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Endoscopic transnasal resection of tuberculum sellae meningioma – case report

Endoskopowa przeznosowa resekcja oponiaka guzka siodła tureckiego – opis przypadku

Wkład autorów:
A – projekt badań
B – wykonanie badań
C – analiza statystyczna
D – interpretacja danych
E – przygotowanie manuskryptu
F – przegląd piśmiennictwa

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ABSTRACT:

Introduction: Tuberculum sellae meningiomas (TSM) represent 5–10% of all intracranial meningiomas. Tumours are located on tuberculum sellae or chiasmatic sulcus of the sphenoid bone. These suprasellar lesions often displace the optic nerves causing visual impairment that is commonly the presenting symptom. Tuberculum sellae meningiomas are traditionally treated with transcranial surgery. However, the popularity of endoscopic transnasal surgery as an alternative method to remove tumours of anterior skull base is increasing.

Methods: The present paper describes the case of a patient with tuberculum sellae meningioma.

Results: A 63-year-old woman was diagnosed due to a headache, facial sensation disruptions on the right side and peripheral vision loss. Ophthalmological examination indicated bitemporal vision loss up to 10–15%. Using MRI, the tumour of dimensions: 8.1 x 8.0 mm was located in tuberculum sellae. The endoscopic transsphenoidal surgery was performed, confirming diagnosis of meningioma. In postoperative period the symptoms almost completely disappeared.

Discussion: The treatment of choice for tuberculum sellae meningiomas is a surgery. Neurosurgeons have two methods of removing the tumour: with transcranial approach or via endoscopic transsphenoidal surgery in collaboration with a rhinosurgeon. The decision about the optimal surgical procedure should be made on case-by-case basis. Cerebrospinal fluid leak is still challenging but using nasoseptal flap (Hadad's flap) significantly reduced their prevalence. Recovery is quicker and postoperative results are promising.

KEYWORDS: endoscopic approach, endoscopic endonasal approach, meningioma, transcranial, tuberculum sellae

STRESZCZENIE:

Wstęp: Oponiaki guzka siodła tureckiego stanowią ok. 5–10% wszystkich wewnątrzczaszkowych oponiaków. Zmiany wywodzą się z guzka siodła lub bruzdy skrzyżowania wzrokowego kości klinowej. Guzy nadsiodłowe często przemieszczają skrzyżowanie wzrokowe lub nerwy wzrokowe, powodując zaburzenia widzenia, które są dominującym objawem zgłaszanym przez chorych. Tradycyjnie guzki siodła tureckiego są usuwane przezczaszkowo. Jako alternatywa dla takich dostępów w operacjach usunięcia zmian w zakresie przedniego dołu czaszki rosnącą popularność zyskały przeznosowe operacje endoskopowe.

Materiał i metody: W pracy przedstawiono przypadek pacjentki z oponiakiem guzka siodła tureckiego.

Wyniki: 63-letnia pacjentka diagnozowana z powodu bólu głowy, zaburzeń czucia twarzy po stronie prawej oraz ubytku pola widzenia. W badaniu okulistycznym stwierdzono dwuskroniowy ubytek pola widzenia do 10–15%, w badaniach obrazowych zaś guz wielkości 8,1 x 8,0 mm, zlokalizowany w okolicy guzka siodła tureckiego. Wykonano endoskopową operację z dostępu przezklinowego, potwierdzając rozpoznanie oponiaka. W okresie pooperacyjnym zaobserwowano prawie całkowite zniesienie dolegliwości.

Wnioski i dyskusja: Oponiaki guzka siodła tureckiego z wyboru leczone są chirurgicznie. Neurochirurdzy stosują dostępy przezczaszkowe, jak również – poprzez współpracę z rynologiem – endoskopowe operacje przezklinowe. Wybór sposobu leczenia zawsze powinien być rozpatrywany indywidualnie. Zaopatrywanie płynotoku nadal jest wyzwaniem chirurgicznym, jednak wykorzystanie naczyniowych płatów nosowo-przegrodowych (płat Hadada) znacznie zmniejszyło częstość ich występowania. Rekonwalescencja po zabiegach endoskopowych jest znacznie szybsza, a wyniki pooperacyjne zadowalające.

