OPTIMIZING HOSPITAL CARE IN ENDOSCOPIC ENDONASAL TRASSPHENOIDAL SURGERY

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Abstract
Pituitary gland tumors are usually benign and rarely malignant. Pituitary tumors can be functional or non-functional, depending on whether or not hormones are produced. Depending on the hormone secreted by the tumor, it might induce a variety of symptoms. This study discusses the role of the interprofessional team in evaluating and treating patients with pituitary cancer, as well as the evaluation and management of pituitary cancer in regards of optimizing current standard care in patient underwent endoscopic endonasal transsphenoidal surgery. We presented 44 years old male with main symptoms decrease visual acuity. Laboratory and MR imaging suggested pituitary adenomas. We used multimodal instruments to achieve safe gross total resection also combine the multidisciplinary pre-, intra- and post-operative care to achieve minimal complications and safe surgical outcome. Pertinent literature with brief discussion in the management of pituitary adenoma will be briefly discussed in this case report.

Introduction
Pituitary adenomas are tumors of the anterior pituitary. Most pituitary tumors are slow-growing and benign. They are classified based on size or cell of origin. Pituitary adenoma can be described as microadenoma, macroadenoma, and giant tumors based on size. Microadenoma is a tumor less than 10 mm, while macroadenoma describes a tumor larger than 10mm. Giant pituitary tumors are bigger than 40 mm.[1] Autopsy and radiological data are used to infer the predicted prevalence of pituitary adenomas. There is a significant variety in prevalence amongst studies and information sources. Pituitary adenomas were shown to be common in 16.7% of cases in a meta-analysis, 14.4% in autopsy, and 22.5 percent in radiology tests.[2] The pathogenesis of pituitary adenoma remains unknown. Most of the pituitary adenomas are sporadic. In a study from Iceland with 410 pituitary adenomas, 43% were non-functioning adenomas, 40% prolactin-secreting adenomas, 11 % growth hormone (GH) secreting adenomas, and 6% Adrenocorticotropic hormone (ACTH) secreting adenomas. [3] Pituitary macroadenoma presents with mass effects and potentially hormonal deficiency or hormonal excess. Pituitary apoplexy is a sudden hemorrhage into pituitary adenoma. It is very rare. It presents with symptoms of a mass effect that includes sudden headaches and vision changes along with hormonal deficiency.[4] Physical examination focuses on the main presenting symptoms of sellar lesions, including visual fields and symptoms of hypo- and hyperpituitarism. Laboratory evaluation in all patients includes evaluation of all pituitary axes. MRI is still the gold standard for the diagnosis of sellar and parasellar lesion especially pituitary adenomas. This examination should also be followed by the additional laboratory examination. The evaluation includes the measurement of various hormones such as prolactin, TSH, free T4, follicle-stimulating hormone (FSH), IGF-1, GH, ACTH, estradiol, testosterone, BMP, and fasting early morning cortisol. [5] That is why in regards of the complexity in managing such cases, the current management of pituitary adenomas requires an endocrinologist and a neurosurgeon to work closely together and develop an "individualized patient-centric"

approach. Trans-sphenoidal surgery is the first-line treatment for most of symptomatic caused by massed effect pituitary adenomas. [6] The risk for the complication during surgery might be lessen by the combination of detailed pre-operative radiological assessment [7,8] and the help of supporting instrument which can distinguish normal structures and tumor. Differentiating tumor from normal pituitary gland is very important for achieving complete resection without complications in endoscopic endonasal transsphenoidal surgery (ETSS) for pituitary adenoma. Indocyanine green (ICG) endoscopy identified vital structures by the phasic appearance of fluorescent signals emitted at specific consecutive elapsed times. Elapsed times for internal carotid arteries did not differ according to tumor size. Conversely, as tumor size increased, elapsed times for normal pituitary gland were prolonged but those for the tumor were reduced. ICG endoscopy revealed a clear boundary between tumors and normal pituitary gland and enabled confirmation of no more tumor. [9] Frameless neuronavigation devices provide for midline and 3-D orientation. Additionally micro-doppler usage before dural incision, carotid localization is determined and potential injuries of Internal carotid artery (ICA) can be avoided.[10] Post-operatively close monitoring of water input and hormonal changes should be maintained to avoid major complication during post-operative treatment. Current case reported our experience in optimizing hospital care of patient with pituitary adenoma underwent ETSS.

