

# Effect of Surgical Treatment on Endocrine Functional Hormone Indexes in Female Patients with Endocrine Disorders Caused by Sellar Region Tumors

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**Abstract:** *Objective:* To explore, evaluate and analyze the effects of surgical treatment on endocrine functional hormone indexes in female patients with endocrine disorders caused by sellar region tumors. *Methods:* 600 female patients with endocrine disorders caused by sellar region tumors who were admitted to the Department of Neurosurgery of Yunan Shuifu People's Hospital and Beijing University of Chinese Medicine Third Affiliated Hospital from March 2018 to March 2023 were selected as the research subjects. The patients were divided into two groups, each consisting of 300 cases: the microscopic group received treatment via the microscopic transsphenoidal approach, while the endoscopic group underwent treatment through the neuroendoscopic transsphenoidal approach. The efficacy of both treatments and surgery-related indicators of the patients of both groups were compared. Besides, the endocrine functional hormone indicators, including estradiol (E<sub>2</sub>) and follicle-stimulating hormone (FSH) levels, were compared between the two groups before operation and 1 week after operation. *Results:* The efficacy of the treatment received by the endoscopic group was higher than that of the microscopic group, but the difference was not statistically significant ( $P > 0.05$ ). The duration of operation and postoperative hospital stay of the endoscopic group were shorter than those of the microscopic group, and the intraoperative blood loss was less than that of the microscopic group, the differences were statistically significant ( $P < 0.05$ ). The postoperative E<sub>2</sub> and FSH levels of the two groups were higher than those before operation, and the E<sub>2</sub> and FSH levels of the endoscopic group after treatment were higher than those of the microscopic group, and the difference was statistically significant ( $P < 0.05$ ). *Conclusion:* The neuroendoscopic transsphenoidal approach for treating female patients with endocrine disorders caused by sellar region tumors proves to be more effective than the microscopic transsphenoidal approach. It enhances the levels of endocrine functional hormones and alleviates clinical symptoms, making it a promising approach worthy of wider adoption.

**Keywords:** Sellar region tumors; Endocrine disorders; Endocrine function hormones; Neuroendoscopy

**Online publication:** September 27, 2023

## 1. Introduction

The sellar region refers to the sella and its surrounding areas in the central part of the middle cranial fossa, bounded anteriorly by the lateral edge of the anterior clinoid process and the front edge of the anterior cruciate groove, posteriorly by the posterior clinoid process and the dorsum sellae, and on both sides by the carotid artery groove, the main structure and adjacent to the sella, sphenoid sinus, pituitary gland, cavernous sinus, perisellar blood vessels and nerves, etc <sup>[1-3]</sup>. The endocrine dysfunction in patients with sellar region tumors varies according to the gender of the patients. Female patients often experience prolonged menstruation or amenorrhea, while male patients often experience impotence and loss of libido due to hypogonadism <sup>[4]</sup>. Because the growth of sellar region tumors compresses the optic nerve and causes abnormal secretion of hormones, leading to endocrine disorders, female patients may experience amenorrhea or lactation <sup>[5-7]</sup>. Neurosurgery is a common treatment method for patients with tumors located in the sellar region. With the development of skull base endoscopic technology, endoscopic transsphenoidal surgery have gradually replaced microscopic transsphenoidal surgery. Close-up observation, comprehensive angle-around viewing, and excellent lighting provided by endoscopic surgery have contributed to an increasing rate of total resection for pituitary tumors while simultaneously reducing the recurrence rate <sup>[8]</sup>. In this study, 600 female patients with endocrine disorders caused by sellar region tumors admitted to our hospital from March 2018 to March 2023 were selected as the research subjects, and surgical treatment was performed to explore its effect on the improvement of endocrine function hormone indicators.

## 2. Materials and methods

### 2.1. General information

From March 2018 to March 2023, 600 female patients with endocrine disorders caused by sellar region tumors who were admitted to the Yunan Shuifu People's Hospital and Beijing University of Chinese Medicine Third Affiliated Hospital were selected as the research objects, according to different treatment methods. Divided into microscopic group and endoscopic group with 300 cases each. All were female patients. The average age of the microscopic group was  $50.28 \pm 6.92$  years, and the average disease duration was  $2.05 \pm 0.42$  years; the average age of the endoscopy group was  $49.96 \pm 7.02$  years, and the average disease duration was  $2.12 \pm 0.39$  years. The basic data of the two groups were comparable ( $P > 0.05$ ).

