Arq Neuropsiquiatr 2003;61(2-B):459-462

CAVERNOUS CAROTID ARTERY PSEUDO-ANEURYSM TREATED BY STENTING IN ACROMEGALIC PATIENT

Jorge Marcondes de Souza[1], Flavio S. Domingues[1], Gaudencio Espinosa[2], Monica Gadelha[3]

ABSTRACT - We report on a case of endovascular management of pseudoaneurysm of the cavernous segment of the internal carotid artery with covered stent reconstruction. A 36 years-old woman with a history of previous transsphenoidal approach for pituitary macroadenoma and false aneurysma formation was studied in a protocol that included balloon test occlusion and cerebral blood flow evaluation. An endovascular covered stent deployment in the area of the carotid laceration was performed with isolation of the aneurysm from the circulation and maintenance of the carotid flow. Helical angio-CT and cerebral digital subtraction angiography showed the carotid preservation without stenosis in the stented area. In conclusion, endovascular stent reconstruction for post-transsphenoidal carotid artery laceration and false aneurysm is demonstrated as useful technical adjunct in the management strategy and with the potential for carotid sacrifice morbidity avoidance.

KEY WORDS: cerebral aneurysms, intravascular stents, transsphenoidal surgery, pituitary tumor.

Pseudoaneurisma da artéria carótida cavernosa tratado com "stent" em paciente acromegálica

RESUMO - Relatamos um caso de manuseio com "stent" recoberto por pseudoaneurisma do segmento cavernoso da artéria carótida interna. A paciente de 36 anos, tinha história de cirurgia trans-esfenoidal para macroadenoma de hipófise e desenvolvimento de falso aneurisma na região cavernosa da ACI, foi estudado com protocolo para avaliação de reserva circulatória carotídea com teste de oclusão por balão e estudo de fluxo sanguíneo cerebral com tomografia computorizada de emissão de fóton único (SPECT). Instalação de "stent" recoberto no segmento lesado isolou o aneurisma da circulação, com manutenção do fluxo carotídeo. Angio-tomografia helicoidal e angiografia digital por subtração demonstraram a reconstrução carotídea sem estenose local. Em conclusão, reconstrução carotídea com "stent" recoberto é possível na estratégia para manuseio de pseudo-aneurisma com potencial para prevenção da morbidade do sacrifício terapêutico carotídeo.

PALAVRAS-CHAVE: stent intravascular, cirurgia trans-esfenoidal, pseudo-aneurisma, tumor hipofisário.

Vascular injury can be one of the most serious complications associated to the surgery of the sphenoid-sellar region. Cavernous internal carotid artery (ICA) injury is uncommon during transsphenoidal surgery and may result in carotid-cavernous fistula or pseudoaneurysm with a reported incidence of 0 to 1.2%[1].

The most common presentation is massive bleeding during the operation, usually controlled by nasal packing. The resulting false aneurysm does not have a real wall and its limits are formed by organized clot. Its natural history is not entirelly defined, some authors show expansion of those lesions without a timing pattern[2,3]. Most pseudoaneursms following transsphenoidal operation described in the literature were associated to growth hormone (GH) secreting tumors and it is intriguing that acromegalic patients also have tendency to develop intracranial elongated and ectatic arteries[4-6].

CASE

A 38-year-old acromegalic woman presented with a history of being submitted to a transsphenoidal operation for treatment of pituitary macroadenoma seven months previously at another institution. There was a report of massive bleeding during the operation and an extended period of admission in the intensive care unit for recovery. She was referred to our university hospital for evaluation and definitive treatment. Her physical examination disclosed typical acromegalic features without arterial hyper-

[1]Service of Neurosurgery, Department of Surgery, Hospital Universitário Clementino Fraga Filho / Faculdade de Medicina / Universidade Federal do Rio de Janeiro (HUCFF/FM/UFRJ), Rio de Janeiro RJ, Brazil; [2]Service of Vascular Surgery, Department of Surgery, HUCFF/FM/UFRJ; [3]Service of Endocrinology, Department of Internal Medicine, HUCFF / FM / UFRJ.

Received 4 October 2002, received in final form 6 January 2003. Accepted 18 January 2003.

Dr. Jorge Marcondes de Souza - Serviço de Neurocirurgia / Hospital Universitário Clementino Fraga Filho - Avenida Brigadeiro Trompowski s /n - 21941-590 Rio de Janeiro RJ - Brasil. E-mail: jmarcondes@hucff.ufrj.br

tension or cardiac symptoms. There was no headache. The neurological examination was essencially normal as well as her campimetric test. Laboratory tests including her hormonal profile and coagulation studies were unremarkable except for increased serum level (13 ng/dl) of the GH and abnormal glucose tolerance curve.