SŁOWA KLUCZOWE: dostęp endoskopowy, endoskopowy dostęp przeznosowy, guzek siodła tureckiego, oponiak

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ABBREVIATIONS

CT – computed tomography
GTR – gross total resection
HBF – Hadad-Bassagasteguy flap
MRI – magnetic resonance imaging

INTRODUCTION

Endoscopic surgery of the base of the skull has evolved as a result of many years of experience of rhinosurgeons gathered during endoscopic surgeries of the nose and paranasal sinuses. The spread of endoscopic access to benign tumours of the pituitary gland has enabled attempts to resect other types of neoplasms, such as tuberculum sellae meningiomas [1].

Meningioma is a neoplasm of the CNS that originates from the meninges of the brain. In 90% of cases it is benign while 10% is malignant [2]. Meningiomas are the most common benign brain tumours, originating from epithelial cells covering the arachnoid mater (meningothelium). They occur sporadically, mainly in adults between 40–70 years of age, while in children they constitute 1.5% of all meningiomas; they occur 3 times more often in women than men, 6 times more often in the skull than in the spinal canal [3]. An increased risk of meningioma is seen in patients with type 2 neurofibromatosis; in those cases, the changes are often multiple.

Exposure of the skull to ionizing radiation is a known predisposing factor. The contribution of viral infections has also been suggested; however, the mechanism is not yet known. An increase in morbidity during pregnancy has also been observed – tumours demonstrate the presence of receptors for progesterone and estrogen [4]. In many cases, benign meningiomas grow slowly. Most lesions are located outside the brain parenchyma, inside the skull or spinal canal [2]. The tumours have the form of hard masses well demarcated from the adjacent brain, with a dura mater attachment. Bone infiltration is sometimes observed [4]. Depending on the location, meningioma may only exhibit symptoms when it reaches a relatively large size. Clinical symptoms depend on the location of the tumour and include dizziness, headache, focal neurological problems such as weakness in the upper or lower limbs, and in the case of meningiomas located near the tuberculum sellae, blurred vision [5].

Sphenoid meningiomas cause visual disturbances, loss of sensation or numbness of the face. Tumours of this location can sometimes involve cerebral vessels, which makes it difficult to remove them completely. Tumours of tuberculum sellae (5–10% of meningiomas) cause visual disturbances due to pressure on the optic nerve crossing [6].

MRI with contrast is the standard diagnostic test used, however in cases of suspected bone infiltration, CT is also employed [7].

The treatment of choice is surgical removal of the tumour. The assumption of the surgical treatment is (GTR together with the dura mater and the affected changed [6]. For meningiomas, removal of the surrounding dura mater or bone provides additional protection against early relapse [8].

There are two surgical approaches: transcranial and transnasal endoscopic, belonging to the extended approaches to the base of the skull [8]. Transcranial approach to cranial base tumours is circular, requiring wide cranial opening, brain tissue retraction, and manipulation of cranial nerves and large vessels [9]. In contrast, the abdominal, middle approach may be more justified because it avoids damage to critical structures of the nervous system [10]. Transnasal endoscopic approach has been widely recognized in the case of pituitary gland tumours, chordomas and craniopharyngiomas; however, in the case of meningiomas it remains controversial. Critics note that complete resection of meningioma along with its dural infolding cannot be achieved by endoscopic approach, and that the risk of cerebrospinal fluid leakage and infection is still high [11].

Many authors compared both therapeutic methods in terms of the procedure's tightness, improved vision and the occurrence of complications. A number of studies have shown that the endoscopic method results in better final outcomes, however the occurrence of diabetes insipidus and cerebrospinal fluid leakage is more common [5, 12–14].

THE AIM

The purpose of this article is to present the case of a patient with tuberculum sellae meningioma, treasted with the transnational endoscopic method by an interdisciplinary neurosurgical otolaryngological team.

MATERIALS AND METHODS

The paper presents a case of a patient with tuberculum sellae meningioma.

RESULTS

A 63-year-old patient was initially admitted to the Clinical Neurology Department for diagnosis due to headaches and facial sensation disruptions located mainly on the right side, as well as blurry vision. Ophthalmological consultation indicated bilateral vision loss of up to 10–15% was observed.

