

Preoperative Irradiation of a Huge Cavernous Hemangioma in the Middle Cranial Fossa

—Case Report—

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Abstract

A 52-year-old female with a huge cavernous hemangioma in the middle cranial fossa received preoperative radiation therapy to reduce intraoperative bleeding from the tumor. Following irradiation the tumor decreased in size and was subtotally removed with ease. Preoperative irradiation is highly beneficial in such cases.

Key words: cavernous hemangioma, computed tomography, radiation therapy

Introduction

Cavernous hemangiomas of the middle cranial fossa are rare.¹⁾ They are very difficult to remove totally because they tend to bleed severely during resection. We and others have found preoperative irradiation to be of great value in reducing the potential for uncontrollable intraoperative bleeding.

Case Report

A 52-year-old female was admitted after suffering a generalized convulsion. A skull x-ray showed destruction of the posterior clinoid process and the left sphenoid ridge. Computed tomography (CT) revealed a huge, contrast-enhanced mass in the left middle cranial fossa and a small amount of perifocal edema (Fig. 1). Carotid angiography showed a hypovascular mass not supplied by the external carotid artery. With slow injection of contrast medium,⁸⁾ faint vascular tumor staining was observed in the late venous phase. The feeding artery was a meningohypophyseal trunk (Fig. 2). Brain scintigraphy showed a large "hot" area in the middle cranial fossa for up to 9 hours after intravenous administration of ^{99m}Tc pertechnetate (Fig. 3). The preoperative diagnosis was cavernous hemangioma.

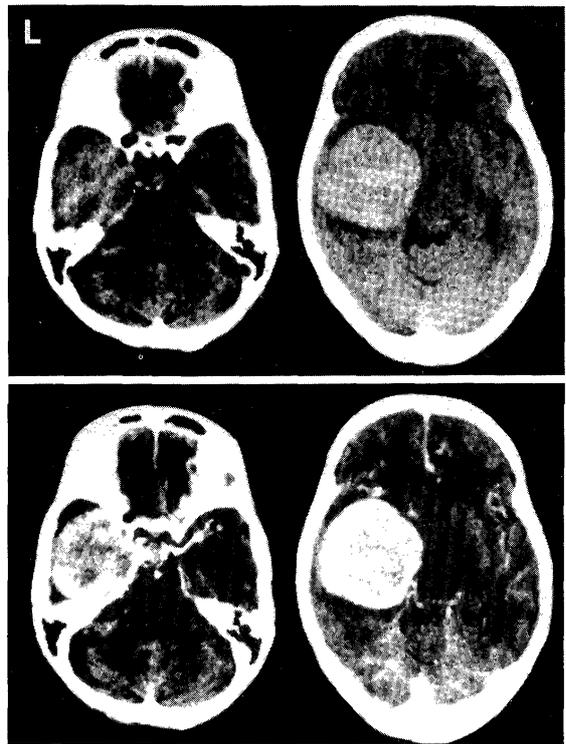


Fig. 1 Pre- (upper) and postcontrast (lower) CT scans showing a contrast-enhanced mass. A small amount of perifocal edema is seen in the left temporoparietal region.

Received April 13, 1987; Accepted April 27, 1988

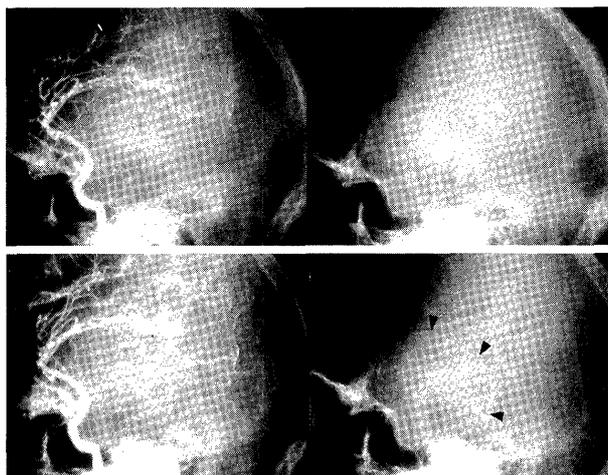


Fig. 2 *upper*: Conventional left carotid angiograms. *lower*: Angiograms obtained during slow injection of 15 ml of 60% Conray. Arrowheads indicate a faint tumor stain.

She underwent irradiation in a total dose of 2850 rads. As the radiation dose increased, the tumor decreased in size, as did the CT number (Figs. 4 and 5). Following irradiation the tumor was subtotally removed except for small pieces attached to the cavernous sinus. Bleeding was easily controlled with a bipolar coagulator. Microscopic examination of a tumor specimen showed numerous thin-walled blood vessels, edematous stroma, and thrombosed vessels. The endothelium was intact (Fig. 6). She was discharged without neurological deficit.

Discussion

A large extracerebral cavernous hemangioma is very difficult to remove totally because of profuse bleeding from the tumor.³⁻⁵ There have been very few reports of complete resection.^{9,10} Shibata *et al.*¹⁰ de-

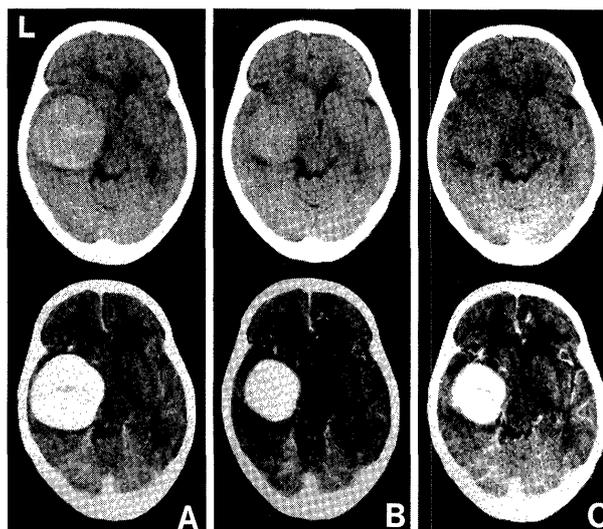


Fig. 4 Pre- (*upper*) and postcontrast (*lower*) CT scans after irradiation of 1000 (A), 2000 (B), and 2850 (C) rads.

scribed a case in which a huge cavernous hemangioma in the middle cranial fossa was totally removed after irradiation, although the first attempt had failed because of a massive intraoperative hemorrhage.