Magnetic resonance imaging (MRI) revealed a parasellar mass next to the right cavernous ICA, invading the sellar compartment and with a of flow void rim. A macroadenoma with supra-sellar extension and optic chiasm distortion was clearly demonstrated close to the lesion surrounded by a layer of hyperintense signal. There was also enhancement of the adjacent sphenoid sinus wall (Fig 1.A). Magnetic ressonance angiography (MRA) showed an image suggestive of an aneurysmal dilatation at the level of the right cavernous ICA (Fig 1.B). A digital subtraction angiography (DSA) of the right ICA confirmed the right cavernous carotid irregular aneurysm and a stenotic supra-aneurysmal segment (Fig 1.C).

After discussion of risks, treatment alternatives and potential complications, the patient consented with the right internal carotid artery colateral flow evaluation with balloon test occlusion (BTO) SPECT in order to stablish the most apropriate management for the aneurysm.

Procedures

She was neurologically intact during the BTO but showed moderate assymetry on the right side on SPECT imaging. It was decided for the stenting of the arterial segment harboring the false aneurysm as the best option for her case as opposed to the carotid definitive occlusion. Under general endotracheal anesthesia and systemic heparinization, a 7-French sheath (Cordis Endovascular, Miami Lakes, FL) was advanced into the ICA and an extra-stiff 14

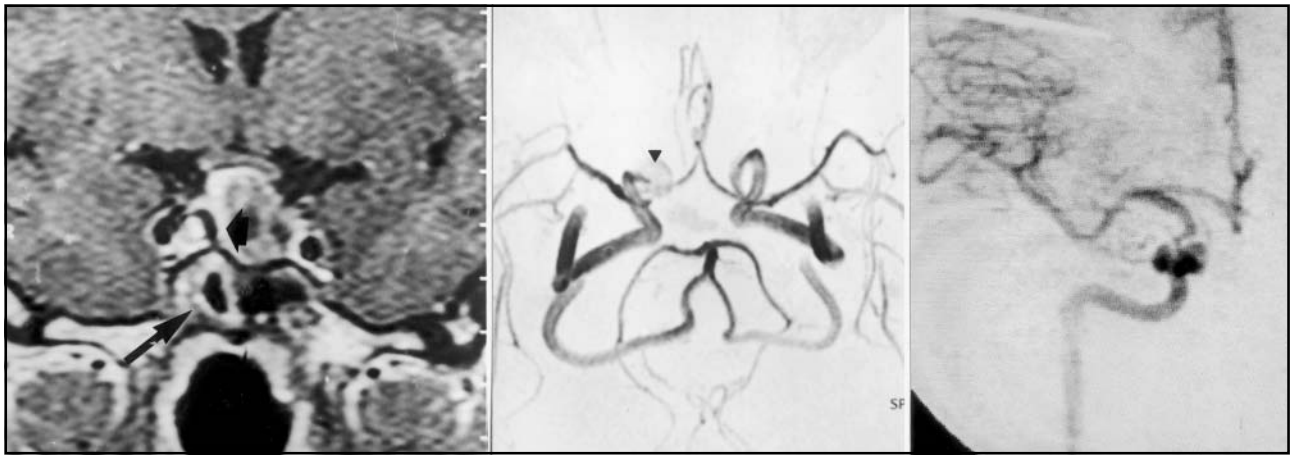

Fig 1. A. MRI T1 coronal showing a parasellar mass next to the right cavernous ICA, invading the sellar compartment and with of flow void rim (arrowhead). A macroadenoma with supra-sellar extension and optic chiasm distortion surrounded by a layer of hyperintense signal. There was also enhancement of the adjacent right chamber of the sphenoid sinus wall (arrow). B. MRA depicting vascular lesion at the cavernous segment of the ICA. C. Digital Angiography with the false aneurysm.