Case Report

A 44 years old male came to outpatient clinic with chief complaint of decrease of visual acuity with diplopia, accompanied by dropping of the left eyelid since 1,5 months ago. Vital sign was within normal limit. On physical examination, ophthalmologist found visual acuity was 5/6 on both eyes with peripheral visual field was decreased (hemianopsia bitemporal). Laboratory examination revealed Free-T4 1.06; TSHs 0.947; Prolactin 2.74 and cortisol 5.5. Upon MRI, Sellar region was enlarged filled with expanding enhanced mass lesion accompanied with surrounding cystic lesion suggesting macroadenoma.**(Figure 1.)** Patient then underwent endoscopic endonasal transsphenoidal surgery. During surgery, we always checked with neuronavigation to confirm the trajectory of the instrument and to identify the tumor.(**Figure 2.)** After opening the sphenoid sinus and incise the duramater, we identified that the tumor pushed the normal gland upward and the normal structures was hardly seen. To ensure our safety of the operation we maintain to use doppler.(**Figure 3.)** This technique allowed operators to make sure surgical resection was safe and preserve critical structures especially vascular structures from the tumor. Remnant of the tumor and capsule was resected and we close the defect with inlay, onlay and overlay technique. The operation was successfully done. Postoperatively we performed hormonal status. The value of hormonal was Free-T4 17.8; TSHs 0.39; and cortisol 25.4. Early post-operative computed tomography showed no haemorrhage within tumor bed and we planned to perform MRI 1 month after the surgery. During post-operative care we maintain fluid intake 1 Litre to avoid post-operative complication of hyperdiuresis. No complication was noted during 3 days post operative and patient was discharged with good outcome and increased visual acuity.

