Comparison of Preoperative Imaging Features and Postoperative Outcomes between Null-Cell and Silent Nonfunctioning Pituitary Adenomas

Kevin L. Webb Ph.D.[1], Ramin A Morshed M.D.[2], Miguel Saez-Alegre M.D., Ph.D.[3], Mickayla L. Hinkle P.A.-C.[3], Yuki Shinya M.D., Ph.D.[3], Jamie J. Van Gompel M.D.[3]

[1]Mayo Clinic Alix School of Medicine, [2]University of California - San Francisco, Department of Neurosurgery, [3]Mayo Clinic, Department of Neurosurgery

BACKGROUND

- Nonfunctioning pituitary adenomas may be further classified as null-cell or silent pituitary adenomas.
- Null-cell pituitary adenomas do not stain positive for anterior pituitary hormones or associated transcription factors.
- Limited data has suggested that null-cell adenomas may be more invasive, worsening postoperative outcomes.[1,2]

AIM

To investigate differences in preoperative imaging features and postoperative outcomes between transcription factor-defined null-cell and silent pituitary adenomas.

METHODS

- Retrospective cohort study all patients receiving transsphenoidal resection for nonfunctioning pituitary adenomas across Mayo Clinic campuses (2005-2023).
- Null-cell pituitary adenomas were defined by negative staining for transcription factors SF-1, PIT-1 (Figure 1) and negative staining for all anterior pituitary hormones.
- Silent pituitary adenomas were defined by positive staining for transcription factors SF-1 or PIT-1, and negative staining for all anterior pituitary hormones.
- Tumor size and invasiveness were determined with preoperative MRI.
- Endocrinologic function was assessed at three-month follow-up.
- Binary logistic regression models were used to examine the association between tumor size/invasiveness and achievement of near/subtotal resection or tumor progression. (Table 2)

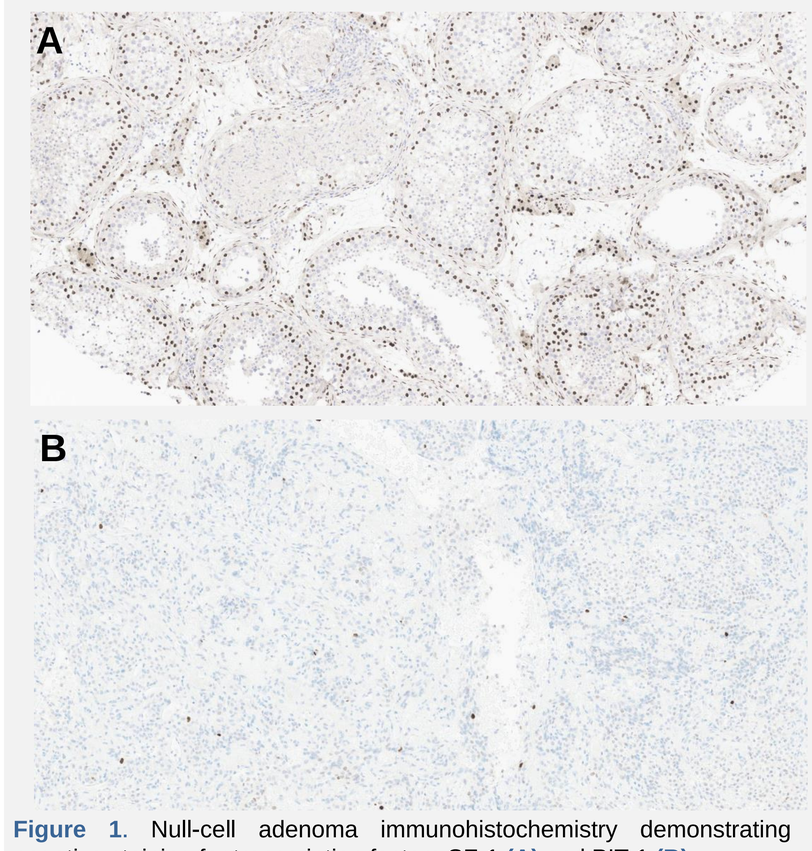


Figure 1. Null-cell adenoma immunohistochemistry demonstrating a negative staining for transcription factors SF-1 **(A)** and PIT-1 **(B)**.