### 2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) patients who have confirmed imaging and pathological findings consistent with symptoms of endocrine disorders caused by sellar region tumors, (2) patients who have not undergone any prior brain-related surgeries, (3) patients and families who have signed an informed consent.

Exclusion criteria: (1) Patients with additional intracranial tumors, (2) patients with coagulation disorders, (3) patients with severe conditions affecting other organs, (4) patients with low compliance.

### 2.3. Methods

General anesthesia was performed followed by conventional endotracheal intubation. The patients were placed in a supine position with the head tilted back  $15^\circ$  and turned  $20^\circ$  to the operator's side. The patients' eyelids were closed and protected with an eye mask. The patients' face was disinfected using 5% iodophor, and the nasal cavity was disinfected using 0.05% iodophor gauze.

Patients in the microscopic group were treated with a microscopic transsphenoidal approach, while the patients in the endoscopic group were treated with a neuroendoscopic transsphenoidal approach.

The neuroendoscope was introduced through the right nostril, revealing a Y-shaped gap between the middle

and inferior turbinates and the nasal septum. The middle turbinate and the nasal septum served as the surgical pathways for expanding access to the nasal cavity-sphenoid sinus. In preparation for skull base reconstruction, a vascular-pediced nasal septal mucosal flap was created. The tumor was completely resected, the internal carotid artery was kept intact, and the damaged wall of the cavernous sinus was repaired. During the exploration, it was found that the pituitary tissue was intact, the diaphragma sellae was intact, and there was no cerebrospinal fluid leakage. Following thorough hemostasis, the skull base was reconstructed according to the anatomical level of the human body. This involved laying artificial dura mater, applying the mucosal flap, and providing support with a protein sponge, resulting in the successful completion of the surgical treatment.

## 2.4. Observation indicators

The efficacy and surgery-related indicators were compared between the two groups, and the endocrine functional hormone indicators before operation and 1 week after operation were compared between the two groups, including the levels of estradiol (E<sub>2</sub>) and follicle-stimulating hormone (FSH).

## 2.5. Statistical analysis

The data collected for this study were input into Excel 2007, and SPSS 28.0 was employed for data analysis. Surgical-related indicators and endocrine functional hormone indicators were presented as (mean ± standard deviation), and the *t*-test was applied. Treatment effects were represented as *n* (%), with the  $\chi^2$  test used for analysis. A significance level of  $P < 0.05$  was considered statistically significant.

## 3. Results

### 3.1. Efficacy of surgery

The endoscopic group exhibited higher efficacy than the microscopic group. Specifically, within the endoscopic group, 258 cases (86.0%) achieved complete resection, 39 cases (13.0%) underwent subtotal resection, and 3 cases (1.0%) experienced partial resection. However, when compared to the microscopic group, the difference was not statistically significant ( $P > 0.05$ ), as detailed in **Table 1**.

**Table 1.** Comparison of treatment effects between the two groups (*n* [%])

Group	Number of cases	Total resection	Sub-total resection	Partial resection
Endoscopic group	300	258 (86.0)	39 (13.0)	3 (1.0)
Microscopic group	300	235 (78.33)	54 (18.0)	11 (3.67)
$\chi^2$		2.593	1.458	2.862
<i>P</i>		0.372	0.594	0.315

### 3.2. Comparison of surgical indicators between the two groups

In the endoscopic group, the operation duration was shorter at  $81.53 \pm 10.94$  minutes, the postoperative hospital stay was  $7.02 \pm 1.34$  d, and intraoperative blood loss was reduced to  $45.73 \pm 5.28$  mL compared to the microscopic group. These differences were statistically significant ( $P < 0.05$ ), as indicated in **Table 2**.

**Table 2.** Comparison of surgical indicators between the two groups (mean  $\pm$  standard deviation)

Group	Number of cases	Duration of surgery/min	Postoperative hospital stay/d	Intraoperative blood loss/mL
Endoscopic group	300	81.53 $\pm$ 10.94	7.02 $\pm$ 1.34	45.73 $\pm$ 5.28
Microscopic group	300	135.27 $\pm$ 12.86	8.65 $\pm$ 2.16	64.91 $\pm$ 7.82
<i>t</i>		14.376	8.204	9.115
<i>P</i>		0.000	0.003	0.001

### 3.3. Endocrine functional hormone indicators

Before the operation, there were no significant differences in the levels of E<sub>2</sub> and FSH between the two groups ( $P > 0.05$ ). However, post-operation, both groups exhibited higher levels of E<sub>2</sub> and FSH compared to pre-operation levels. Notably, in the endoscopic group, the levels of E<sub>2</sub> and FSH after treatment were significantly higher than those in the microscopic group, and this difference was statistically significant ( $P < 0.05$ ), as indicated in **Table 3**.

