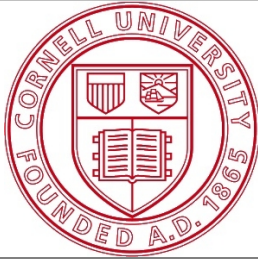




Endoscopic Endonasal Transssphenoidal Surgery for Functional Pituitary Adenomas

Christoph Hofstetter MD PhD; Benjamin Shin BS; Lynn Mubita MD; Clark Huang; Vijay K. Anand MD, FACS; John A. Boockvar MD; Theodore H. Schwartz MD, FACS

Brain and Spine Center, Weill Cornell Medical College



Introduction

To analyze preoperative predictors of endocrinological cure following endonasal endoscopic resection of therapy-resistant prolactin (PRL)-, growth hormone (GH)- and adrenocorticotropin (ACTH)-secreting pituitary adenomas and establish benchmarks for cure using the most recent consensus criteria.

Methods

We reviewed a prospective database of 86 consecutive functional pituitary adenomas that were resected by a purely endoscopic endonasal transssphenoidal technique. Extent of resection was evaluated on postoperative contrast-enhanced MRI. Endocrinological remission was defined according to the most recent consensus criteria.

Patient characteristics					
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Type of pathology		Total	PRL-secreting	ACTH-secreting	GH-secreting
Number of patients		86	35	18	33
Gender	Male	37 (43.0%)	13 (37.1%)	5 (27.8%)	19 (57.6%)
	Female	49 (57.0%)	22 (62.9%)	13 (72.2%)	14 (42.4%)
Age (years)		45.2 ± 1.8	36.3 ± 2.5*	53.8 ± 3.8	49.9 ±2.6
Previous surgery	Yes	18 (20.9%)	8 (22.9%)	6 (33.3%)	4 (12.1%)
	No	68 (79.1%)	27 (77.1%)	12 (66.6%)	29 (87.9%)
Maximum tumor diameter	< 1 cm	32 (37.2%)	13 (37.1%)	11 (61.1%)	8 (24.2%)
	> 1 cm	54 (62.8%)	22 (62.9%)	7 (38.9%)	25 (75.8%)
Invasion of the cavernous sinus	Yes	21 (24.4%)	5 (14.3%)	4 (22.2%)	12 (36.4%)
	No	65 (75.7%)	30 (85.7%)	14 (77.8%)	21 (63.6%)
Suprasellar tumor extension	Yes	15 (29.1%)	14 (40.0%)	3 (16.7%)	8 (24.2%)
	No	61 (70.9%)	21 (60.0%)	15 (83.3%)	25 (75.8%)
Apoplexy	Yes	5 (5.8%)	5 (14.3%)	0 (0.0%)	0 (0.0%)
	No	81 (94.2%)	50 (85.7%)	18 (100.0%)	13 (100.0%)
*ANOVA, P < 0.001, Tukey Posthoc P < 0.01 compared to GH secreting and P < 0.001 compared to ACTH-secreting adenomas					

Results

The majority of functional adenomas (62.8%) were classified as macroadenomas (>1 cm in maximum diameter) and 24.4% of them had invaded the cavernous sinus at the time of surgery. A gross total resection was achieved in 75.6% of all patients. The rate of endocrinological remission differed between various types of functional adenomas. Cure rates were 92.3% (micro) and 57.1% (macro) for prolactinomas, 75% (micro) and 40% (macro) for GH-secreting tumors and 54.5% (micro) and 71.4% (macro) for ACTH-secreting tumors. Lower rates of cure occurred in GH-secreting macroadenomas due to a high rate of cavernous sinus invasion and in ACTH-secreting adenomas due to a high rate of non-visible lesions on pre-operative MRI. Whereas univariate analysis showed that macroadenoma, suprasellar, or cavernous extension and extent of resection correlated with cure, on multivariate analysis, only extent of resection predicted cure. One patient developed postoperative meningitis that was complicated by hydrocephalus requiring a ventriculoperitoneal shunt. Two patients developed postoperative panhypopituitarism and two patients suffered from CSF leaks which were treated with lumbar CSF diversion.

Outcome						
Type of pathology		Total	PRL-secreting	ACTH-secreting	GH-secreting	
Number of patients		86	35	18	33	
GTR	Yes	65 (75.6%)	26 (74.3%)	13 (72.2%)	26 (78.8%)	
	No	21 (24.4%)	9 (25.7%)	5 (27.8%)	7 (21.2%)	
Endocrinological Cure (EC)	Yes	51 (60.0%)	24 (70.6%)	11 (61.1%)	17 (51.5%)	
EC in microadenomas	Yes	24 (75.0%)	12 (92.3%)	6 (54.5%)	6 (75.0%)	
	No	8 (25.0%)	1 (7.7%)	4 (45.5%)	2 (25.0%)	
EC in macroadenomas	Yes	27 (50.9%)	12 (57.1%)	5 (71.4%)	10 (40%)	
	No	26 (49.1%)	9 (42.9%)	2 (28.6%)	15 (60.0%)	
EC in adenomas	Yes	7 (38.9%)	3 (60.0%)	1 (33.3%)	3 (30.0%)	
with CV invasion	No	11 (61.1%)	2 (40.0%)	2 (66.7%)	7 (70.0%)	
Gamma knife	Yes	12 (14.0%)	3 (8.6%)	4 (22.2%)	5 (15.2%)	
	No	74 (86.0%)	32 (91.4%)	14 (77.8%)	28 (84.8%)	
Excess hormone serum levels	Preop		PRL 684.9 ± 308.4	ACTH 85.4 ± 19.1	Cortisol 16.5 ± 4.2	GH 30.3 ± 8.2
	Postop		107.9 ± 50.1	42.0 ± 18.2	13.6 ± 4.3	IGF-1 469.7 ± 42.5
	Last fu		34.1	45 ± 14.4	9.8 ± 2.0	295.6 ± 40.1
Last fu (months)		22.8 ± 2.2	22.3 ± 3.4	24.8 ± 5.1	22.2 ± 3.9	

CV: cavernous sinus, EC: endocrinological cure

Predictors for cure						
Adenoma characteristics	Prediction of endocrinological cure			Prediction of endocrinological cure		
	Odds ratio	P value	Confidence interval	Odds ratio	P value	Confidence interval
GTR	4.74	0.004	1.65 – 13.59	3.91	0.016	1.293 – 11.798
Microadenoma	3.44	0.015	1.27 – 9.31	1.61	0.376	0.562 – 4.598
No suprasellar extension	3.50	0.012	1.32 – 9.25	2.12	0.176	0.713 – 6.311
No cavernous sinus invasion	3.21	0.033	1.09 – 9.43	1.26	0.73	0.332 – 4.834

Complications

Type of complication	N	Treatment
Meningitis and communicating hydocephalus	1 (1.2%)	Antibiotics and ventriculoperitoneal shunt
CSF leak	2 (2.3%)	Lumbar CSF diversion
Panhypopituitarism*	2 (2.3%)	Hormone replacement
Sinusistis	2 (2.3%)	Antibiotics
Dry eye	1 (1.2%)	Artificial tears

* in patients with preoperative intact pituitary-hypothalamic axis

Conclusions

This paper reports benchmarks for endocrinologic remission as well as complications in a large series of purely endoscopic pituitary surgeries using the most recent consensus criteria. The advantages of the extended endonasal approaches are most profound in tumors with suprasellar extension and cavernous sinus invasion.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) describe the goals and endocrinological outcome of surgical resection of functional pituitary tumors

References

Hofstetter et al. 2011, Neurosurgical focus