AJNR

Major Complications of Percutaneous Embolization of Skull-Base Tumors

Alfredo Casasco, Emmanuel Houdart, Alessandra Biondi, Harish S. Jhaveri, Denis Herbreteau, Armand Aymard and Jean-Jacques Merland

AJNR Am J Neuroradiol 1999, 20 (1) 179-181
http://www.ajnr.org/content/20/1/179

AJNR Am J Neuroradiol 20:179–181, January 1999

Case Report

Major Complications of Percutaneous Embolization of Skull-Base Tumors

Alfredo Casasco, Emmanuel Houdart, Alessandra Biondi, Harish S. Jhaveri, Denis Herbreteau, Armand Aymard, and Jean-Jacques Merland

Summary: The technique of direct intratumoral injection of permanent liquid polymerizing agent was initially described in 1994 and has evolved significantly with experience. We report complications that occurred in two patients during injection of Histoacryl and offer suggestions to prevent such complications in the future. In one patient, the glue settled in the right middle cerebral artery; in the second, the glue entered the left ophthalmic artery through a collateral branch. Although the fundamental injection technique has not changed, we suggest additional precautions and modifications to make this procedure a safer and more valuable element in the overall management of patients with difficult skull-base tumors.

During the past 3 years, we have used direct intratumoral embolization with glue (Histoacryl; Braun, Melsungen, Germany) to treat 65 hypervascular lesions, including 29 juvenile nasopharyngeal angiofibromas, 22 glomus tumors, four metastases of the calvaria, four meningiomas, three hemangiopericytomas, one primary carcinoma of the sella, one hemangioblastoma, and one dural cavernoma of the sellar region.

The technique of direct tumoral puncture has been described previously (1–3), and while this is generally a safe procedure, we encountered two major complications that arose during its use. As our experience with this technique has evolved, we have learned some of its limitations. In this report, we offer some precautions one can take to avoid these potential complications.

Case Reports

Case 1

A 15-year-old boy with a juvenile nasopharyngeal angiofibroma on the right side was treated via a right transfacial approach. The large tumor had already eroded part of the skull base. Toward the end of the procedure, while we were treating the tumor close to the skull base, the tip of the needle was obscured owing to the dense opacity of the already embolized overlying tumor. During injection of the glue, a small amount of this agent entered the right internal carotid artery and polymerized in the right middle cerebral artery (Fig 1). We immediately stopped injecting the glue; however, acute infarction of the right middle cerebral artery territory developed and, 3 days later, the patient died. The glue mixture we used consisted of 0.5 mL of Histoacryl+, 1.5 mL of Lipiodol+, and 1.5 g of tantalum powder.

Case 2

An 18-year-old boy was treated for a large juvenile nasopharyngeal angiofibroma on the left side. Toward the end of the procedure, we were managing the part of the tumor that had eroded the floor of the orbit. After verifying the needle position in both anteroposterior and lateral projections with injection of contrast medium, we began the embolization, slowly injecting the mixture of Histoacryl, Lipiodol, and tantalum powder. However, we immediately stopped the injection when we noticed the embolic mixture entering a small collateral vessel of the ophthalmic artery. Reflux into this collateral vessel had also been observed when the contrast medium was injected to verify the needle position prior to injecting the Histoacryl. A small mount of Histoacryl entered the ophthalmic artery (Fig 2), resulting in an acute loss of vision in the left eye.

Discussion

We have encountered two severe complications during the treatment of a tumoral lesion using the technique of direct percutaneous intratumoral embolization with glue. The following considerations might permit others to avoid such problems and their dramatic consequences.

In the first case, only the anteroposterior view was analyzed for the intratumoral glue injection. The preembolization test, consisting of intratumoral injection of contrast medium through the needle percutaneously positioned in the tumor, was viewed only in the anteroposterior projection. Since then, regardless of which approach we choose for introduction of the needle, we carefully look at both the anteroposterior and lateral views during preembolization angiographic evaluation, which includes both intraarterial angiography and intratumoral injection of contrast agent. To avoid migration of the glue from the tumoral vascular network to the arterial feeders, we have modified the glue mixture, obtaining an embolization agent with a faster polymerization time: 0.5 mL of Histoacryl+, 0.5 mL (versus

Received May 12, 1997; accepted after revision May 5, 1998.

From the Department of Diagnostic and Interventional Neuroradiology, Groupe Hospitalier Pitié-Salpêtrière (A.C., A.B.), and the Department of Diagnostic and Interventional Neuroradiology, Hôpital Lariboisiere (E.H., H.S.J., D.H., A.A., J.J.M.), Paris, France.

