Intensivist’s View on the Transsphenoidal Approach for Tumors of the Sella Turcica at Hospital das Clinicas de São Paulo

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ABSTRACT

Introduction: Expansive lesions in the pituitary region can produce neurological and endocrinological repercussions, imposing the need for multidisciplinary medical support and clinical and neurosurgical treatment. The transsphenoidal surgical approach, both microscopic and endoscopic, is the most used. **Objective:** To show the series of a large Brazilian reference center for transsphenoidal surgeries. **Methods:** Retrospective study by analyzing medical records. **Results:** Between January and December 2020, 54 transsphenoidal endonasal surgeries were performed using microscopic or endoscopic techniques, with all patients remaining in the initial postoperative period in the intensive care unit (ICU). During the period in ICUs, the patients’ evolutionary aspects were analyzed. **Conclusion:** It was found a higher rate of intraoperative cerebrospinal fluid leaks in patients undergoing endoscopic surgery, a condition related to the larger dimension, parasellar extension and complexity of the lesions submitted to the endoscopic procedure. **Keywords:** Pituitary tumors; Transsphenoidal surgery; Endoscopic surgery; Adenomas

RESUMO

Introdução: Lesões expansivas na região hipofisária podem produzir repercussões neurológicas e endocrinológicas, impondo a necessidade de suporte médico multidisciplinar e tratamento clínico e neurocirúrgico. A abordagem cirúrgica transesfenoidal, tanto microscópica...
INTRODUCTION

Pituitary tumors represent about 10% of intracranial tumors, being classified based on their hormonal activity in non-secretory and secretory. Among the secretors are those that produce prolactin (PRL), thyroid-stimulating hormone (TSH), adrenocorticotropic hormone and growth hormone (GH)\(^1,2\). The clinical picture is dependent on the production or hormone deficiency generated by them, besides being related to neurovascular compression effects caused by tumor growth\(^3\).

In addition to adenomas, other lesions can affect the pituitary region, such as craniopharyngiomas, chordomas, meningiomas, inflammatory and infectious diseases and metastatic neoplasms.

Surgical treatment, in general, is imposed in cases with an expansive effect and neurological impairment, as well as in cases of GH, FSH and GH-secreting tumors and in those that secrete PRL that are resistant to drug treatment\(^1,4\).

The surgical treatment of pituitary tumors has been evolving continuously, with improvement of operative strategies and techniques. In 1907, Herman Schloffer performed the first transsphenoidal bypass surgery. Soon after, still in the beginning of the 20th century, Harvey Cushing, introduced the sublabial incision for the surgical treatment of pituitary tumors\(^5\). In 1960, with the introduction of the surgical microscope by Jules Hardy, new surgical techniques were developed, refined and standardized\(^5-7\).

In the 1970s, transsphenoidal surgery using the surgical microscope replaced transcranial surgery as the preferred treatment for sellar lesions, as this approach allowed excision of more tissue with less chance of serious complications. Around 1992, Jankowski performed the first completely endoscopic transsphenoidal approach for pituitary tumors, which was later developed in Singapore by Sethi and Pillay and, in Pittsburgh, by Jho and Carrau\(^2,4\).

Both the microscope and the endoscope are suitable for performing the surgical procedure, allowing the visual differentiation of normal and pathological tissues\(^8\). However, in the last 20 years, there has been a great advance in the endoscopic technique, with technological improvement and expansion of anatomical knowledge, which allowed broader and more extensive approaches to lesions in the pituitary region\(^9\).

Transsphenoidal surgery is a safe surgical procedure, with a mortality variation between 0.4% and 2.0%, being associated with the surgeon’s experience. Generally, such procedure involves low rates of complications, which, however, can be fatal. Its main complications include the presence of cerebrospinal fluid (CSF) fistulas, vascular lesions, syndrome of inappropriate antidiuretic hormone secretion (SIADH), diabetes insipidus, meningitis, visual and endonasal complications (anosmia, epistaxis, nasal obstruction, infection), hypopituitarism, venous thrombosis, and pulmonary thromboembolism, pneumonia and even septicemia\(^7\).

