Simultaneous Cerebral Aneurysms and Carotid Disease

Should the Symptomatic Lesion always be the first to be Treated?

A Case Report

E. CASTRO, F. VILLORIA, F. FORTEA, J. CARRERA*, O. MATEO*,
S. SANCHEZ-ALARCOS*, L. REPARAZ**

Departments of Neuroradiology, *Neurosurgery and **Vascular Surgery Hospital Gregorio Marañón. Madrid. Spain.

Key words: carotid stenosis, cerebral aneurysms

Summary

Simultaneous presentation of carotid stenosis and cerebral aneurysms is rare and it is conventionally accepted that symptomatic lesions need to be treated first. Our purpose was to describe our experience in managing patients who simultaneously presented significant carotid stenosis and cerebral aneurysm.

Introduction

Simultaneous occurrence of cerebral aneurysms and carotid stenosis is uncommon and management raises treatment dilemmas. We retrospectively reviewed the simultaneous occurrence of both entities from September 2000 to July 2002. Over 127 cerebral angiograms were performed in response to suspected significant symptomatic carotid stenosis after a Doppler study, yielding three patients (2.4 %) with unruptured cerebral aneurysms (UIAs). In the same time period, 47 four-vessel angiograms were performed in the setting of an SAH, and three patients (6.3 %) had significant carotid stenosis, bilateral in one case. No cases of simultaneous symptomatic or asymptomatic occurrence were detected.

In patients with significant *symptomatic carotid stenosis* (more than 70 % according to the NASCET measurement scale) and *unruptured cerebral aneurysm* (two men and one woman; mean age 71 years) all UIA were ipsilateral to carotid stenosis (two MCA and one carotid ophthalmic) and size was less than 10 mm in diameter (mean 5.3 mm). Carotid stenosis was treated according to our institution's criteria (in one case by surgery and in two cases by carotid stenting) without any modifications to the protocol (heparin or antiplatelet therapy). No bleeding episodes were found.

A second group consisted of three patients with *aneurysmal SAH* and *incidental carotid stenosis*. The risk of perioperative stroke needs to be assessed in non-acute patients with severe carotid stenosis, and different combined strategies were employed. Herein we present these cases.

Case reports

Case one was a left A2 bifurcation aneurysm in a 69-year-old man (HH grade II) treated in acute phase ten hours after bleeding (figure 1). Bilateral 80 % asymptomatic carotid

A

B

C

D

Figure 1 69-year-old man with SAH HH grade II treated in acute phase. A) Cerebral angiogram demonstrated a left A2 bifurcation aneurysm. B, C) Bilateral 80% carotid stenosis was also seen. D) Standard GDC treatment was performed without complications.

stenosis was found. Standard endovascular treatment using GDC coils was performed under general anesthesia via a left A1 approach with the guiding catheter in the left common carotid just below the stenosis. There were no complications related to the embolization procedure.

Case two was a 56-year-old woman with acute ruptured Acom. Aneurysm (figure 2). Her medical history was unremarkable. Diagnostic angiogram showed an 80 % right ICA stenosis without right A1 angiographic filling. Endovascular treatment was performed from a dominant left A1 approach under general anesthesia. Sudden hypotension related to the anesthesia administered was noted at the beginning of the procedure, requiring volume expansion and vasoactive drugs. When the patient re-awakened, left side hemiparesis was noted and a CT scan revealed a cortical ischemic lesion in the right MCA territory.

Case three was a 71-year-old man (HH grade I) referred to our institution eight days after bleeding (figure 3). A cerebral angiogram showed a broad neck Acom. aneurysm with angiographic vasospasm and filling of both A2 systems from the left side, with a severe (95%) stenosis of the right ICA. No angiographic filling of the right A1 segment was present. Surgical clipping of the aneurysm was considered, and the potential advantages and risks of preliminary right ICA stenosis treatment were discussed. Ultimately, it was decided to perform carotid stenting (OTW 7x30 Carotid Wallstent) under systemic heparinization with strict control of ACT (200-250). Heparin was discontinued at the end of the procedure, and the patient was put on aspirin (300 mg/24 h). Five days after the endovascular procedure, the aneurysm was surgically clipped without complications.