A CT scan of the head followed by MRI revealed a tumour in the area of tuberculum sellae – a tuberculum meningioma. The lesion with the dimensions of 8.1 x 8.0 mm put pressure on the optic nerve intersection.

Following the neurosurgical-laryngological consilium, a decision was made to employ transnasal endoscopic access. Under neuronavigation control, endoscopic removal of the tuberculum sellae meningioma with transsphenoidal access was performed. Quite abundant intraoperative cerebrospinal fluid leakage was sealed with layered plasters, including Tachosil®, HBF (so-called Hadad-Bassagasteguy flap – HBF) and tissue adhesive [15].

During the postoperative period no complications were observed, while the discomfort in terms of vision and sensory disturbances

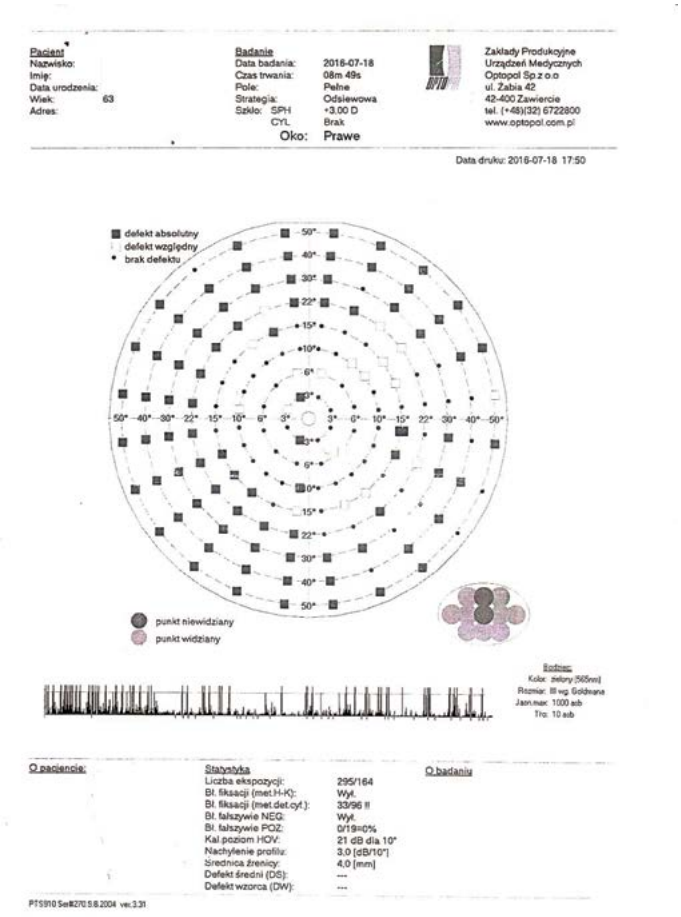

Fig. 1. OR – visual field test, diagram shows bitemporal vision loss up to 10–15%.