In preoperative radiation therapy, it is important that the radiation dose be sufficient to maximally affect the tumor without injuring normal brain tissue. Lindgren⁶ stated that the minimum dose that damages normal brain tissue is between 4500 and 5000 rads over 30 days. Ellis¹¹ noted that the biological effect of radiation on tissue is dependent on the total dose, the duration of irradiation, and the number of fractions. He established the concept of the nominal standard dose (NSD). In this calculation, total dose (D) = (NSD)(N^{0.24})(T^{0.11}), where the total dose (D) is expressed in rads, T is the number of days, and N is the number of fractions. Nakamura⁷

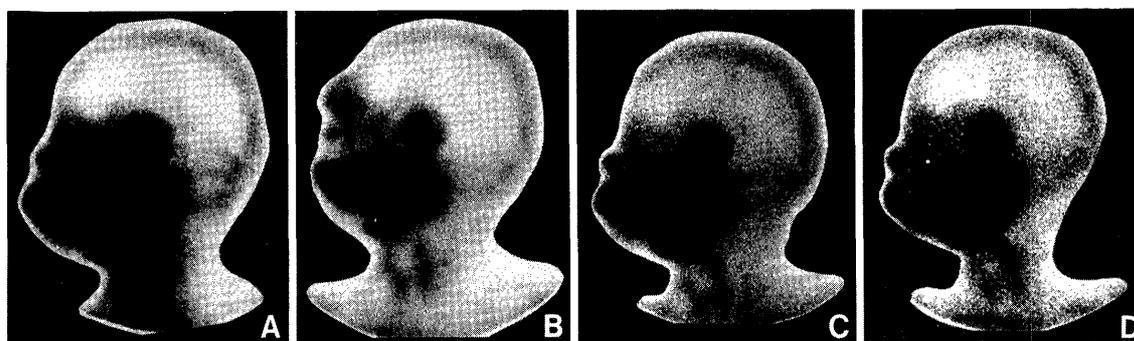


Fig. 3 Brain scintigrams demonstrating a "hot spot" in the left temporal area at 1 (A), 3 (B), 6 (C), and 9 (D) hours after intravenous administration of ^{99m}Tc pertechnetate.

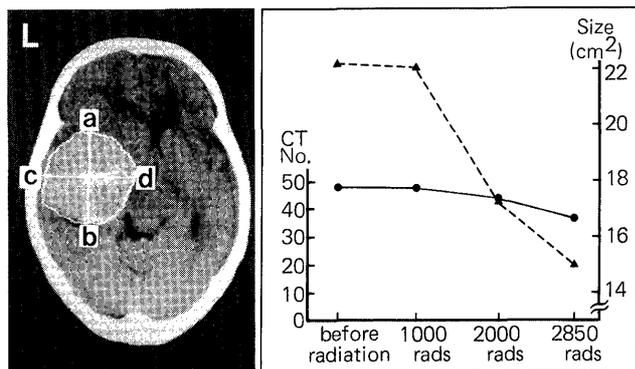


Fig. 5 Sequential changes in tumor size (▲) and CT number (●) during radiation therapy. The tumor size was calculated from the diameter $[(ab + cd)/2]$ of an imaginary circle. The CT number is the average absorption value of the tumor volume enclosed by the circle on precontrast CT scans. Both the tumor size and CT number decreased as the radiation dose accumulated.

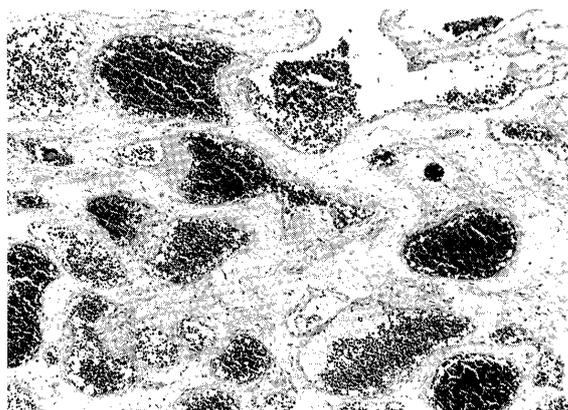


Fig. 6 Photomicrograph of the surgical specimen showing large, thin-walled blood vessels with marked stromal edema. HE stain, $\times 120$.

examined autopsy cases of patients who received brain irradiation and found that those who received more than 1400 rets more frequently developed radiation necrosis. The NSD in our case was 1083 rets, with a total dose of 2850 rads given in 15 fractions over 19 days. This NSD is below the tolerance level of normal brain and therefore may not result in radiation necrosis. As the radiation dose accumulated, the tumor shrank and the CT number decreased. During its resection, bleeding from the tumor was easily controllable.

The influence of irradiation on blood vessels is well known.²⁾ Damage to the endothelium results in

increased permeability to plasma and thrombus formation, stromal edema, and obstruction of blood vessels. In our patient, thrombi were formed in the lumen of blood vessels and stromal edema occurred, but there was no morphological destruction of the endothelium. This suggests that a total dose of approximately 3000 rads is appropriate.

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