Discussion

Simultaneous presentation of carotid stenosis and cerebral aneurysms is rare, and it is conventionally accepted that symptomatic lesions need to be treated first. Endovascular techniques now offer a new tool in the management of these diseases and may offer the possibility of different combined strategies in selected cases of simultaneous presentation, depending on the experience and results of the endovascular and surgical teams¹⁻².

Symptomatic carotid stenosis and unruptured cerebral aneurysms

Treatment of carotid stenosis may alter local intracranial hemodynamics and therefore increase the chance of aneurysm rupture, because the ICA stenosis may have a protective effect on intra-aneurysmal pressure. The prognosis of patients with symptomatic ICA stenosis and coincidental UIA was examined as part of the NASCET study³. The incidence of UIA aneurysm was 3.1%, and for lesions less than 10 mm in diameter treatment of carotid stenosis without first repairing the UIA can be considered safe. This same criterion was applied in the case of our patients, and no changes in the surgical or medical protocol were required in cases in which carotid stenting was performed (intraprocedural heparin with ACT control between 250-300 and double antiplatelet therapy 72 hours before the procedure, with AAS 200 mg/24 hours and clopidogrel 75 mg/24 hours). There were no complications related to aneurysmal bleeding.

Ruptured cerebral aneurysm and incidental carotid stenosis

Approximately 0.5% of patients with symptomatic aneurysms will have incidental carotid stenosis⁴. Only a few cases of simultaneous ruptured cerebral aneurysm with SAH and incidental carotid stenosis have been reported, and the risk of perioperative ischemic stroke or sudden thrombosis in patients with severe carotid stenosis is present⁴. Different conventional management strategies have been advocated, and while many experienced authors have pointed out that there is no conceivable circumstance where treatment of extracranial occlusive vascular disease should take precedence over treatment of an acutely ruptured aneurysm, no recommendations have been put forward based on clinical series. In this circumstance, however, aneurysms probably need to be treated first in most cases, but certain factors will need to be considered beforehand, namely:

- Is the patient in an *acute phase*? The risk of rebleeding in aneurysmal SAH is higher in the first 48 hours, and any delay in treatment in order to repair carotid stenosis is probably unjustified during this period.

In our third case, the patient was referred to our institution eight days after hemorrhage, and the potential advantages of previous treat-

Figure 2 56-year-old woman with SAH HH grade I and Acom aneurysm treated during the acute phase. A) Cerebral angiogram showed an Acom aneurysm with filling of both A2 systems from the left side. B) No filling of right A1 segment was demonstrated. C) The diagnostic angiogram also revealed right 80% ICA stenosis. D) Standard endovascular GDC treatment was performed from the left A1 segment without complications. E) CT scan showed a small, ischemic cortical area in the right MCA territory 24 hours after the procedure.

ment of severe 95% right ICA stenosis were weighed against the risk of rebleeding. Carotid stenting was finally performed first under systemic heparinization. No standard double antiplatelet therapy was administered, and in order to minimize surgical bleeding the patient

was only put on aspirin (300 mg/24 h) until surgical clipping five days later. However, no standard modifications to the usual medical protocols may be recommended.

– How are *cerebral hemodynamics* related to carotid stenosis, and what will the situation be

A

B

C

Figure 3 71-year-old man with SAH HH grade II Acom referred to our institution 8 days after bleeding with a broad neck Acom aneurysm. A) Cerebral angiogram demonstrated a incidental severe right 95 % ICA stenosis. B) Stenting of carotid stenosis was performed at first without complications. C) Cerebral aneurysm was clipped five days after carotid stenting.

tiplatelet therapy was administered, and in order to minimize surgical bleeding the patient was only put on aspirin (300 mg/24 h) until surgical clipping five days later. However, no standard modifications to the usual medical protocols may be recommended.

