, 60 to 72 years old (mean = 66.8), underwent carotid and vertebral angioplasty and stenting at Imam Reza (A.S.) Hospital (Mashhad, Iran). All the patients (100%) had symptomatic cerebral artery stenosis of at least 70% of the luminal diameter on color duplex ultrasonography.

One patient (20%) had diabetes mellitus, two others (40%) had hypertension and three patients (60%) had severe coronary artery disease. Indications for intervention were a prior stroke in one patient, vertebrobasilar ischemia related symptoms (vertigo attacks) in another patient and hemispheric transient ischemic attack in three others.

Clinical characteristics and demographic data are shown in Table I.

Table I. Patient characteristics

Characteristics	No.	Percent
Patients	**5**	**100%**
Mean age (year)	**66.8**	**-**
Sex (male/female)	**5/0**	**100% Male**
Diabetes mellitus	**1**	**20%**
Hypertension	**2**	**40%**
Coronary artery disease	**3**	**60%**
Stroke	**1**	**20%**
Transient Ischemic Attack	**3**	**60%**
Vertigo	**1**	**20%**

All the patients underwent diagnostic aortic arch and four-vessel, selective carotid and vertebral angiography. Significant angiographic stenosis was defined as more than 70% diameter stenosis. All the patients received aspirin 100 mg/day and ticlopidine 250 mg/BID or clopidogrel 75 mg/day for one week before the procedure. Angiography and stenting were performed with local anesthesia via the femoral approach. After arterial access, 5000-10000 IU heparin was administered. No sedation was used before and during the procedure. Hemodynamics were monitored continuously. The stenotic lesions were crossed with a protection device (filter wire EZ) placed 2cm distal to the lesions and expanded before the stents were deployed. All the lesions were treated with self-expandable stents (Carotid Wallstent, Boston Scientific). After stent deployment, post-dilation with a balloon 5 mm in diameter was performed. Just before balloon inflation, atropine 1 mg was administered to

prevent bradycardia. At the end of the procedure, the emboli-protection device containing the captured emboli was collapsed and removed. Carotid and vertebral angiography was performed in all the patients to assess technical results and the presence of distal spasm (Fig. 1).

Fig. 1-A

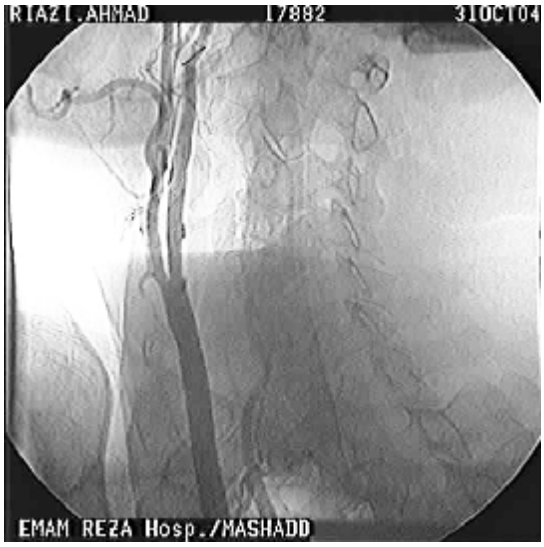

Fig. 1-B

Fig.1. Angiograms demonstrating left internal carotid artery ostial stenosis in a 70-year-old man with history of hypertension, who presented with transient ischemic attack. Color Doppler ultrasonography revealed 70% stenosis in the left internal carotid artery (Fig 1-A). The final result after stenting (Fig. 1-B).

After the procedure, all the patients were observed in CCU for 48 hours with blood pressure and heart rate monitoring. The patients were usually discharged after 48 hours and after examination by a neurologist and were prescribed ticlopidine 250 mg/BID or clopidogrel (75mg/day) for 3 months and aspirin 100 mg/day for an unlimited time. Outpatient follow-up was done at 30 days, 3 and 6 months after the procedure. Six months after the procedure, color duplex ultrasonography was repeated in all the patients.

Post-stenting residual stenosis equal to or greater than 30% and recurrent or residual in-stent stenosis with more than 50% diameter reduction, determined by duplex ultrasonography, were defined as technical failures.

Angiographic results

Most lesions were located at the proximal portion of the vessels. Treated cerebral arteries were the left vertebral artery in one patient, the right internal carotid artery in three patients and left internal carotid artery in one patient. Technically successful procedures were achieved in all the patients. No significant residual stenosis and no immediate neurological problems occurred after cerebral artery stenting. Two patients had hypertensive instability due to internal carotid artery balloon dilation. No stroke, myocardial infarction or death occurred during a 30- day follow-up. During 1 to 6 months' follow-ups, all the patients remained neurologically unchanged, and color duplex ultrasonography revealed that all the stents were patent without residual or recurrent stenosis.

Discussion

According to the findings of European Carotid Surgery Trial (ECST)[5] and North American Symptomatic Carotid Endarterectomy Trial (NASCET),[6] the most common cause of cerebral artery stenosis is atherosclerosis. Carotid surgery is the standard treatment for severe symptomatic carotid artery stenosis. In ECST and NASCET, the 30 days' stroke and death rates in patients in the surgical group were 7.0% and 6.5%, respectively.[5,6] There have been many reports on the percutaneous interventional treatment of cerebral arteries on the basis of the CAVATAS Trial. Angioplasty is better than surgery because it reduces the risks related to the incision in the neck and general anesthesia. Also, according to CAVATAS, there is no significant difference in the major risks of balloon angioplasty or stenting and carotid surgery (10% frequency of death or any stroke in both groups). According to the SAPPHIRE trial,[4] stenting was not inferior to surgery, and the rate of death and stroke within 30 days was 4.8% in the stenting group and 9.8% in the endarterectomy group. Wholey and colleagues reported that carotid stenting had a complication rate of stroke and death of 5.8% within 30 days of treatment. However, cerebral embolization is currently considered as the major risk associated with carotid artery stenting.[7] Most strokes after carotid angioplasty are the result of plaque fracture in the carotid artery at the time of balloon inflation with subsequent thrombosis and embolism. For this reason, primary stenting seems to be safer than simple balloon angioplasty.[1] Stents will also prevent a free intimal flap from dissection. Improved dilation achieved by stenting than with balloon angioplasty might also reduce the rate of stroke in the short-term after treatment.[1] In addition, distal protection devices reduce intra-procedural embolization during carotid artery stenting.[8] In our study, primary carotid and vertebral

stenting with the emboli-protection device was done successfully in all the patients, without any complications. Short-term follow-up showed no residual stenosis or restenosis. In conclusion, cerebral artery stenting can be performed safely and may provide an alternative to endarterectomy, especially in patients with high surgical risk. Long-term follow-up, however, is required.

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