Address reprint requests to Alfredo Casasco, MD, Department of Diagnostic and Therapeutic Neuroradiology (H. Fischgold), Groupe Hospitalier Pitié-Salpêtrière, 47/83 Boulevard de l'Hôpital, 75651 Paris, Cedex 13, France.

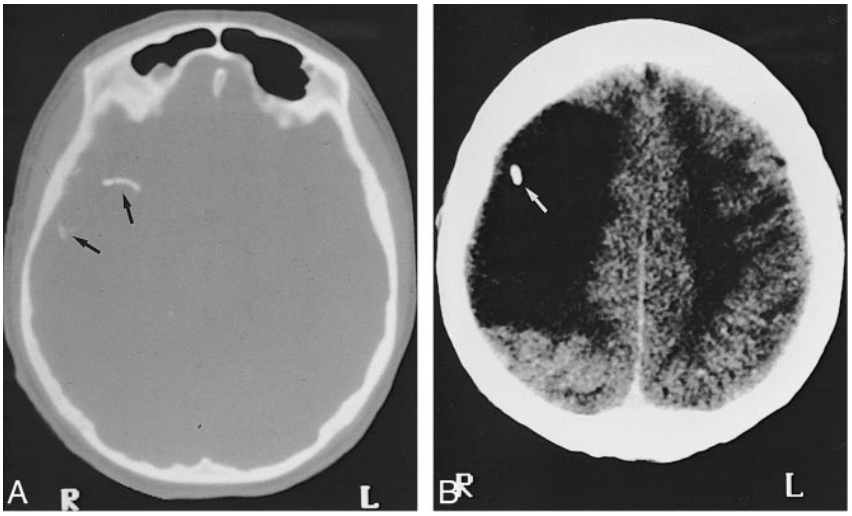

FIG 1. Case 1: 15-year-old boy with juvenile nasopharyngeal angiofibroma on the right side.

A, Axial CT scan of the head with bone windows reveals a small amount of Histoacryl in the right middle cerebral artery (*arrows*).

B, Axial CT scan of the head with soft-tissue windows shows infarction in the territory of distribution of the right middle cerebral artery. Histoacryl is also seen in a branch of the right middle cerebral artery (*arrow*).

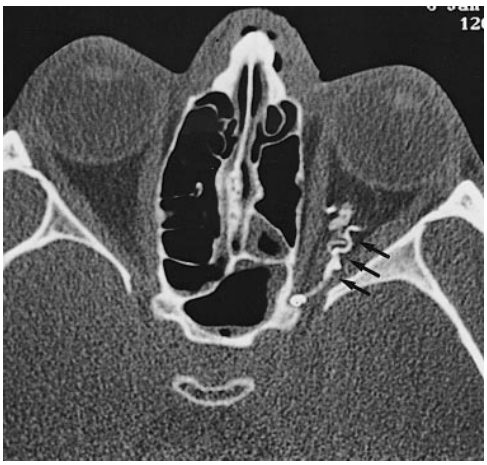

FIG 2. Case 2: 18-year-old boy with large juvenile nasopharyngeal angiofibroma on the left side. Axial CT scan of the orbits with bone windows shows Histoacryl in the left ophthalmic artery (*arrows*).

1.5 mL) of Lipiodol, and 1.0 g (versus 1.5 g) of tantalum for direct puncture embolization of skull-base tumors.

If the arterial supply to the tumor from the internal carotid artery is below the origin of the ophthalmic artery, we use a standard 1.8F microcatheter (Balt Extrusion, Montmorency, France) with a mounted balloon. We gently inflate the balloon just in front of the arterial feeder of the tumor with a diluted contrast agent for a few seconds while injecting the glue directly into the tumor (Fig 3). The same precautionary measure is taken if we find that an arterial feeder from the vertebral artery is participating in the blood supply to the tumor. Temporary balloon occlusion is performed under systemic heparinization.

If we find that the arterial feeders originating from the ophthalmic artery are contributing to the blood supply of the tumor, those small branches are surgically clipped and that section of the tumor is not embolized via the direct puncture technique. We do not use balloon protection in this situation, and we consider such a situation a relative contraindication for direct intratumoral puncture embolization. When embolizing a juvenile nasopharyngeal angiofibroma that has eroded the floor of the orbit, one must be especially careful because of the recruitment of ophthalmic artery branches, as observed in our second case.