– How are *cerebral hemodynamics* related to carotid stenosis, and what will situation be if temporary clipping or temporary endovascular occlusion become necessary during treatment of the aneurysm?

Temporary clipping is a well established surgical technique in the treatment of cerebral aneurysms. Occlusion time is the main prognostic factor in determining ischemic damage reported in the literature, but safe limits for vessel occlusion remain to be determined⁵.

None of the protective measures have been proven to limit ischemic damage in clinical settings. In the anterior circulation, the peri or intraoperative risk of ischemia may be increased in patients with extracranial carotid disease, and cerebral hemodynamics need to be evaluated in relation to aneurysm location.

In Acom. A complex aneurysms, the most important feature in the angiograms is the dominance of the A1 segments, because most lesions are observed in conjunction with asymmetry of the A1 arteries⁶.

If clipping is selected (as in our third case), temporary occlusion of one or both A1 segments may be necessary during the surgical approach.

In the first of these situations, if increased contralateral flow is required to maintain perfusion of both A2 systems, the presence of se-

vere carotid stenosis may increase the risk of cerebral ischemia.

– A discussion of *the treatment of asymptomatic carotid stenosis* falls outside the scope of this paper, and aspects of the ACAS study are under review at many centers^{7,8}. At our institution, only carotid stenoses greater than 80% in male patients are considered for treatment. However, treatment is considered in patients scheduled for major surgery with asymptomatic carotid stenosis greater than 60% (male or female), especially if contralateral occlusion is present. The second case represented an increased risk of perioperative stroke in this patient group with significant asymptomatic carotid stenosis which became symptomatic after endovascular treatment of the cerebral aneurysm as a result of hypotension under general anesthesia.

Conclusion

Simultaneous presentation of cerebral aneurysm and carotid stenosis is rare. Treatment of symptomatic extracranial occlusive vascular disease without first repairing the UIA can be considered safe where the diameter is less than 10 mm. Patients with concomitant aneurysmal SAH and significant incidental carotid stenosis require treatment of the aneurysm first in most of cases. However, the risk of perioperative stroke needs to be assessed in nonacute patients with severe carotid stenosis, and if simultaneous treatment of both lesions is not planned, previous treatment of the stenosis may be performed in selected cases.

References

- 1 International Subarachnoid Aneurysm Trial (ISAT) of neurosurgical clipping versus endovascular coiling in 2143 patients with ruptured intracranial aneurysms; a randomized trial. *Lancet* 360: 1267-1274, 2002.
- 2 Roubin G, New G et Al: Immediate and late clinical outcomes of carotid artery stenting in patients with symptomatic and asymptomatic carotid artery stenosis. *Circulation* 103: 532-537, 2001.
- 3 Kapelle L, Eliasziw M et Al: Small, unruptured intracranial aneurysms and management of symptomatic carotid artery stenosis. *Neurology* 55: 307-309, 2000.
- 4 Porter R, Lawton Met Al: Concurrent aneurysm rupture and thrombosis of high-grade internal carotid artery stenosis: report of two cases. *Surg Neurol* 47: 532-40, 1997.
- 5 Taylor C, Selman W et Al: Temporary vessel occlusion during intracranial aneurysm repair. *Neurosurgery* 39: 893-906, 1996.
- 6 Solomon R: Anterior communicating artery aneurysms. *Neurosurgery* 48: 119-127, 2001.
- 7 Executive Committee for the Asymptomatic Carotid Atherosclerosis Study. Endarterectomy for Asymptomatic Carotid Artery Stenosis. *JAMA* 273: 1421-1427, 1995.
- 8 Barnett H, Meldrum H et Al: The appropriate use of carotid endarterectomy. *CMAJ* 166: 1169-1189, 2002.

E. Castro Reyes MD
Neuroradiology Department
Hospital General Universitario Gregorio Marañón
C/Dr. Esquerdo 46
28007 Madrid - Spain.
e-mail: enriquecastro@ctv.es
Phone: 91586675