Acute tumoral bleeding in recurrent falx meningioma after stereotactic radiosurgery: a case report

Case Report

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Summary

We report a 39-year-old man who underwent stereotactic radiosurgery for recurrent right frontal falx meningioma. Severe headache with transient loss of consciousness occurred 3 hours after the procedure. Emergent image study revealed tumor bleeding with rupture into the ventricles. Conservative treatment was administered and six-month follow-up revealed no complications. Although SRS has proven to be a safe therapeutic option for intracranial tumors, acute tumoral bleeding may occur in a benign intracranial tumor after SRS.

I. Introduction

Stereotactic radiosurgery (SRS) for brain tumors is generally believed to have no significant acute complications. Iwai and colleagues in their series of gamma knife radiosurgery (γKR) treatments for forty-three meningioma patients, observed in 2003 no neurological deficits after radiosurgery.

Kondziolka and colleagues noted in 2000 that neurological symptoms after γKR for vestibular schwannomas were usually mild and transient. Harris and colleagues reported in 2003 delayed visual field defect in only one of thirty meningioma patients having undergone SRS. A Pittsburgh study of fifty meningioma patients treated with GKR revealed no immediate postoperative complications (Kondziolka et al, 1991).

Acute tumor bleeding after SRS is particularly rare. A review of the English medical literature reveals only one case of tumoral hemorrhage immediately after SRS for a metastatic brain tumor (Iwata et al, 2006). Acute tumor bleeding after SRS for benign intracranial tumors has not been reported.

II. Case

A 39-year-old man had undergone removal of a right frontal falx meningioma 7 years earlier (Figure 1). Since then, his condition was uneventful until the day before admission when he suffered a generalized seizure attack. Emergent CT scan indicated local recurrence with a tumor volume of 12.26 ml contoured by MRI-CT fusion images. The average diameter of this tumor was less than 3 cm (range, 2.14-3.20 cm) (Figure 2). Throughout the course of treatment, the patient exhibited only transient loss of consciousness and had no focal motor weakness. The selected treatment option was SRS, which has been recommended for residual meningiomas after surgical resection and has a low complication rate (Torres et al, 2003).

The prescribed dose was 15 Gy to margin. A five-arc treatment plan was designed by Novalis treatment planning v5.31 (BrainLab, Germany). The tumor was covered by 100% isodose line with a maxium dose of 16.95 Gy. The course of SRS was
Su et al: Acute tumoral bleeding in recurrent falx meningioma

uneventful. However, the patient suffered a generalized seizure attack 3 hours after the radiosurgical procedure. Fortunately, he quickly regained consciousness and showed no neurological deficit. Emergent CT scan without enhancement showed focal hematoma in the meningioma and rupture of blood into the ventricles (Figure 3).

The patient was treated conservatively with short term intravenous administration of steroids. One week later, follow-up CT scan without enhancement showed clearance of blood in the ventricles and marked decrease in intratumoral blood (Figure 4). He was discharged in good condition 10 days after the bleeding episode. At 3-month follow-up, the condition of the patient was good and showed no neurological deficits.

Magnetic resonance imaging at that time showed no intracranial blood and a slight decrease in the volume (9.22ml) of the treated tumor (Figure 5). The condition of the patient was again stable at 6-month follow-up.

Figure 1. Microphotoscopic image of the falx meningioma revealing sheets of meningothelial cells with oval nuclei arranged in short fascicles (H&E stain, 100X).

Figure 2. Magnetic resonance image of the falx meningioma immediately before SRS showing a tumor volume of 12.26 ml with average diameter of less than 3 cm. A: axial view showing a maximum and minimum diameter of 3.15 and 2.33 cm, respectively. B: saggital view showing a maximum and minimum diameter of 3.20 cm and 2.14 cm, respectively.

Figure 3. Tumoral hemorrhage and rupture of blood into ventricles revealed by CT scan 3 hours after SRS.

Figure 4. Reduced blood in the tumor and clearance of intraventricular blood revealed by CT scan 7 days after SRS.
IV. Discussion

Although SRS at sufficient doses has proven to be a safe therapeutic option for intracranial tumors (Bertalanffy et al., 2001), temporary volume increases observed in some tumors after SRS demonstrate the vigorous effect of radiosurgery on treated targets (El Shehaby et al., 2005). In a study of forty-three meningioma patients who received SRS or radiotherapy, Kalaparakal and colleagues reported in 1997 that five patients with large tumors developed life-threatening panhemispheric edema.

A multicenter review of 203 patients who underwent radiosurgery for parasagittal meningiomas showed no clinical failures in patients with smaller tumors (<7.5 ml). The authors advocated radiosurgery for patients with small (<3 cm in average diameter) tumors (Kondziolk et al., 1998). Although tumor volume in the current case was 12.26 ml, its average diameter of less than 3 cm was safe for radiosurgery according to the multicenter review (Kondziolk et al., 1998).

A strong correlation has been demonstrated between the occurrence of post-SRS complications and higher irradiation dosages (Kalaparakal et al., 1997). However, these dosages are necessary for tumor volume reduction (Ganz et al., 1993). An irradiation dosage of 15 Gy to margin was prescribed in the current case. This dosage was based on a study by Kondziolk and colleagues who reported in 1999 an average margin dose of 16 Gy for patients undergoing radiosurgery for meningiomas.

Tumor bleeding induced by SRS is extremely rare. In a large series study of 380 meningioma patients who underwent SRS, none presented tumoral bleeding complications (Kondziolk et al., 1999). A literature review further reveals one only case of acute tumoral hemorrhage after SRS for intracranial tumors. This case involved a 46-year-old female with lung cancer complicated by multiple brain metastases. The prescribed marginal dose, corresponding to a 50% isodose line, was 20 Gy for nine metastatic lesions. The patient expired 4 days later (Izawa et al., 2006).

Five cases of delayed (1 to 8 years after GKR) tumoral hemorrhage that had undergone GKR for intracranial tumors have also been reported (Kwon et al., 2002; Kim et al., 2004). However, any correlation between the hemorrhage and the radiosurgical procedure was speculative as bleeding occurred long after SRS and may have been the natural course of a tumor.

This case presented a meningioma originating from the falx. Patients with tumors in this area are vulnerable to injury by SRS (Kalaparakal et al., 1997), and this injury was believed to have been cause by occlusion of superior sagittal sinus and bridging veins after SRS (Gotoh et al., 1993). However, previously reported cases involved brain edema instead of tumoral bleeding (Kalaparakal et al., 1997).

In conclusion, this is the first reported case of immediate tumoral hemorrhage in a benign tumor (falx meningioma) after SRS. Any case of intracranial tumor must be closely examined for tumoral bleeding when undergoing SRS.

References


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