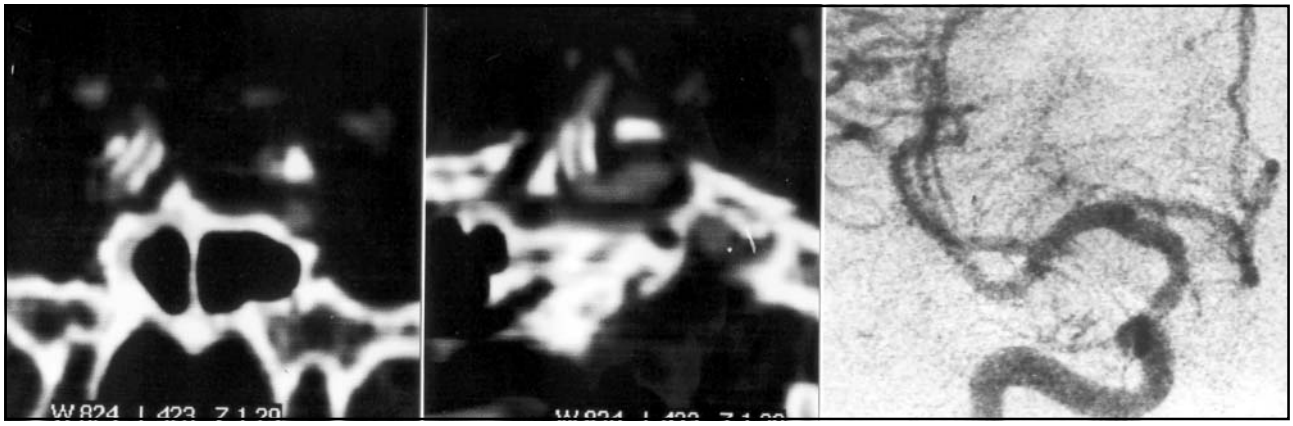

Fig 2. A. Helical Angio-CT showing the stent at the level of the cavernous ICA in the coronal section. B. Sagittal section of the helical angio-CT with the stent in place. C. Control digital angiography with normal carotid flow and without disappearance of the pseudoaneurysm.

microguidewire (Guidant, Santa Clara, USA) was positioned beyond the lesion. A 4 x 9 mm coronary stent-graft (JOMED, Helsingberg, Germany) mounted on its 4 x 15 mm delivery balloon (Guidant, Santa Clara, USA) was navigated across the region of the aneurysm. The balloon was inflated and the stent deployed with complete exclusion of the aneurysm from the circulation.

Heparin was not reversed and the patient was asymptomatic afterwards. She was placed on ticlopidine (Ticlid; Roche Pharmaceuticals, Nutley, NJ), 250 mg twice daily for a 4-week period. Follow-up helical-CT angiogram and DSA (Fig 2 A, B and C) one month later showed good flow in the stented area, without recanalization of the aneurysm. After ticlopidine interruption she was submitted to a sublabial transsphenoidal reoperation, when became obvious that the previous operation was a transnasal paramedian transsphenoidal approach with a right lateral entry site into the sphenoid sinus. We ressected the midline bony bridge that divided her sphenoid sinus and completed the adenoma ressection uneventfully. She was discharged on the fifth postoperative day without intercorrence.

DISCUSSION

Transsphenoidal approach is a safe and accepted procedure for pituitary lesions, being critical to be aware of the relationships of the carotid artery with the sphenoid sinus walls as well as the sela turcica boundaries.During the operation, the midline orientation remains one of the cornerstones to the route toward the selar floor[7-9]. A computerized tomography with bone window may be important in case of any doubt about variations in the septation of the sphenoid sinus. False aneurysm from carotid lesion during transsphenoidal access for pituitary lesions can be a life-threatening complication. After arterial bleeding controlled, those patients should undergo DSA in order to understand the magnitude of the lesion and to plan the treatment strategy. Endovascular balloon occlusion of the ICA has been offered as advantageous over trapping procedures minimizing the chances of thromboembolic accidents and the morbidity associated with intracranial procedures[4,7,10]. Bavinski et al. described seven cases of traumatic false aneurysm of the intracavernous ICA managed by balloon occlusion at the level or just bellow to the lesion and advocate it as a very effective and safe method of treatment[10]. Long-term complications of the permanent carotid artery occlusion should be considered. Several studies found the 5 to 10% of delayed infarction after therapeutic carotid occlusion in spite of normal BTO results[11,12]. Awad et. al showed de novo appearance of subcortical hyperintense lesions on MRI after therapeutic ICA occlusion even in patients that tolerated ICA occlusion with maximal prophilaxis against thromboembolism[13]. Link et al. described the experience of total follow up for sixty patients of 468 patient-years with four delayed infarcts after permanent carotid occlusion[14]. Endovascular treatment using electrolytic detachable coils have been described and Lempert et al had two good outcome but one neck refilling afterwards[15]. The MRI and DSA evaluation of our case showed two well known disadvantages of using coils alone: 1) a wide neck aneurysm, due to the risk of bulging of them into the parent artery with occlusion of the vessel; 2) the possibilities of dislodging intralesional thrombus and promote distal embolization. The current endovascular technology includes the use of endovascular constructive approaches that could preserve the parent artery either by stent deployment or concurrent use of stents and detachable coils for complex intracranial vascular diseases[16-19].

The placement of a covered intravascular stent within the parent artery across an aneurysm opening promotes immediate stasis and thrombosis inside the lesion. The endoluminal reconstruction avoids the carotid sacrifice and the chances of distal embolization. Long term effects of stenting of the intracranial arterial segments are currently unknown and myointimal hyperplasia and stenosis remains as a concern for possible future hemodynamic compromise of the distal circulation, although vessels with larger diameters have a lower rate of significant stenosis than smaller ones[17,20].