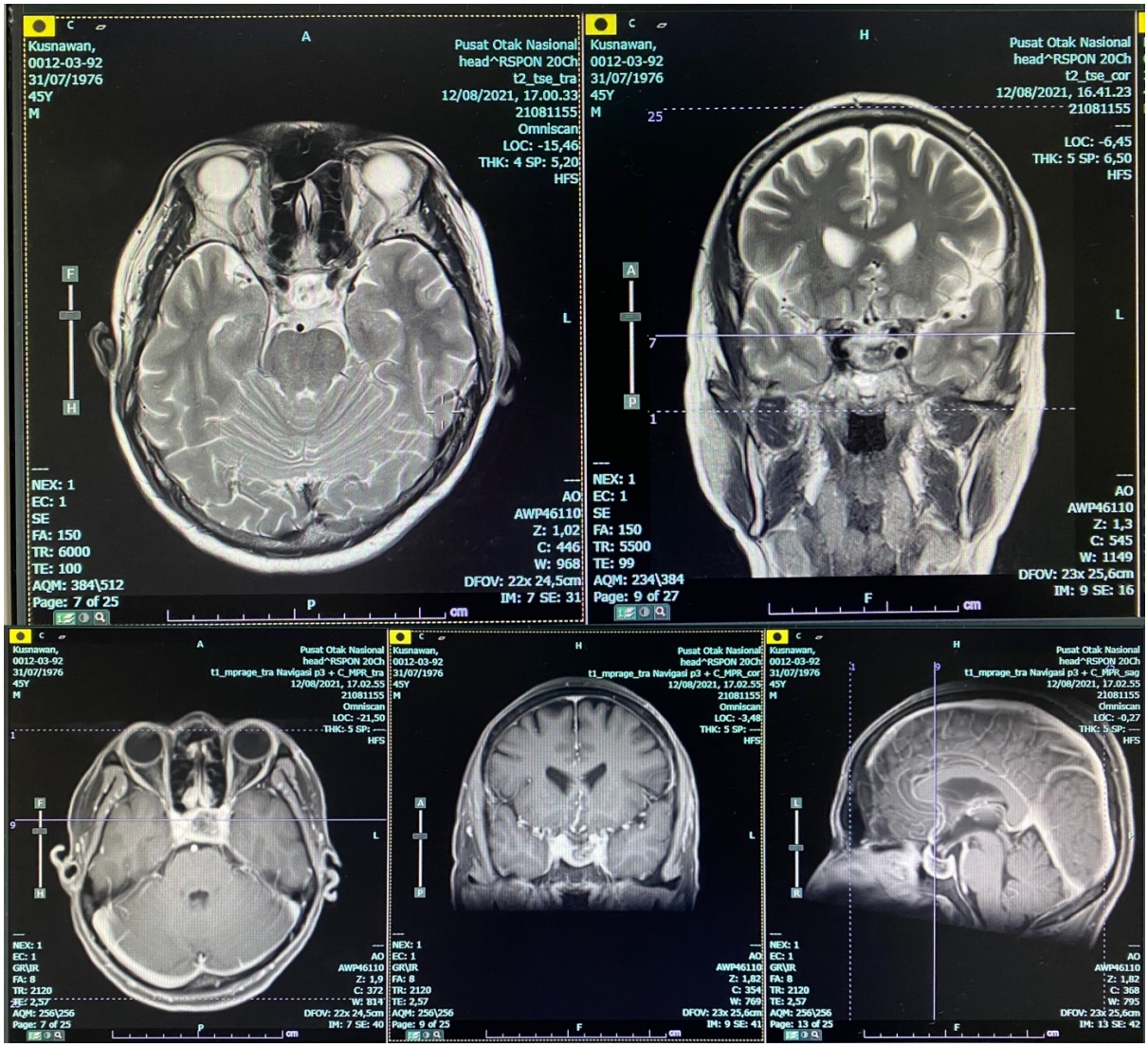

Figure 1. MRI T1 with Gadolinum and T2WI showed intrasellar cystic lesion between left and right internal carotid arteries.

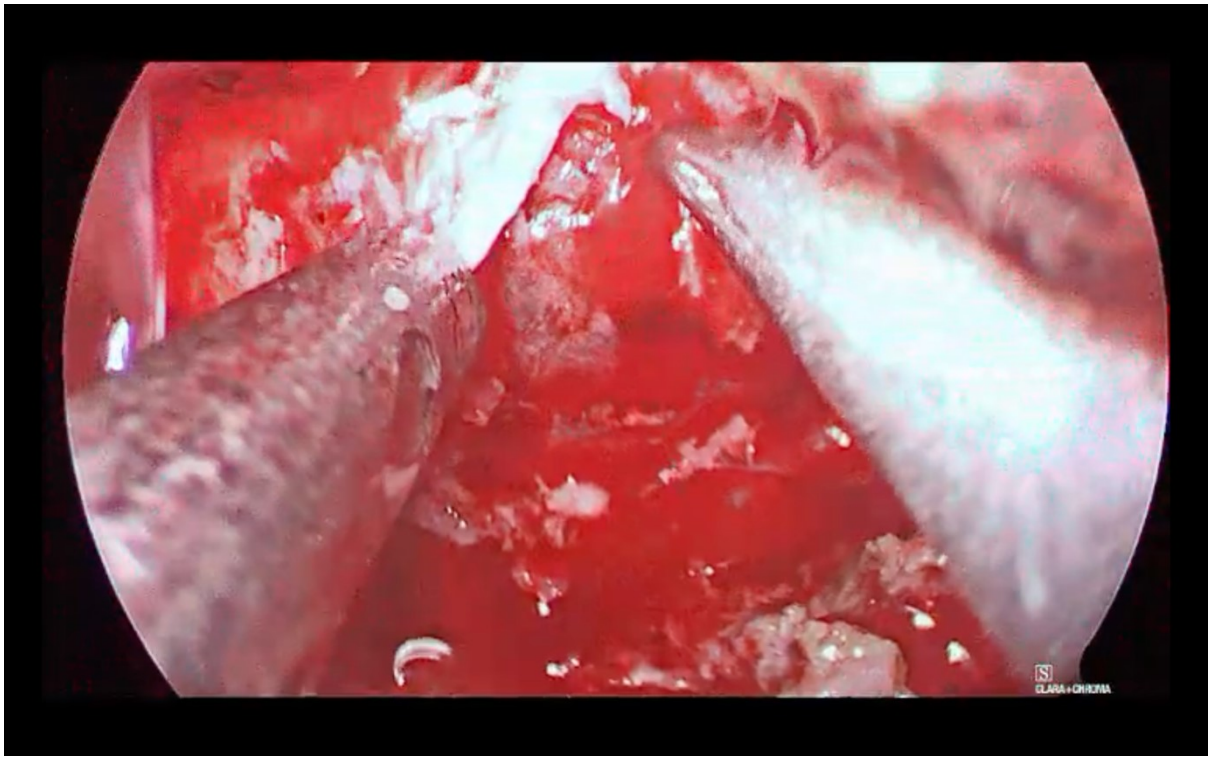

Figure 2. Introduction neuronavigation after incision of the duramater.

