Intracavernous aneurysm of the carotid artery following transsphenoidal surgery

Case report

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An intracavernous aneurysm of the left internal carotid artery arose following transsphenoidal surgery in this patient. The pathogenic, clinical, and therapeutic aspects of the case are discussed. Only four other iatrogenic intracavernous carotid aneurysms have been reported previously.

KEY WORDS • iatrogenic aneurysm • epistaxis • transsphenoidal surgery

TRANSSPHENOIDAL approach to pituitary fossa tumors and some related conditions has become accepted worldwide. It is a safe procedure, with mortality figures reported around 2% in the most important recent series. Complications are also unusual. This paper presents a very rare complication, namely, the occurrence of an iatrogenic aneurysm of the intracavernous portion of the left internal carotid artery (ICA), associated with epistaxis. The aneurysm was successfully treated by gradual occlusion of the left ICA in the neck.

Case Report

This 41-year-old woman was referred to us by the Service of Endocrinology of our hospital for surgical treatment of a growth hormone-secreting pituitary adenoma. Neurological examination, including ophthalmological examination, was normal. Skull x-ray films showed an enlarged sella turcica with "double contour" of the sellar floor. Tomograms of the sphenoid sinus showed that the septum was displaced to the left of midline. Neuroradiological studies, including computerized tomography (CT), showed no evidence of suprasellar extension of the tumor.

First Operation. The pituitary fossa was reached by a transsphenoidal approach. When the opening in the anterior wall of the sella was being enlarged toward the left, a brisk venous hemorrhage suddenly occurred. The only way of controlling the hemorrhage was to pack the sphenoid sinus with Surgicel, and the nasal cavity with Vaseline gauze packs. Although the dura mater of the sella had already been opened, the tumor could not be removed because of the hemorrhage.

First Postoperative Course. Aside from transient diabetes insipidus, the postoperative course was uneventful until the 12th postoperative day, when the patient complained of pulsating retro-ocular pain in the left side, radiating to the cutaneous territory of the first branch of the trigeminal nerve. The patient also complained of blurred vision. Ophthalmological examination was normal and there was no audible bruit. The pain subsided spontaneously in 2 days but occurred again on the 17th postoperative day, lasting on this occasion only 1 day. It was decided that surgical treatment of the adenoma was not advisable, and the patient was referred to the radiotherapy service for outpatient radiation therapy.

Second Admission. One month after the first operation, the patient was readmitted because of violent epistaxis that was controlled at another center by massive nasal packing with Vaseline gauze. Blood replacement was not needed. Skull x-ray films showed that the left paranasal sinuses were blocked, a finding that was confirmed by CT. Densitometric study of the contents of the left paranasal sinuses was compatible...
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Fig. 1. Left carotid angiogram 1 month after the first operation, anteroposterior (left) and lateral (right) views. The bilobed aneurysm can be seen arising from the medial wall of the artery.

with blood. A left carotid angiogram showed an aneurysm in the intracavernous portion of the carotid artery (Fig. 1). The aneurysm arising from the medial surface of the artery was bilobed and projected toward the midline. No carotid cavernous fistula was seen. Compression of the right carotid artery showed good left-to-right cross filling.

Second Operation and Postoperative Course. A Selverstone clamp was placed around the left ICA in the neck. Gradual occlusion of the carotid artery was performed without untoward effects over 7 days. A right ICA angiogram showed excellent arterial filling on both sides without backflow in the left carotid artery. The aneurysm could not be visualized (Fig. 2). The patient was discharged 10 days later, totally asymptomatic.

Discussion

Hemorrhagic complications in transsphenoidal surgery are not unknown, although they have not been reported in some of the largest series. They may be due to damage to the cavernous sinus, the carotid artery, or the anterior intercavernous sinus.

Renn and Rhoton demonstrated that the carotid arteries bulge within the sphenoid sinus in 71% of cases, and that the arteries are covered only by the dura mater of the cavernous sinus and the mucosa of the sphenoid sinus in 4% of cases. In addition, they found that carotid arteries come as close as 4 mm to the midline within the sella, the mean distance being

Fig. 2. Right internal carotid angiogram, anteroposterior view, after occlusion of the left internal carotid artery. There is no retrograde flow in the left internal carotid artery, and the aneurysm cannot be seen.
12 mm. Hardy\textsuperscript{16} found carotid arteries within the sella on four occasions. Thus, if a surgeon does not adhere to the midline during transsphenoidal surgery, damage to the carotid artery may occur if certain anatomical variations are present. Hemorrhage may be controlled by repairing the arterial wall or packing the sphenoid sinus, but in such cases false aneurysms may occur\textsuperscript{21,30,34} as have been described in other intracranial locations.\textsuperscript{22} In our case, it is presumed that the carotid artery was lacerated when attempting to open the anterior wall of the sella. An iatrogenic aneurysm of the artery rapidly developed, initially causing symptoms of cavernous sinus involvement, and later producing epistaxis when it ruptured into the paranasal sinuses. Rapid development of traumatic intracranial aneurysms, as in our case, has been reported previously.\textsuperscript{20,27,30,34}