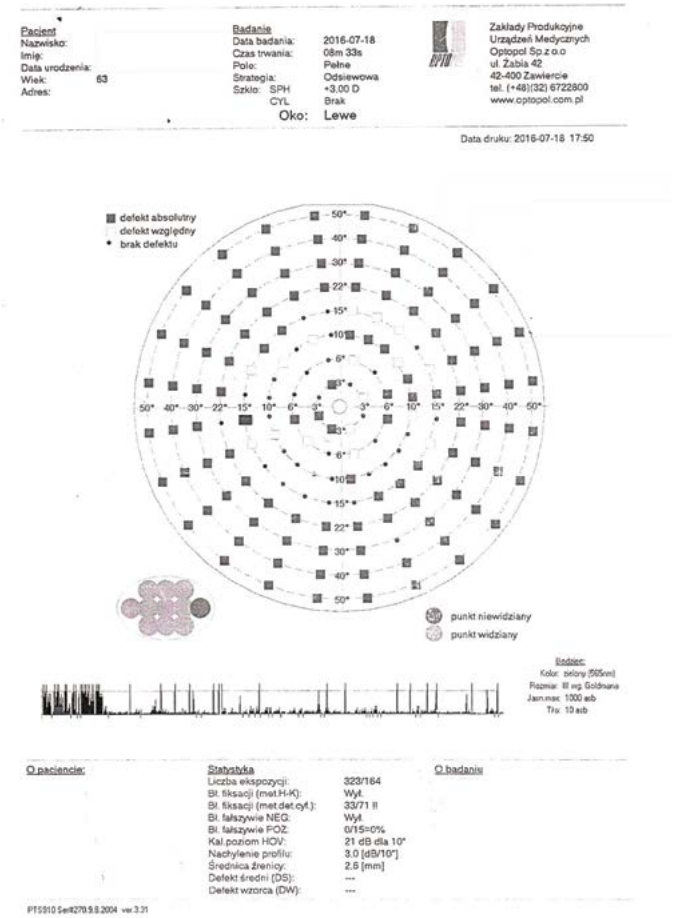

Fig. 2. OL – visual field test, diagram shows bitemporal vision loss up to 10–15%.

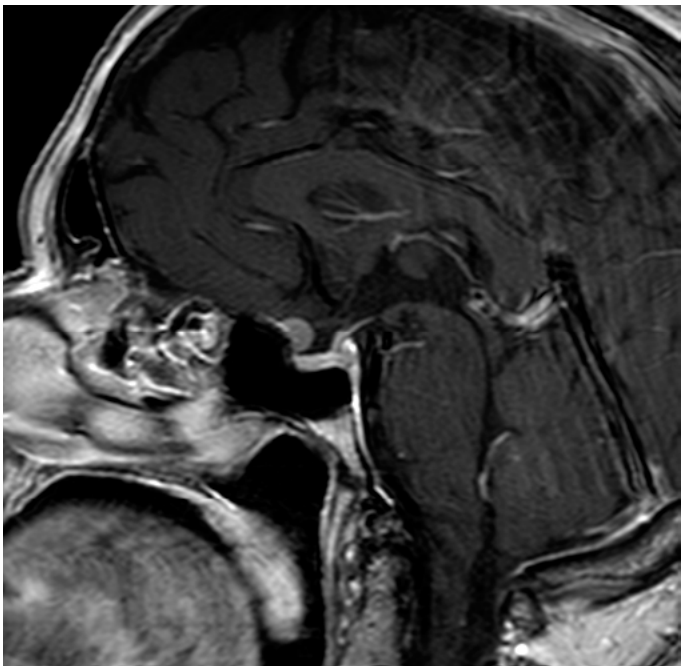

Fig. 3. MRI of the head, sagittal section, showing tumour located within tuberculum sellae.

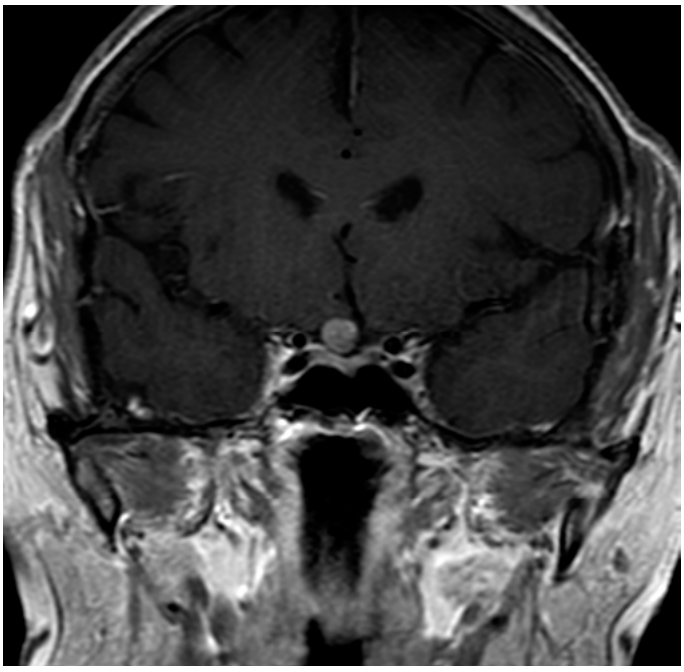

Fig. 4. MRI of the head, frontal section, showing tumour located within tuberculum sellae.

was resolved completely. After several months, the nasal mucosa was fully healed at the donor site of the septal lobe. In the ophthalmological control examination, only minimal narrowing of the field of view was found.