In conclusion, endovascular covered stent reconstruction for post-transphenoidal carotid artery laceration and false aneurysm is demonstrated as useful technical adjunct in the management strategy and with the potential for carotid sacrifice morbidity avoidance. To our knowledge, there has been no previous description of isolated carotid covered stenting for this clinical situation.

REFERENCES

1. Ciric I, Ragin A, Baumgartner C, Pierce D. Complications of transsphenoidal surgery: results of a national survey, review of the literature and personal experience. Neurosurgery 1997;40:225-237.
2. Amirjamshidi A, Rahmat H, Abbassioun K. Traumatic aneurysms and arteriovenous fistulas of intracranial vessels associated with penetrating head injuries ocurring during war: principles and pitfalls in diagnosis and management. J Neurosurg 1996;84:769-780.
3. Tokunaga K, Kusaka N, Nakashima H, Date I, Ohmoto T. Coil embolization of intradural pseudoaneurysms caused by arterial injury during surgery: report of two cases. AJNR Am J Neuroradiol 2001;22:35-39.
4. Cabezudo JM, Carrilo R, Vaquero J, Areitio E, Martinez R. Intracavernous aneurysm of the carotid following transsphenoidal surgery. J Neurosurg 1981;54:118-121.
5. Wilson CB, Dempsey LC. Transsphenoidal microsurgical removal of 250 pituitary adenomas. J Neurosurg 1978;48:13-22.
6. Weir B. Pituitary tumors and aneurysms: case report and review of the literature. Neurosurgery 1992;30:585-590.

7. Ahuja A, Guterman LR, Hopkins LN. Carotid cavernous fistula and false aneurysm of the cavernous carotid artery: complications of transsphenoidal surgery. Neurosurgery1992;31:774-779.
8. Paullus WS Jr, Norwood CW, Morgan HW. False aneurysm of the cavernous carotid artery and progressive external ophtalmoplegia after transsphenoidal hypophysectomy. J Neurosurg 1979;51:707-709.
9. Wright DC. Transsphenoidal approach to sellar and sphenoidal regions. In Sekhar LN, de Oliveira E, (eds). Cranial microsurgery - approaches and techniques. New York: Thieme, 1999:246-259.
10. Bavinzki G, Killer M, Knosp E, Ferraz-Leite H, Gruber A, Richling B. False aneurysm of the intracavernous carotid artery: report of 7 cases. Acta Neurochir (Wien) 1997;139:37-43.
11. Lee S, Awad AI. Therapeutic carotid occlusion: current management paradigmas. Clin Neurosurg 1998;46:363-391.
12. Segal DH, Sen C, Bederson JB, et al. Predictive value of balloon test occlusion of the internal carotid artery. Skull Base Surg 1995;5:97-107.
13. Awad IA, Masaryk T, Magdinec M. Pathogenesis of subcortical hyperintense lesions on magnetic resonance imaging of the brain: observations in patients undergoing controlled therapeutic internal carotid artery occlusion. Stroke 1993;24:1339-1346.
14. Link MJ, Tomsick TA, Tew JM. Honored guest presentation: therapeutic carotid artery occlusion. Clin Neurosurg 1998;46:326-338.
15. Lempert TE, Halbach VV, Higashida RT, et al. Endovascular treatment of pseudoaneurysms with electrolytically detachable coils. AJNR Am J Neuroradiol 1998;19:907-911.
16. Klein GE, Szolar DH, Raith J, Fruhwirth H, Pascher O, Hausegger KA. Posttraumatic extracranial aneurysm of the internal carotid artery: combined endovascular treatment wiht coils and stents. AJNR Am J Neuroradiol 1997;18:1261-1264.
17. Lanzino G, Wakhloo AK, Fessler RD, Hartney ML, GutermanLR, Hopkins N Efficacy and current limitations of intravascular stents for intracranial internal carotid,vertebral and basilar artery aneurysms. J Neurosurg 1999; 91:538-546.
18. Lavine SD, Larsen DW, Giannota SL, Teitelbaum GP. Parent vessel Guglielmi detachable coil herniation during wide-necked aneurysm embolization: treatment with intracranial stent placement: two technical case reports. Neurosurgery 2000;46:1013-1017.
19. Phatouros CC, Sasaki TYJ, Higashida RT, et al. Stent-supported coil embolization: the treatment of fusiform and wide-neck aneurysms and pseudoaneurysms. Neurosurgery 2000;47:107-115.
20. Kadyrov NA, Friedman JA, Nichols DA, Cohen-Gadol AA, Link MJ, Piepgras DG. Endovascular treatment of an internal carotid pseudoaneurysm following transsphenoidal surgery. J Neurosurg 2002;96:624-627.