Gamma Knife Surgery for Craniopharyngioma

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Summary

We present our results of Gamma Knife surgery for craniopharyngioma in nine patients. The current status of surgery, radiation therapy, intracavitary instillation of radionucleides and Gamma Knife surgery in the management of craniopharyngiomas is discussed.

Keywords: Craniopharyngioma; Gamma Knife; radiosurgery.

Introduction

Benign by nature and uncommon in occurrence, craniopharyngiomas remain a challenging problem for all who have to deal with them. Harvey Cushing considered them 'one of the most baffling of surgical problems'. Furthermore they have always been surrounded by controversy, whether it be regarding their origin or their appropriate management. Efforts to achieve a complete resection of these lesions are often hampered by the proximity of structures in the suprasellar and interpeduncular cisterns, notably the optic pathways, hypothalamus, circle of Willis and the brainstem. Another confounding feature is that approximately 60 percent of these lesions are cystic, with or without a solid component. These cysts behave very differently in response to conventional microsurgical management as compared to the solid tumor. Although numerous surgeons have extolled the virtue in total extirpation of these lesions the recurrence rates reported after occasionally heroic surgical ventures have kept the debate from reaching a conclusion. Current practice includes microsurgery, intracystic instillation of radioisotopes and Gamma Knife surgery for these lesions.

We present our experience in Gamma Knife surgery of these lesions and review its current place in the management of craniopharyngioma.

Patient Material

At the University of Virginia, Charlottesville, we have treated nine patients for their craniopharyngiomas with the Gamma Knife between March 1989 and May 1994. Two patients had no prior surgical intervention, two had only stereotactic biopsy and the remaining five had a history of one or more microsurgical resections. Six of the tumors were mixed solid and cystic, and 3 were purely solid. One of the patients was treated four months prior to this writing and had not had a follow-up MRI. Brief case descriptions of all nine patients are presented.

Case 1

BB, a 57 year old white female who presented with marked decrease in vision and severe headaches of two months duration. She was diagnosed as having a suprasellar solid mass and underwent a craniotomy and subtotal removal of a craniopharyngioma. She had profound dyselectrolytemias following the operation and episodes of cardiac asystole from which she recovered after protracted efforts to correct the electrolyte imbalance. Her vision continued to be poor postoperatively and follow-up MRI revealed an enlarging residual tumor 12 months after the surgery. She underwent Gamma Knife surgery on a residual tumor measuring 16X16X13 mm. She received 30 Gy as the maximum dose and the dose delivered to the periphery of the tumor was 10 Gy. The optic pathways received under 5 Gy. Postoperatively she has done very well and has had no dyselectrolytemias. Follow-up MRI at 6 months following the Gamma Knife treatment revealed marked reduction in the tumor size. Patient is doing well and reports improvement in visual acuity.

Case 2

GT, a 34 year old male presented with a two and a half year history of decreased vision and severe headaches of two months duration. She was diagnosed as having a suprasellar solid mass and underwent a craniotomy and subtotal removal of a craniopharyngioma. She had profound dyselectrolytemias following the operation and episodes of cardiac asystole from which she recovered after protracted efforts to correct the electrolyte imbalance. Her vision continued to be poor postoperatively and follow-up MRI revealed an enlarging residual tumor 12 months after the surgery. She underwent Gamma Knife surgery on a residual tumor measuring 16X16X13 mm. She received 30 Gy as the maximum dose and the dose delivered to the periphery of the tumor was 10 Gy. The optic pathways received under 5 Gy. Postoperatively she has done very well and has had no dyselectrolytemias. Follow-up MRI at 6 months following the Gamma Knife treatment revealed marked reduction in the tumor size. Patient is doing well and reports improvement in visual acuity.
Fig. 1. Gamma Knife surgery for the solid part of a craniopharyngioma with solid and cystic components: Sagittal post contrast T1 weighted MR images of a craniopharyngioma in a 34 year old male, showing the tumor (left) at the time of radiosurgery, with superimposed 30 and 50% isodose configuration (center) the time of treatment and the resultant reduction in the size of the tumor shown here at two and a half years following Gamma Knife surgery (right).

Fig. 2. Early response of craniopharyngioma to Gamma Knife surgery: Axial and coronal post contrast T1 MR images at the time of Gamma Knife surgery (a, b) for craniopharyngioma in a 77 year old man and follow-up MR images (c, d) obtained 2 months following the treatment. A marked reduction in the size of this mixed solid and cystic tumor.