In this review were analyzed surgeries for resection of pituitary tumors performed using endoscopic and microscopic techniques at a reference center in São Paulo and their complication rate.

METHOD

Data collection at the HC-FMUSP on the transsphenoidal approach to pituitary tumors using microscopic and endoscopic techniques, in addition to multidisciplinary follow-up with the...
Neuroendocrinology, Otorhinolaryngology, Neurosurgery and Intensive Care teams.

RESULTS

Between January and December 2020, 54 surgeries for resection of lesions in the pituitary region were performed in the neurosurgery service of Hospital das Clínicas de São Paulo. In this work we evaluated the use of two different techniques, endoscopic and microscopic transsphenoidal approaches, in the approach of different lesions and the occurrence or not of intraoperative CSF fistula.

Of the 54 surgeries, 26 were performed by microscope and 28 by endoscope, with 31 female patients (15 approached by microscope and 16 by endoscopy) and 23 male (11 approached by microscope and 12 by endoscopy). The mean age of those involved was 44 years (minimum 18 and maximum 78 years) (Figure 1).

Among all, 26 patients underwent resection of adenomas, of which 13 were endoscopically and 13 were microscopically, the presence of intraoperative fistula was observed in 2 patients who had a microscopic approach and in 4 who had an endoscopic approach. Another 5 patients were operated for resection of craniopharyngiomas, 1 microscopically and 4 endoscopically. The patient submitted to the microscopic approach did not present fistula, while 3 of the patients who were approached endoscopically presented fistula, an expected and predicted fact, since in these cases endoscopic surgeries are performed through the so-called extended access, when there is a wide opening of the dura-mater in the sphenoid plane region for access to the tumor (Figure 2).

Likewise, 9 patients underwent surgery on GH-producing tumors, 8 microscopically and 1 endoscopically, none of the patients had a fistula. Another 9 patients operated on ACTH-producing tumors, 3 of which were microscopically and 6 were endoscopically, and in each group there was only 1 patient with the presence of a fistula. Another 3 patients underwent surgery due to the presence of prolactinomas and of these all were approached endoscopically, with 2 patients presenting intraoperative fistula. There was only one patient with a cyst, operated microscopically, who didn't present fistula, as well as one patient with an ACTH-producing tumor and one with GH-producing tumor, both operated endoscopically.

Complications were observed in six cases (11.1%) addressed in this study, among them, pulmonary focus sepsis (2), urinary focus sepsis (1), ischemic stroke (1) and lowered level of consciousness due to hypernatremia (2). Of all these patients, only one required readmission in less than 24 hours. In addition, 2 were hospitalized again for external ventricular shunting (1 case) and ventriculoperitoneal shunting (1 case).

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Figure 1. Adenoma resection surgeries by technique and gender.
Endoscopic procedures had an incidence of intraoperative CSF fistula in 13% of cases, while in microscopic surgeries the incidence was 5.5%.

As antibiotic prophylaxis, a second-generation cephalosporin was used for 24 hours in all microscopic procedures. However, in the extended transsphenoidal accesses, those in which the dural opening and consequent CSF fistula was required for adequate tumor excision, this antibiotic coverage was extended up to five days, according to a protocol established in conjunction with the Infectiology, Neurosurgery and Intensive therapy teams. In addition, nasal tampons were used and a Foley tube was placed inside the sphenoid sinus in those cases in which nasoseptal flaps were used to close the cerebrospinal fluid fistula. The tube was removed by the otorhinolaryngology team on the fourth postoperative day.

