Aggressive pituitary adenomas: is pathology the only feature of aggressiveness?

Amir R. Dehdashti¹ · Shamik Chakraborty¹

Received: 8 November 2017 / Accepted: 13 November 2017 / Published online: 24 November 2017
© Springer-Verlag GmbH Austria, part of Springer Nature 2017

Though pituitary adenomas are typically considered benign tumors, they can sometimes exhibit aggressive characteristics such as rapid growth, invasion into adjacent neurologic structures, and a high rate of recurrence. There is no clear definition of “aggressive” pituitary adenomas, and they are typically defined on an ad-hoc basis on such characteristics. In their study, Ceccato et al. attempt to clarify clinical, pathologic, and radiologic factors that correlate to clinical behavior and response to treatment, with the goal of potentially identifying factors that may signal tumor aggressiveness, thus guiding appropriate treatments.

The authors retrospectively reviewed the records of 582 patients who had undergone treatment for pituitary adenomas. Of these, 102 patients were considered to have “aggressive” adenomas, with the majority of them presenting with invasion of adjacent neurologic structures. Specifically, growth hormone, prolactin, and nonsecretory tumors were more likely to present with invasion. Hormone secretion did not seem to affect the recurrence rate after surgery or need for adjuvant therapy. Twenty-four percent of cases were defined as atypical adenomas, and radiologic characteristics, responses to medical treatment, and remission rates were similar between typical and atypical adenoma patients.

The previous WHO classification divided pituitary tumors into categories such as “typical” adenomas, “atypical” adenomas, and pituitary carcinomas based on histopathologic features [1]. This seems to be the basis of classification used by Ceccato et al., understandably, given that their mean follow-up time was approximately 5 years. However, these classifications do not always correlate with the clinical behaviors of the tumors, and there is variation in how these tumors present in patients. The latest WHO classification system utilizes modern genetic and molecular characteristics in its classification scheme. Using the modern WHO classification system,

more accurate tumor subtyping, assessment of the tumor proliferation profile by mitotic count and Ki-67 index, and using clinical parameters such as tumor invasion (characterized by MRI or operative assessment) allow for more individualized characterization [2].

There is some difficulty in classifying pituitary tumors as Ceccato et al. have done. Indeed, such a means of determining tumor aggressiveness is best done post hoc, after one has surgically ascertained the level of invasiveness and can evaluate the tumor histopathologically. This may lead to avoiding a more extensive operation to treat an aggressive tumor. The level of tumor invasiveness is not always ascertainable with even a high-quality MRI, as even very large or invasive-looking tumors may have a well-delineated capsule, not truly invading adjacent structures, and be fully resectable [3]. Although helpful in guiding post-surgical treatment and prompting early adjuvant treatment, the system developed by Ceccato et al. does not always allow for planning an aggressive operation to deal with an aggressive tumor. A means of evaluating pituitary tumors that allows for proper surgical planning to appropriately treat aggressive tumors aggressively is key.

Given the rise of machine learning and the ability of computers to analyze massive amounts of data and the radiologic patterns of thousands of MRI scans on patients with brain tumors, and to correlate them with their treatments and outcomes [4], it is not difficult to imagine a “big-data” solution to identifying potentially aggressive pituitary adenomas. The work presented by Ceccato et al. is an important step in this direction and represents a laudable effort to systematically approach aggressive pituitary tumors to ensure proper treatment. It will be important to use the full armament of novel genetic testing and radiologic workup to understand these tumors and their response to both surgical and adjuvant treatments. Additionally, these factors can be used to guide treatment based on these characteristics, allowing for more individualized targeted treatment strategies—something that is imperative in these patients whose aggressive tumors inherently require aggressive treatments.

✉ Amir R. Dehdashti
Adehdashti@northwell.edu

¹ Northshore University Hospital, Northwell Neuroscience Institute, Manhasset, NY, USA

References

1. Di Ieva A, Rotondo F, Syro LV, Cusimano MD, Kovacs K (2014) Aggressive pituitary adenomas—diagnosis and emerging treatments. *Nat Rev Endocrinol* 10:423–435
2. Mete O, Lopes MB (2017) Overview of the 2017 WHO classification of pituitary tumors. *Endocr Pathol*. <https://doi.org/10.1007/s12022-017-9498-z>
3. Matsuyama J, Kawase T, Yoshida K, Hasegawa M, Hirose Y, Nagahisa S, Watanabe S, Sano H (2010) Management of large and giant pituitary adenomas with suprasellar extensions. *Asian J Neurosurg* 5:48–53
4. Zacharaki EI, Wang S, Chawla S, Soo Yoo D, Wolf R, Melhem ER, Davatzikos C (2009) Classification of brain tumor type and grade using MRI texture and shape in a machine learning scheme. *Magn Reson Med* 62:1609–1618