Similar precautionary measures should be taken when treating a chemodectoma located at the bifurcation of the common carotid artery. In these tumors, small arterial feeders originating from the proximal external carotid artery near the bifurcation of the common carotid artery are known to participate in vascular supply to the tumor. To prevent potential retrograde migration of the glue into the internal carotid artery, we use a small nondetachable balloon mounted on a Magic B1 microcatheter (Balt) coaxially positioned in the external

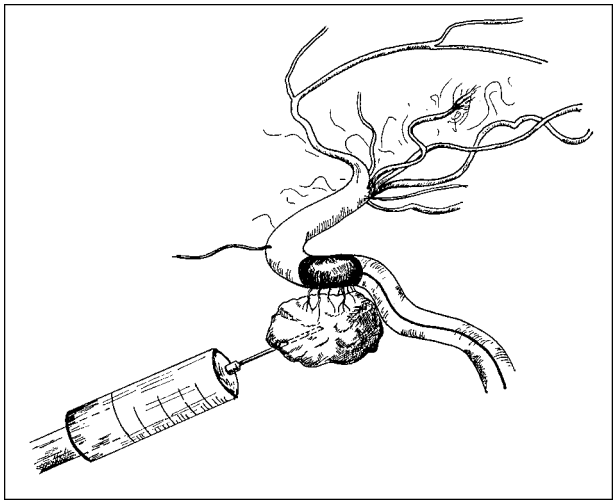

FIG 3. Schematic diagram shows a microcatheter with a nondetachable balloon occluding the internal carotid artery at the level of dangerous feeders to a tumor. The balloon is inflated for few seconds during each intratumoral injection of glue administered via percutaneous needle puncture of the tumor. Vascular occlusion prevents potential reflux of the glue into the internal carotid artery.

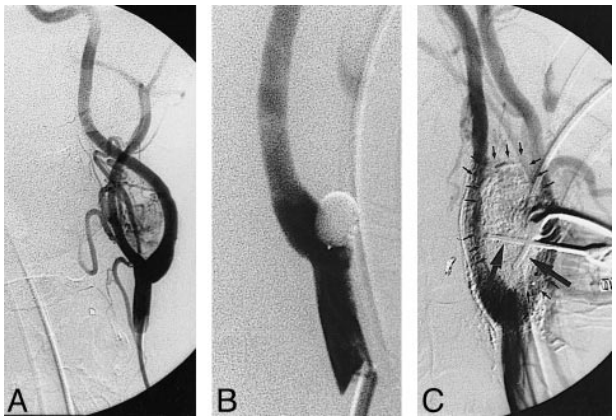

FIG 4. *A,* Common carotid angiogram, anteroposterior view, shows a highly vascular carotid body chemodectoma.

B, Common carotid angiogram, lateral view, shows balloon is temporarily inflated in order to occlude the external carotid artery at its origin and prevent potential reflux of glue into the internal carotid artery.

C, After embolization, common carotid artery angiogram shows that both external and internal carotid arteries are patent. The puncture needles (*large arrows*) and the glue cast (*small arrows*) filling the tumor are seen.

carotid artery close to the bifurcation of the carotid artery. The balloon is inflated for a few seconds during each intratumoral injection of glue (Fig 4).

Conclusion

Our recommendation is to search carefully for all the collateral arterial supplies to the tumor during preembolization diagnostic angiography and to look also for dangerous anastomotic feeders. Just before injecting the glue, one should inject a small amount of intratumoral contrast medium and analyze the images carefully for dangerous anastomoses. Additionally, in cases of arterial supply to the tumor by short arterial feeders from the internal carotid or vertebral arteries, we recommend temporary balloon occlusion of these arteries proximal to the feeders during intratumoral injection of the glue. A feeder from the ophthalmic artery contributing blood supply to the tumor is a relative contraindication for direct puncture embolization with glue. We hope these suggestions will increase the safety and number of satisfactory results obtained with these procedures.

Acknowledgments

We thank Elio Vivas and Christelle Forzale for the medical illustration.

References

1. Casasco A, Herbreteau D, Houdart E, et al. **Devascularization of craniofacial tumor by percutaneous tumor puncture.** *AJNR Am J Neuroradiol* 1994;15:1233–1239
2. Tran Ba Huy PP, Borsik M, Herman P, Wassef M, Casasco A. **Direct intratumoral embolization of juvenile angiofibroma.** *Am J Otolaryngol* 1994;15:429–435
3. George B, Casasco A, Deffrennes D, Houdart E. **Intratumoral embolization of intracranial and extracranial tumors: technical note.** *Neurosurgery* 1994;35:771–774