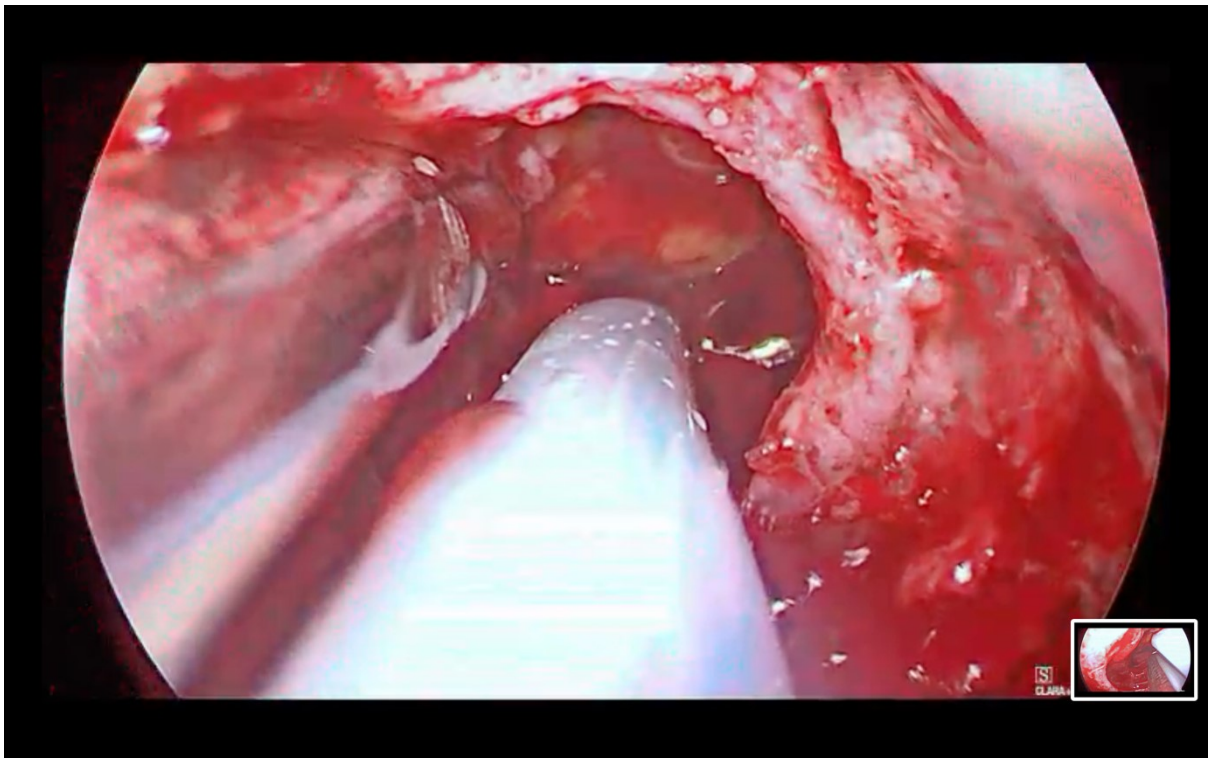

Figure 3. Introduction USG doppler to confirm vascular structures.

Discussion

About one-half of pituitary tumors that present clinically are macroadenomas and these patients should have a careful evaluation for hypopituitarism and assessment for visual field defects if the tumor abuts the optic chiasm. For hormone-secreting adenomas, other causes of elevated hormone levels must be excluded and then specific testing should be done to document

autonomous tumor hormone production.[1] The Pituitary Society established criteria for designating Pituitary Centers of Excellence (PTCOE) in a statement in 2017. They proposed a systematic strategy in which a "leadership team" constituted of an endocrinologist and a neurosurgeon collaborated closely during the patient's initial evaluation. They should be part of a center of excellence with neuroradiology, neuropathology, radiation oncology, and neuro-ophthalmology as support units.[11]

