Influence of Tumor Volume and Cavernous Sinus Invasion on Hormone Levels and Remission Following Endoscopic Transsphenoidal Surgery for Acromegaly

Michael Schiraldi MD PhD; Miriam Nuno PhD; John D. Carmichael MD; Vivien Bonert; Shlomo Melmed MD; Adam N. Mamelak MD

Pituitary Center, Departments of Neurosurgery and Endocrinology, Cedars-Sinai Medical Center, Los Angeles, CA

Learning Objectives

By the conclusion of this session, participants should be able to determine factors that influence outcome following endoscopic transsphenoidal surgery in acromegalic patients

Introduction

While cavernous sinus invasion has traditionally been considered a limiting factor for surgical cure of GH-secreting pituitary adenomas, endoscopy has potentially improved outcomes. We aimed to determine factors influencing outcome following endoscopic transsphenoidal surgery for acromegaly.

Methods

Acromegalic patients undergoing endoscopic transsphenoidal surgery by a single surgeon (ANM) were identified by retrospective review of our pituitary database. Tumor volumes were calculated from coronal gadolinium-enhanced MRIs (2-3 mm slice thickness) using the "closed polygon" algorithm of DICOM software (Osirix). Cavernous sinus invasion was measured in Knosp (K) scores by inspection of coronal images. Pre-operative IGF-1 and basal (bGH) and nadir (nGH) growth hormone levels during OGTT were recorded. Remission was based on post-operative criteria of normal IGF-1 and nGH < 0.4ng/ml. Data was subjected to multivariate analysis using ANOVA and univariate comparison to outcome (SPSS software).

Univariate Analyses

		Cured		
Variables	All patients	yes	no	p value
Number of patients, N (%)	46	36 (78.3)	10 (21.7)	
Age at diagnosis, years				0.002
mean (SD)	49.4 (13.7)	52.6 (13.0)	37.9 (9.4)	
median [IQR]	51 [19-72]	56 [21, 72]	40 [19-47]	
IGF-1 normalized				0.59
mean (SD)	268.2 (159.9)	258.0 (154.8)	309 (179.6)	
median [IQR]	220 [51-834]	220 [51-834]	254 [137-627]	
bGH				0.26
mean (SD)	26.2 (41.5)	22.8 (33.6)	40.2 (65.5)	
median [IQR]	10 [0.3-200]	6 [0.3-147]	15 [0.5-20]	
nGH				0.32
mean (SD)	23.2 (41.9)	19.6 (32.0)	37.9 (71.9)	
median [IQR]	6 [0.4-200]	4 [0.5-136]	13 [0.4-200]	
K score, N (%)				0.27
0	18 (39.1)	16 (44.4)	2 (20.0)	
1	14 (30.4)	11 (30.6)	3 (30.0)	
2+	14 (30.4)	9 (25.0)	5 (50.0)	
Volume (cc3)				0.13
mean (SD)	2.20 (2.7)	1.92 (2.50)	3.22 (3.1)	
median [IQR]	0.74 [0.04-10.4]	0.72 [0.04-8.50]	3.23 [0.42-10.44]	

Pearson Correlation Coefficients

	K score 3	IGF 1	bGH	nGH	
K score 3	1.000000	0.066280	0.058650	0.102860	Corr. coefficients
		0.6616	0.7157	0.5505	p values
IGF1	0.066280	1.000000	0.116910	0.116090	Corr. coefficients
	0.6616		0.4666	0.5001	p values
bGH	0.05865	0.11691	1.00000	0.95664	Corr. coefficients
	0.7157	0.4666		<.0001	p values
nGH	0.10286	0.11609	0.95664	1.00000	corr. coefficients
	0.550500	0.500100	<.0001		p values

Results

50 patients underwent surgery for acromegaly between 2006 and 2012, with long-term follow-up available in 46 patients. Remission occurred in 36 (78%) patients with follow-up of up to 7 years (mean 3.7 years). Age at diagnosis significantly predicted post-operative remission, with older patients more often cured (mean age 52.6 years vs. 37.9 years; p=0.002). Neither smaller tumor volume nor lower K-score correlated with remission, indicating that endoscopic removal may be more effective for larger and more invasive tumors than microscopic methods. There was no relationship between pre-operative IGF-1, bGH, or nGH and remission.

Conclusions

Endoscopic transsphenoidal surgery yields high surgical cure rate (78%). There was no correlation between tumor volume and surgical cure, and little impact of cavernous sinus invasion. When compared to published data, these results suggest that endoscopy yields better outcomes than microscopy for acromegaly. K-score did not predict pre-operative GH or IGF-1 levels, suggesting that cavernous invasion does not directly influence serum measures of these values.