Commentary on:
Giant Pituitary Adenomas: Surgical Outcomes of 50 Cases Operated on by the Endonasal Endoscopic Approach
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Challenge of Giant Pituitary Tumors

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The definition of giant pituitary tumors is unclear. Although some authors label giant tumors as those that are more than 3 cm in their vertical height, others label those tumors as giant that are more than 4 cm. With respect to surgical treatment, tumors more than 4 cm in height are much more difficult to resect than those lesser than 4 cm (3, 4). The authors of this manuscript mention that they have treated tumors measuring 4–7 cm in size but, unfortunately, have shown by example tumors that are relatively small. The authors could have shown their best and largest tumor cases and those that were real giant pituitary tumors that they treated successfully. Surgery on giant pituitary tumors more than 4 cm in their vertical height has specific issues that are different from those in smaller tumors.

Giant pituitary tumors are more often nonfunctioning in nature and the principal presenting feature is visual obscuration, field loss, or blindness. Hormonally active pituitary tumors are relatively rare. Despite the fact that some pituitary tumors achieve a giant size, these tumors are more often histologically essentially benign. The diagnosis of the pituitary tumor can usually be made on the basis of clinical features and their classical anatomic extensions seen on imaging. The surgery for the purpose of histologic confirmation alone therefore has little relevance.

In the year 2004, we proposed a classification system of giant pituitary tumors that assists in indicating the nature of anatomic extensions of the tumor, ease of surgical resection, and possibilities of complete resection, and in suggesting the need for adjuvant treatment and in predicting the long-term outcome. The various grades are as follows.

Grade I (**Figure 1**) pituitary tumors are those that are located within the confines of sella, remain underneath the superiorly elevated diaphragma sellae, and does not invade into the cavernous sinus. The diaphragma sellae is stretched superiorly, sometimes even beyond the corpus callosum. It covers the entire superior dome of the pituitary tumor. Although, the suprasellar extension of the tumor is intracranial, it is "subdiaphragmatic."

Grade II (**Figure 2**) pituitary tumors are those where the tumor invades into the cavernous sinus. The exact anatomic- or tumor histology–related reason as to why some tumors extend into the cavernous sinus and some do not is unclear. Although several studies are now available, the nature of membranes that demarcate the cavernous sinus from the pituitary gland remains controversial (1).

Grade III (**Figure 3**) pituitary tumors are those giant pituitary tumors where the roof of the cavernous sinus is elevated superiorly.

Grade IV (**Figure 4**) pituitary tumors are those that transgress the diaphragma sella boundary and extend into the subarachnoid spaces of the brain. These tumors encased the arteries of the circle of Willis. Such pituitary tumors are anatomically, surgically, and also according to clinical behavior "aggressive."

Surgery for these tumors is aimed at radical resection. Partial tumor resection or incomplete tumor resections can lead to bleeding

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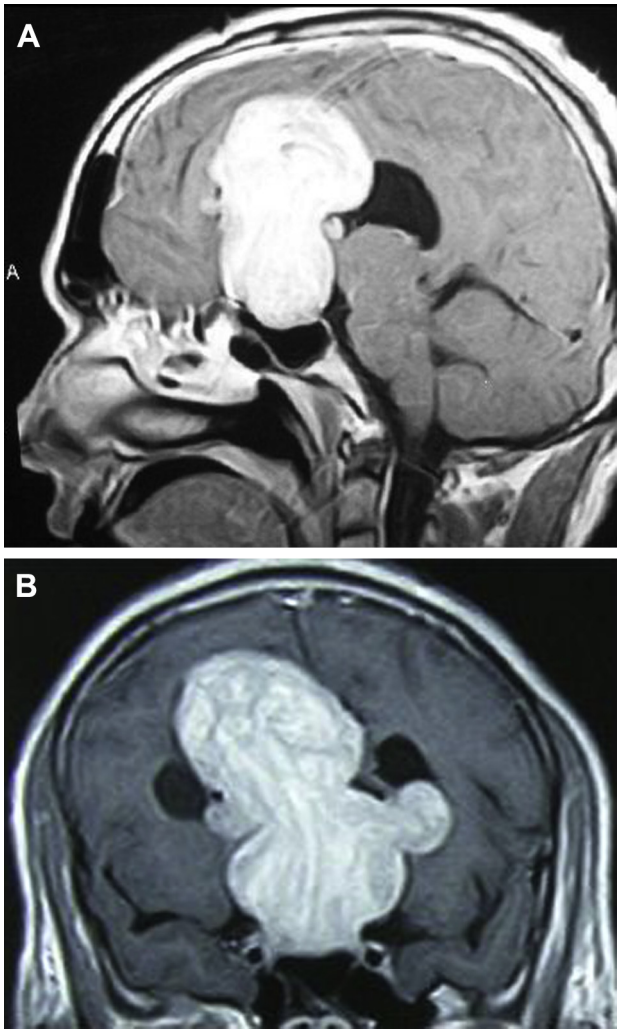

