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Technical note

Large and giant pituitary adenoma resection by microscopic trans-sphenoidal surgery: Surgical outcomes and complications in 123 consecutive patients

Mohan Karki, Jinzhang Sun, Chandra Prakash Yadav, Bing Zhao *

The Second Affiliated Hospital of Anhui Medical University, China
Department of Neurosurgery, Skull Base Tumor Research Center, Anhui Medical University, Hefei 230601, Anhui, China

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ABSTRACT

To evaluate surgical outcomes and complications of patients who underwent microscopic trans-sphenoidal surgery (MTS) for large and giant pituitary adenomas (PAs). A retrospective study of electively operated cases of PA over a six year period was performed. Surgical outcomes and complications of 64 patients with large PAs (≥3 cm) and 59 patients with giant PAs (>4 cm), who underwent MTS at same period, were reviewed. Medical reports of all selected patients were assessed to collect demographic information such as age, sex, clinical symptoms, PA size, the extent of PA extension and resection, outcomes and complications. Patients with large PAs had improvement in visual improvement (78.1%; 50/64), gross total resection (84.4%; 54/64) compared to patients with giant PAs who had improvement in visual (71.2%; 42/59) and gross total resection (74.6%; 44/59). The rate of CSF leakage was 7.8% and 23.7% for large and giant PAs ($p = 0.0399$). After a mean follow-up period of 40.8 (6–75) months, 10 (15.6%) patients with large PAs experienced tumor recurrence, while 2 giant PA patients (3.4%) experienced tumor recurrence after a mean follow-up period of 40.6 (3–70) months ($p = 0.0314$). Resection of both large and giant pituitary adenomas by microscopic trans-sphenoidal surgery may be safe and effective surgical technique with low morbidity and mortality.

1. Introduction

Pituitary adenomas (PAs) constitute approximately 10–15% of all intracranial tumors [1]. PAs are histologically benign and slow growing tumors [2], large and giant size PAs have most potential to compress surrounding structures such as optic nerves, optic chiasma, carotid arteries, some cranial nerves and the pituitary gland, and these may present functional defects such as visual disturbance, headache, and endocrine dysfunction [3]. Even if there are no any established criteria to categorize large PAs, some recent case series have made attempts to categorize them based on whether PA maximum diameter is ≥3 cm (large PA) [4], or >4 cm (giant PA) [5].

Surgery is one of a number of available treatment options, along with close observation, medical therapy and radiotherapy, and it is usually recommended when medical therapy fails to manage symptoms, or if there is confirmation of local mass effects [6]. In view of these difficulties associated with surgical removal, treatment of large and giant PAs continues to be a challenge, since most large PAs have extra-sellar extension and gross invasion of cavernous sinus, all of which increases risk of injury to neurovascular structures [7]. It is largely perceived that surgical outcome and complications associated with MTS for large and giant PAs, may be poor, this perception has not received much research attention. On the basis of these inconsistencies, the present study retrospectively evaluated the appropriateness of MTS for large and giant PAs, with specific focus on surgical outcome and complications.

2. Methods and materials

A retrospective assessment was conducted on the medical report/records of patients who had their large PAs (3–4 cm) and giant PAs (>4cm) removed by MTS resection. In all 64 patients met the criteria for large PAs while 59 patients met inclusion criteria for giant PAs. The selected cases were patients who were admitted to the Second Affiliated Hospital of Anhui Medical University from January 2010 to 2015 December. All patients underwent

* Corresponding author at: Department of Neurosurgery, The Second Affiliated Hospital of Anhui Medical University, Skull Base Tumor Research Center, Anhui Medical University, 678 Fu Road, Hefei, Anhui Province 230601, China.
E-mail address: zhaopumcmd@yeah.net (B. Zhao).

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pre-operative and post-operative visual acuity and visual field testing by an ophthalmologist. Visual improvement was stated, if improvement of visual acuity and visual field or both and worsening of either were defined as visual worse at follow-up period. Presence of low secretion of pituitary hormone or excess secretion from functional adenoma was defined as an endocrinopathy. Pre-operative and post-operative magnetic resonance imaging (MRI) characteristics were assessed. All patients underwent routine post-operative MRI at 1–3 days and 3 months and/follow up period to evaluate extent of tumor resection: gross total resection (GTR), without any evidence of residual adenoma; subtotal resection (STR), residual adenoma <20%; partial resection (PR), residual adenoma <50%. The pre-operative and post-operative characteristics of patients with large and giant PAs were compared. All patients underwent microscopic trans-sphenoidal surgery as previously described [8]. We did not employed Neuro-navigation surgical technique for all cases. All patients received an intra-operative and post-operative hydrocortisone, except few Cushing's diseases patients were not given any post-operative steroids unless they presented with clinical symptoms of hypocortisolism or serum cortisol values less than 100 micromol/L. Routinely, MRI was performed as a primary method of monitoring during follow-up period (Fig. 1). Based on serial images, re-growth of residual adenoma or discovering new adenoma without evidence of residual tumor was considered as recurrence.

2.1. Statistical methods

All statistical analyses were done with SPSS software (version 17.0; Chicago, IL). P value < 0.05 was considered as statistically significant in all analysis.