Traumatic or iatrogenic rupture of the intracavernous carotid artery leading to carotid-cavernous fistula is well known.\textsuperscript{4,7,11,30} For epistaxis to occur, the wall of the cavernous sinus must be torn in addition to damage to the artery. The first reported case of epistaxis after rupture of a traumatic aneurysm of the intracavernous carotid artery was that of Delens in 1870.\textsuperscript{3} McCormick and Beals\textsuperscript{22} found 15 proven cases with a clear traumatic origin, but none of them was iatrogenic. Moore, \textit{et al.},\textsuperscript{24} found another three cases, and reported one of their own. We have found reports of four cases not previously reviewed.\textsuperscript{1,22} In addition to our case, we have found only four cases of aneurysms of the intracavernous carotid artery following surgery.\textsuperscript{27,28,30,34} Of these, only the patient of Wilson and Dempsey\textsuperscript{33} exhibited epistaxis (Table 1).

The mode of treatment of intracavernous carotid artery aneurysms depends on whether a carotid-cavernous fistula is present. If there is a fistula, the preferred treatment is entrapment of the carotid artery with or without embolization of the fistula,\textsuperscript{11,12,18} or occlusion of the fistula by balloon techniques.\textsuperscript{2,28} When there is no fistula, as in our case, the accepted treatments are carotid ligation\textsuperscript{1,17,176} or trapping,\textsuperscript{1,4,31} although some authors advocate direct surgical approach to the aneurysm.\textsuperscript{19,56} In our case, as in that of Wilson and Dempsey,\textsuperscript{33} we decided to perform occlusion of the left ICA. We did not ligate the common carotid artery in order to avoid flow from the internal to the external carotid artery. Right ICA angiography after occlusion of the left ICA did not show filling of the aneurysm, so we thought that it was not necessary to perform a second operation to occlude the supraclinoid portion of the ICA below the ophthalmic artery.

**Summary**

Avoidance of damage to the carotid artery during transsphenoidal surgery requires strict observance of the midline. Once the carotid artery has been injured, and a satisfactory control is believed to be accomplished, the possibility of a false aneurysm developing in a short time and producing carotid-cavernous fistula, or causing epistaxis when it ruptures, must not be forgotten. Early angiographic assessment of the evolution of the lesion may permit correct treatment before the aneurysm ruptures. Once the aneurysm has ruptured, urgent exclusion of such aneurysm from the carotid circulation is needed.

**References**


\begin{table}[h]
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\begin{tabular}{|l|l|c|l|c|l|}
\hline
Author & Year & Sex, Age (yrs) & Surgical Procedure & Onset & Symptoms & Treatment & Result \\
\hline
Yamaura, \textit{et al.}, & M, 31 & \textit{rt ethmoidectomy} & 1 mo & \textit{rt eye chemosis} & \textit{trapping, embolization} & \textit{excellent} \\
1978 & & & & & & \\
Wilson & not & \textit{transsphenoidal surgery for acromegaly} & not stated & \textit{epistaxis} & \textit{carotid ligation} & not stated \\
Dempsey, & stated & & & & & 1978 \\
\hline
Paullus, \textit{et al.}, & M, 48 & \textit{transsphenoidal surgery for hypophysial adenoma} & 6 days & \textit{ophthalmoplegia \\ & & & & & & \textit{& proptosis of lt eye} \\
1979 & & & & & & trapping, embolization & \textit{excellent} \\
Wakai, \textit{et al.}, & M, 51 & \textit{lt ethmoidectomy} & 10 days & \textit{epistaxis, lt hemiplegia, aphasia, stupor} & \textit{STA-MCA bypass, trapping} & \textit{rt hemiparesis} \\
& & & & & & & 1980 \\
Cabezudo, \textit{et al.}, & F, 41 & \textit{transsphenoidal surgery for acromegaly} & 1 mo & \textit{epistaxis} & \textit{lt ICA ligation} & \textit{excellent} \\
& & & & & & & 1981 \\
\hline
\end{tabular}
\caption{Reported cases of aneurysms of the intracavernous carotid artery after surgery*}
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