Figure 1. (**A**) Contrast-enhanced sagittal image of magnetic resonance imaging shows a grade I pituitary tumor. The diaphragma sellae is elevated by the giant tumor. (**B**) Coronal image of the tumor. The dome of the tumor has lobulated the diaphragma sellae but has not transgressed it.

within the confines of the residual tumors, an event that we labeled as postoperative pituitary apoplexy (2). Although a successful radical tumor resection can be associated with dramatic recovery in the vision, any surgical mishap can lead to rather quick postoperative death. It is unusual that the authors resected 44% tumors partially and had no major complication. The surgical strategy, particularly for tumors invading into cavernous sinus, could have been elaborated. The authors report that 76% of their patients had improved vision following surgery. The authors have treated the patients in the series over several years. It would have been informative if the recurrence or regrowth rate of the tumor after partial or radical resection of the tumors could have been detailed. This information would have been particularly important as the authors have not subjected majority of their patients to radiation treatment. Our observation is that the recurrence rate of the tumor after its radical resection is low.

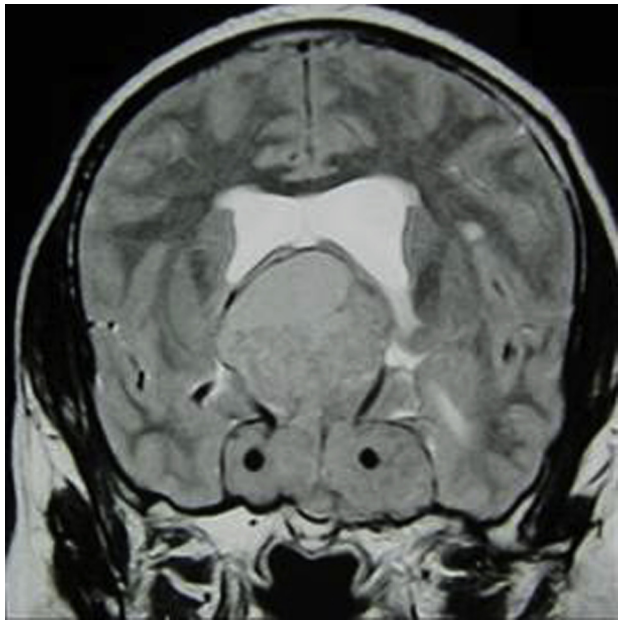

Figure 2. Coronal image of the magnetic resonance imaging showing grade II tumor. Both cavernous sinuses are invaded by the tumor.

Some giant pituitary tumors can be relatively straightforward to resect surgically because of the soft and necrotic/cystic nature of the tumor despite the frequently observed high vascularity. The confinement of the tumor under firm dural boundaries assists in the tumor resection. The tumors shown by the authors seem to be necrotic and/or cystic in nature, both of these features make tumor resection easier (5). On the other hand, solid tumors can be more difficult to resect. Such features and high vascularity can make resection difficult. Often the tumors are relatively firm, but they can be shredded and resected. Firm, fibrous, or elastic tumors are rare.

Although an endoscope has been used by the authors, our personal observation is that microscopic transsphenoidal surgery can be safe, quick, and effective in cases with any kind of pituitary tumors. We use a conventional transsphenoidal operation using microscope and regular speculums and curettes. More often, even in massive tumors, we expose only the anterior wall of the sella and only rarely find the need for adopting an "expanded" exposure that would include the resection of bone of the tuberculum and planum sphenoidale. The soft and necrotic/cystic nature of the tumor makes shredding of tumor and reducing its bulk relatively easier. Giant pituitary tumors are resected using an intracapsular surgical approach. Because of the size and the nature of the tumor, extracapsular tumor resection is not the best option. The tumor needs to be progressively reduced in bulk. Instruments like controlled suction or CUSA (Integra, Plainsboro, New Jersey, USA) can be useful in such a situation. Despite the high vascularity, there is no need for coagulation within the confines of the tumor. The bleeding can be relatively easily controlled using hemostats like gel-foam after the tumor has been radically resected. Valsalva maneuver can assist in pushing the diaphragm sellae in the surgical field along with