The postoperative routine was performed in the intensive care unit, with strict control of electrolytes, especially serum sodium, assessment of the neurological status, notably the level of consciousness, vision and hourly pupillary pattern. The presence of fever and increase in C-reactive protein (CRP) values had made us to expand infectious surveillance with collection of blood cultures and urine cultures, while in stable patients it was routine to prioritize the removal of invasive devices within the first 24 hours after surgery.

In the immediate postoperative period, all adenomas, except those producing ACTH, received 60 mg of oral cortisone on the first day, 40 mg on the second and 30 mg on the third day, a dose that was maintained until hospital discharge. Intraoperatively, if the serum cortisol was between 9 and 13 µg/dL, intravenous hydrocortisone was administered and 50 mg was maintained every 8 hours in the immediate postoperative period.

In patients undergoing surgical procedure for Cushing’s disease, there was no need for intraoperative intravenous glucocorticoid, but for oral cortisone replacement from the first day, following the same criteria as for other adenomas.

It should be noted that the use of intravenous hydrocortisone at a dose of 200mg is necessary in all patients with symptomatic arterial hypotension.

Our mortality was 1.85%, and this patient was diagnosed with Covid-19 during hospitalization and mortality was a consequence of complications secondary to the virus.
Postoperative diabetes insipidus was identified in 37% of the cases, generally starting on the second day of the postoperative period and persisting, in some cases, until the fifth day. The diabetes insipidus treatment routine was to encourage water intake in those patients with clinical and neurological conditions and in those without conditions of cooperation and with losses greater than 600 ml of urine in 2 hours, volume replacement was necessary, in addition to exogenous application of desmopressin (DDAVP), if serum sodium values were above 140 mEq/L.

In our series, postoperative diabetes insipidus was observed in 45% of cases involving non-secretory macroadenomas, 15% of craniopharyngiomas, 15% of prolactinomas, 20% of ACTH-producing tumors and 5% distributed among the other presentations.

In those patients submitted to extended access and intraoperative cerebrospinal fluid fistula, the decision to maintain antibiotics for five days and strict control of CRP, in addition to commonly measured parameters, such as leukometry, clinical and neurological signs and fever, allowed for the anticipation of the diagnosis of postoperative meningitis in our series, which resulted in great therapeutic efficacy.

In patients with progression to postoperative diabetes insipidus, DDAVP was prescribed only when serum sodium values were greater than 140 mEq/L, associated with a diuresis of at least 600 ml in 2 hours, a procedure that avoids dehydration imposed by diabetes insipidus, as well as precipitous administration of DDAVP, which can result in iatrogenic hyponatremia.

## DISCUSSION

Pituitary tumors are classified according to their hormonal activity into secretory and non-secretory, with secretory tumors being responsible for 75% of cases and, among them, prolactinomas are the most frequent. The clinical picture varies according to its hormonal characteristics and the treatment involves the use of medication and surgery, the second being defined as the gold standard for most cases.

Surgical treatment has been improving since the beginning of the 20th century, with transsphenoidal endonasal surgery being highlighted today, mainly with the use of the endoscopic technique, in addition to the use of other auxiliary methods such as neuronavigation, intraoperative vascular Doppler and intraoperative magnetic resonance imaging.

Pituitary tumors represented 22.5% of our sample of patients during 2020 at Hospital das Clínicas de São Paulo. The choice of the endoscopic or microscopic approach was decided by the multidisciplinary team of neurosurgeons, neuroendocrinologists, and otorhinolaryngologists, taking into account characteristics such as etiology, tumor size and location. In this way, more complex cases involving tumors with larger dimensions, suprasellar, parasellar and clival extension and reoperations were preferably approached endoscopically, justifying the higher occurrence of intraoperative CSF fistula.

In patients with progression to postoperative diabetes insipidus, DDAVP was prescribed only when serum sodium values were greater than 140 mEq/L, associated with a diuresis of at least 600 ml in 2 hours, a procedure that avoids dehydration imposed by diabetes insipidus, as well as precipitous administration of DDAVP, which can result in iatrogenic hyponatremia.

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