Transsphenoidal surgery and medical treatment are the cornerstones of the management of pituitary adenomas. However, the optimal therapy should be chosen based on the type of tumor, the patient, and the tumor characteristics. For nonfunctional adenomas surgery is still the first-line treatment. However, for prolactinomas surgery has been replaced by medical treatment. In the other functional pituitary adenomas a more balanced approach is needed to decide between surgery and medical therapy as first-line treatment. In the majority of cases a combination of treatment modalities is needed.[12] All patients undergoing transsphenoidal surgery should undergo careful preoperative evaluation with both a neurosurgeon and a neuroendocrinologist.[5] Laboratory testing involves both blood and urine testing. Specific hormonal level testing is usually dictated by correlating symptoms; however, more commonly, a panel of hormone testing is performed when incidental or nonfunctioning tumors are involved. Hormonal testing is performed primarily to rule out hypersecretory tumors. Routinely tested levels are a must and include prolactin, insulin-like growth factor (IGF-1). Early morning cortisol levels are reserved for patients with symptomatic manifestations of Cushing syndrome.Hyposecretory adenomas are tumors that cause hyposecretion of hormones from the pituitary gland and can involve one or more hormones. Hyposecreting tumors require measuring levels of multiple hormones such as thyroid-stimulating hormone (TSH), follicle-stimulating hormone (FSH), luteinizing hormone (LH), free T4, total testosterone (in men) and cortisol. Hypogonadotropic hypogonadism requires an MRI at the time of diagnosis to rule out a pituitary tumor as the cause. Confirmatory testing with stimulatory testing follows the basic laboratory testing, and these tests are specific to the hormone involved.[13] In our current clinical setting we were only study 4 hormonal status, but as this hormonal panel is getting important in the clinical study of the operative result, now we increase our examination based on current standard.

Imaging is an important part of a pituitary tumor's diagnostic process. It detects whether a tumor is microadenoma or macroadenoma, which directs treatment and management. To determine the mass-effect, a computed tomography (CT) scan might be used first. This, however, is insufficient for the investigation of a suspected pituitary tumor. The importance of a magnetic resonance imaging (MRI) of the pituitary gland with and without contrast is critical.[14] One study demonstrate the feasibility of tracing the HHT in pituitary adenomas and concluded that it will helpful to identify the location of pituitary stalk preoperatively.[7]

In the present case, we used ultrasound and navigation in order to obtain real-time anatomical information of a pituitary tumor and surrounding tissues during nasal endoscopic transsphenoidal surgery. The use of ultrasound during nasal endoscopic transsphenoidal surgery was useful for avoiding injury to the carotid and other arteries and for determining the extent of tumor extension. Doppler ultrasound imaging was especially useful for the visualization of arteries. [10] Intraoperative multimode navigation also appears to be safe and effective in endoscopic transsphenoidal surgery. It is yielded more GTRs and lower residual tumor volume. [15]

Patients who have undergone transsphenoidal surgery, regardless of their underlying sellar disease, are at risk of various problems in the immediate postoperative term. Hyponatremia, hypopituitarism, and CSF leak are only a few of them. Hyponatremia rates have been found to range from 3.6 percent to 19.8 percent in the literature. [16] Patients should undergo assessments of serum sodium and urine-specific gravity every 6 hours and serum cortisol daily

while in the hospital. Cortisol is best assessed in the fasting state in the early morning, as this is the typical physiological peak. Admission to the ICU typically only occurs for patients with large lesions with suprasellar extension or patient with 1) need for close postoperative monitoring of vision, 2) evidence of a particularly hemorrhagic lesion at risk for post- operative hematoma, and 3) patients with severe medical comorbidities. Fluid restriction helps to limit the occurrence of hyponatremia in this setting, and careful steroid repletion, as above, precludes development of complications of adrenal insufficiency. uring the 1st week post- operatively, all patients are instructed to limit daily water intake to 1 L, and all patients are discharged with a standard 1-L hospital water pitcher.[5] Long-term follow-up in these patients is imperative to assess for recurrence of the initially resected lesion. We performed MRI in 3 months and 1 year follow up to assess the remission rate of the disease.

The prognosis of pituitary adenomas depends on its being functioning or non-functioning. The non-functioning adenomas and prolactinomas have an excellent prognosis if treated promptly with surgery and/or medical therapy. Functioning adenomas like Cushing's disease and acromegaly are associated with several other co-morbidities and complications. There is increased mortality especially in patients with Cushing's disease with delays in medical or surgical treatment.

Conclusion

Patients with pituitary tumors should be treated by centers of excellence, which include competent neurosurgeons who perform pituitary surgery by transsphenoidal and other techniques, as well as experienced neuroendocrinologists who specialize in these tumors. A center like this would be the best organization for patients, the most cost-effective for health managers, and a better framework for deriving and presenting results, as well as advancement of pituitary science. All patients should get sophisticated, multidisciplinary postoperative care to monitor for common adverse events and enhance outcomes. To confirm current study, large sample studies along with standardized guidelines is warranted in the near future.

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