**Table 3.** Comparison of endocrine function hormone indexes between the two groups of patients (mean  $\pm$  standard deviation)

Group	Number of cases	E <sub>2</sub> (pmol/L)		FSH (IU/L)	
		Preoperative	Postoperative	Preoperative	Postoperative
Endoscopy group	300	207.58 $\pm$ 54.21	252.35 $\pm$ 53.19	7.11 $\pm$ 2.08	10.56 $\pm$ 6.25
Microscopic group	300	208.17 $\pm$ 55.62	216.57 $\pm$ 52.82	7.12 $\pm$ 2.21	8.64 $\pm$ 4.97
<i>t</i>		1.586	10.224	2.073	8.016
<i>P</i>		0.502	0.000	0.457	0.005

## 4. Discussion

There are many types of sellar tumors, among which the more common ones are craniopharyngioma, meningioma of tuberculum sellae, pituitary tumor, and Rathke cleft cyst. They also have different characteristics and clinical symptoms according to their respective growth locations<sup>[9,10]</sup>. In general, most sellar region tumors will cause vision loss, dizziness, headache and endocrine abnormalities in patients. Patients with pituitary tumors, craniopharyngiomas, Rathke cleft cysts, and tuberculum sellae meningiomas have all showed signs of endocrine changes<sup>[11]</sup>. Pituitary tumors, which originate from pituitary tissue, often lead to significant changes in various hormone levels<sup>[12,13]</sup>. In the case of craniopharyngioma, the endocrine symptoms tend to be more pronounced because craniopharyngioma may compress the anterior pituitary gland, thereby reducing the secretion of gonadotropin and growth hormone. This reduction can result in growth retardation, slow bone growth, or even complete cessation in affected patients, leading to shorter stature. On the other hand, patients with Rathke cleft cysts exhibit a broader range of endocrine abnormalities<sup>[14]</sup>. These tumors can be treated by microscopic or endoscopic transsphenoidal surgery. Regardless of the surgical method, a detailed understanding of the ventral skull base is required. The purpose of the surgery is to fully expose the sellar floor, completely remove the tumor, and prevent tumor recurrence<sup>[15]</sup>. Furthermore, it is essential during the operation to prioritize the preservation of the sella diaphragm's integrity. In the event of a sellar diaphragm rupture leading to cerebrospinal fluid leakage, it becomes imperative to execute thorough skull base reconstruction. This is done to prevent postoperative complications such as cerebrospinal fluid rhinorrhea and intracranial infection.



The neuroendoscope, with its elongated and slender design, is ideal for surgeries involving narrow and elongated cavities or channels. It enables the examination of lesions through natural cavities like the nasal passage or small incisions. This instrument enables minimally invasive surgery, facilitating precise lesion localization, optimal surgical approach planning, and a significant reduction in surgical trauma<sup>[16-18]</sup>. In female patients with endocrine disorders resulting from sellar region tumors, neuroendoscopic surgery can streamline the procedure and reduce the duration of surgery when compared to microscopic surgery. This is proven by the results of this study, which showed that the duration of surgery ( $81.53 \pm 10.94$  min) and postoperative hospital stay ( $7.02 \pm 1.34$  d) of the endoscopic group were shorter than those in the microscopic group. FSH is a glycoprotein hormone secreted by the pituitary gland. Its main function is to promote the development and maturation of ovarian follicles. E<sub>2</sub> is secreted by ovarian follicles to promote the transition of endometrium into a proliferative phase. It plays an important role in promoting the development of female secondary sexual characteristics<sup>[19,20]</sup>. In this study, surgical treatment was performed on female patients with endocrine disorders caused by tumors in the sellar region. The results revealed that postoperative E<sub>2</sub> and FSH levels in both the microscopy group and endoscopic group were higher compared to their respective preoperative levels. However, the levels of E<sub>2</sub> and FSH in the endoscopic group were higher than those in the microscopic group. Therefore, endoscopic transsphenoidal approach in the treatment of female patients with endocrine disorders caused by sellar region tumors is more effective than the microscopic transsphenoidal approach, and it can improve the level of endocrine functional hormones and improve clinical symptoms.

## Disclosure statement

The author declares no conflict of interest.

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