3. Results

In all a total of 123 PA cases comprising 64 large PAs and 59 giant PAs (Table 1) were surgically removed by using MTS. The mean age of patients in large group was 49.3 ± 13.4 (range 22–77) years, whereas mean age of patients with giant PA group was 51.2 ± 10.8 (range 29–72) years. In the large PA group, visual improvement was achieved in 50 (78.1%) patients, and in the giant PA group, visual improvement was accomplished in 42 (71.2%) patients (Table 2, Fig. 2). During mean follow-up period (mean ± SD) of 40.8 ± 21 months, ten patients (15.6%) with large PA experienced tumor recurrence, while two patients (3.4%) with giant PAs experienced tumor recurrence at mean follow up period of 40.6 ± 16 months (Tables 1 and 3).

4. Discussion

We herein report that MTS may be as good a surgical technique for large and giant PAs. Importantly, it was found that both surgical

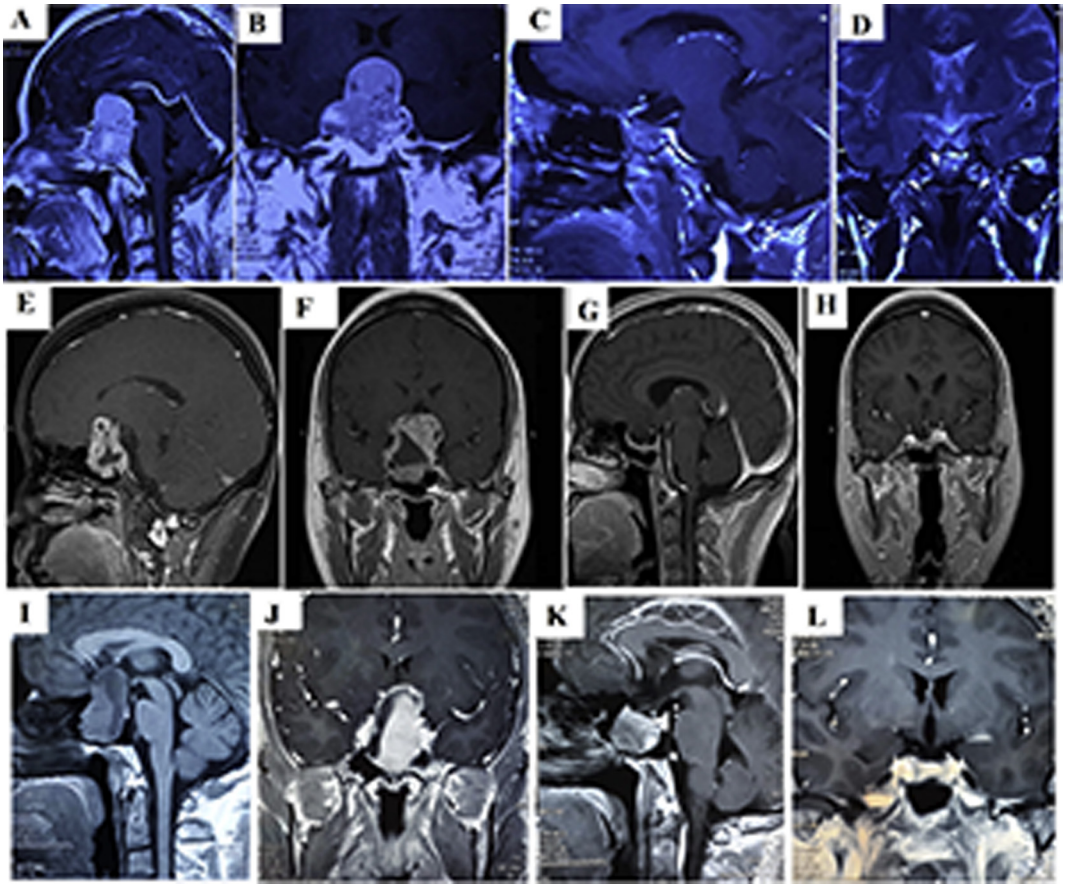

Fig. 1. It demonstrates pre-and post-operative T1 weighted MR Images (contrast with gadolinium) obtained in three patients with large and giant pituitary adenomas accompanying with headache, bitemporal hemianopsia and endocrinopathy. All patients underwent microscopic trans-sphenoidal surgery and improvement in vision and endocrinopathy. A–D (48 year/ female), (A and B): Demonstrates a heterogeneous macro-adenoma with suprasellar extension reaching the floor of third ventricle along with displacement of optic chiasma and cavernous sinus invasion. (C and D, 3 months post adenoma resection): Shows a successful gross total resection of tumor with no recurrence. E–H (30 year/ male), (E and F): Demonstrates a solid and cyst macro-adenoma, with suprasellar extension compressing floor of third ventricle along with optic chiasma and minimal cavernous sinus invasion. (G and H, 32 months after adenoma resection): Reveals a partial residual tumor in cavernous sinus. I–L (54 year/ female), (I and J): Demonstrates a heterogeneous macro-adenoma compression floor of third ventricle and optic chiasm with cavernous sinus invasion. Contrast MRI done (K and L, 3 months post adenoma resection): Reveals optic chiasma free of tumor but majority of tumor is still in cavernous sinus.