RESULTS

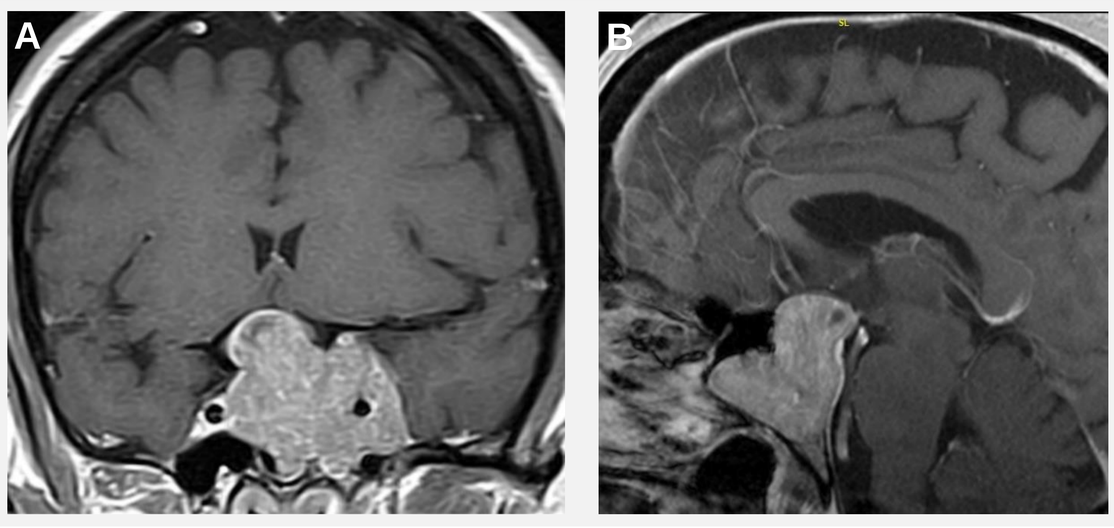
	Null-Cell Pituitary Adenomas	Silent Pituitary Adenomas	*P*-value
Number of patients (*n*)	14	118	-
Female patients (*n, %*)	13 (93%)	45 (38%)	**<0.001**
Age at surgery (*years*)	55 ± 12	60 ± 12	0.186
Hypopituitarism (*n, %*)	4 (29%)	44 (37%)	0.521
Tumor Size			
Macroadenoma (*n, %*)	14 (100%)	117 (99%)	-
Microadenoma (*n, %*)	0 (0%)	1 (1%)	-
Tumor diameter (c*m*)	2.9 ± 1.0	2.4 ± 0.8	**0.042**
Anterior-posterior diameter (c*m*)	2.4 ± 1.0	1.8 ± 0.7	**0.009**
Medial-lateral diameter (c*m*)	2.6 ± 0.7	2.1 ± 0.7	**0.008**
Superior-inferior diameter (c*m*)	2.8 ± 1.1	2.2 ± 0.9	**0.038**
Tumor Invasiveness			
Sphenoid sinus invasion (*n, %*)	4 (29%)	4 (3%)	**<0.001**
Cavernous sinus invasion (*n, %*)	7 (50%)	41 (35%)	0.262
Knosp grade ≥ 3 (*n, %*)	10 (71%)	35 (30%)	**0.002**
Degree of Surgical Resection			
GTR (*n, %*)	6 (43%)	79 (67%)	0.075
NTR (*n, %*)	2 (14%)	8 (7%)	0.316
STR (*n, %*)	6 (43%)	31 (26%)	0.191
Postoperative Outcomes			
Follow-up duration (*months*)	38 ± 19	35 ± 30	0.753
Tumor recurrence after GTR (*n, %*)	1 (17%)	10 (13%)	0.788
Tumor progression after NTR/STR (*n, %*)	5 (63%)	7 (18%)	**0.008**
Reoperation (*n, %*)	1 (7%)	9 (8%)	0.948
Adjuvant radiosurgery (*n, %*)	2 (14%)	9 (8%)	0.726
New diabetes insipidus (*n, %*)	0 (0%)	4 (3%)	0.342
Worsened pituitary function (*n, %*)	5 (36%)	26 (22%)	0.254
Stable pituitary function (*n, %*)	9 (64%)	83 (70%)	0.641
Improved pituitary function (*n, %*)	0 (0%)	9 (8%)	0.284

Table 1. Comparison of patient cohort, tumor size/invasiveness, degree of surgical resection, and postoperative outcomes between null-cell and silent pituitary adenomas treated by transsphenoidal resection. Abbreviations: GTR, gross total resection; NTR, near total resection; STR, subtotal resection cm, centimeters

Figure 2. Representative imaging of null-cell pituitary adenomas from two patients.

A) Coronal T1-gadolinium MRI demonstrating expansion through the sella tercica, encasement of the left internal carotid artery, and displacement of the optic chiasm.

B) Sagittal T1-gadolinium MRI demonstrating anterior-posterior extension from the sella to the posterior clivus.



	Odds Ratio	*P*-value
Variable Associations with NTR/STR		
Tumor diameter	1.07 [1.01-1.13]	**0.013**
Sphenoid sinus invasion	5.55 [0.57-53.96]	0.140
Knosp grade	1.41 [1.05-1.89]	**0.022**
Variable Associations with Tumor Progression		
Group (NCPA, SPA)	0.36 [0.04-3.59]	0.382
Age at surgery	0.93 [0.86-1.00]	0.057
Preoperative hypopituitarism	0.08 [0.01-1.17]	0.065
Tumor diameter	1.11 [0.99-1.25]	0.078
Sphenoid sinus invasion	2.28 [0.13-38.63]	0.569
Knosp grade	0.94 [0.50-1.76]	0.850

Table 2. The association of tumor characteristics and preoperative demographics with the achievement of near- or subtotal resection, and subsequent tumor progression at follow-up. Results presented with 95% confidence interval. Abbreviations: NTR, near total resection; STR, subtotal resection; NCPA, null-cell pituitary adenoma; SPA, silent pituitary adenoma.

CONCLUSIONS

- Null-cell pituitary adenomas appear to exhibit greater invasiveness and higher likelihood of tumor progression following subtotal resection.
- These findings may help guide selection of postoperative management strategies and inform prognosis.

REFERENCES

[1]Haddad et al. 'Clinical characteristics and outcomes of null-cell versus silent gonadotroph adenomas in a series of 1166 pituitary adenomas from a single institution'. *Neurosurgical Focus*. 2020

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