



Early Versus Late Gamma Knife Radiosurgery Following Transsphenoidal Resection for Nonfunctioning Pituitary Macroadenomas: A Matched Cohort Study

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Introduction

Nonfunctioning pituitary macroadenomas frequently invade the cavernous sinus and many cannot be completely resected without undue risk. Gamma Knife radiosurgery (GKRS) is highly effective for treating residual and recurrent adenomas. However, there is no consensus as to whether GKRS should be used early to treat residual adenoma or after a set period of clinical observation during which adenoma growth is demonstrated. Given the high incidence of adenoma progression after subtotal resection over time, the present study examines the potential utility of GKRS performed shortly after transsphenoidal surgery versus expectant management with delayed GKRS treatment.

Methods

This is a retrospective review of patients with nonfunctioning pituitary macroadenomas who underwent transsphenoidal surgery followed by GKRS from 1996 to 2013 at the University of Virginia. Patients were stratified based on interval between resection and radiosurgery. Operative results, imaging and clinical outcomes were compared across groups following early (<6 months) or late (>6 months) radiosurgery.

Results

Sixty-four patients met our study criteria and were grouped based on early (n=32) or late (n=32) GKRS following transsphenoidal resection. There was greater risk of tumor progression after GKRS in the late radiosurgical group (p=0.027) over a median radiographic follow-up period of 68.5 months. Furthermore, there was a significantly higher occurrence of post-GKRS endocrinopathy in the late radiosurgical cohort (p=0.041). Seventeen percent of patients without endocrinopathy in the early cohort developed new endocrinopathies during the follow-up period versus 64% in the late cohort (p=0.036). This difference was primarily due to a significantly higher rate of tumor growth during the observation

period of the late treatment cohort (p=0.014). Of these patients with completely new endocrinopathies, radiation-associated pituitary insufficiency developed in one of two patients in the early group and three of seven (42.9%) patients in the late group.

Conclusions

Early treatment with GKRS appears to decrease the rate of radiographic and symptomatic progression of sub-totally resected nonfunctioning pituitary macroadenomas compared to late GKRS treatment after a period of expectant management. Delaying radiosurgery may place the patient at increased risk for adenoma progression and endocrinopathy.

Learning Objectives

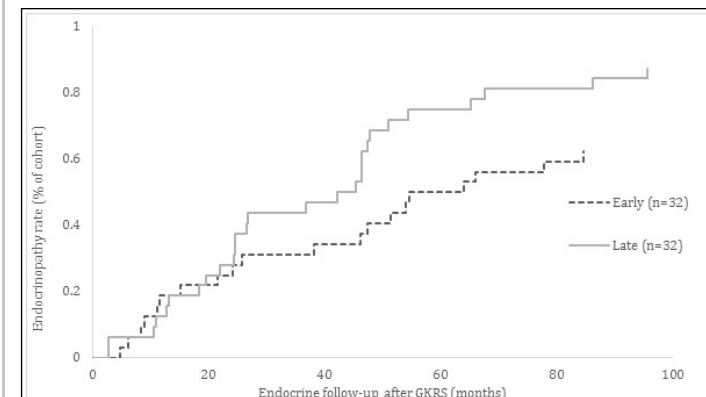
Participants should be able to:

1. Recognize the role for adjuvant radiosurgery following transsphenoidal resection of nonfunctioning pituitary macroadenomas
2. Learn the risks and benefits of subtotal resection of tumors invading cavernous sinus with high rates of recurrence
3. Gain insight into the clinical course of operative patients with nonfunctioning pituitary macroadenomas

References

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Note: This work is currently in press with the Journal of Neurosurgery



Kaplan-Meier plot of endocrinopathy rates after GKRS in patients in the early (dashed line) and late (solid line) cohort

	Early GK (= 6 mos)		Late GK (>6 mos)	
Residual tumor at last f/u ^a	18	56.3%	27	84.4%
Tumor stable	17	94.4%	24	88.9%
Tumor growth	1	5.6%	3	11.1%
Growth or new residual	2	6.3%	9	28.1%
Pre-GK endocrinopathy ^b	20	62.5%	21	65.6%
Fully resolved endocrinopathy	2		0	
Pre-GK no endocrinopathy	12	37.5%	11	34.4%
Completely new endocrinopathy	2		7	
Post-GK endocrinopathy ^c	20	62.5%	28	87.5%
Secondary to tumor growth	0		8	
Secondary to reoperation*	15		16	
Secondary to radiosurgery	5		3	
Unknown	0		1	
Completely new endocrinopathy**	2	16.7%	7	63.6%
Secondary to tumor growth	0		1	
Secondary to reoperation	1		3	
Secondary to radiosurgery	1		3	

a = number of pts in each group with residual tumor at last f/u; b = same as post-op endocrinopathy; c = % of total pts in each group; * = 5 of the patients in the Late GK group developed endocrinopathy after first TSR, not repeat operation; ** = % of patients with pre-GK no endocrinopathy