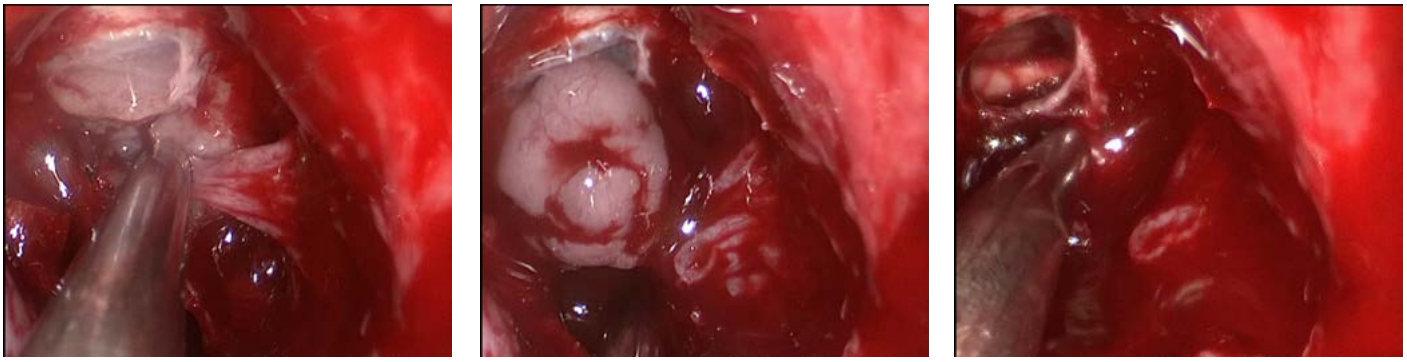

Fig. 5. Intraoperative view; a – tumour of tuberculum sellae, b – removed meningioma, c – postoperative box, optic nerve intersection visible at the bottom.

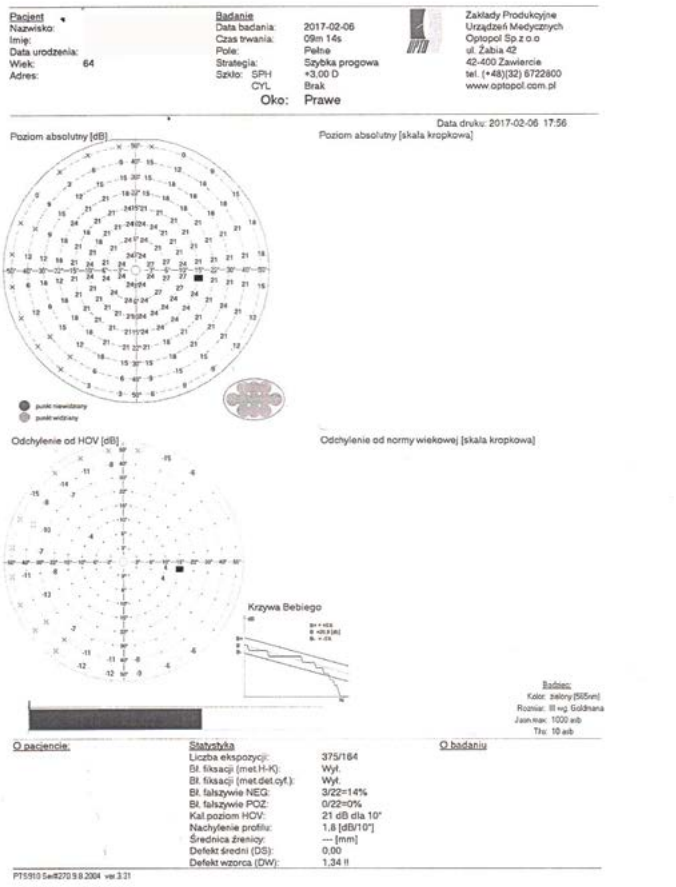

Fig. 6. OR – postoperative visual field test showing improved vision.

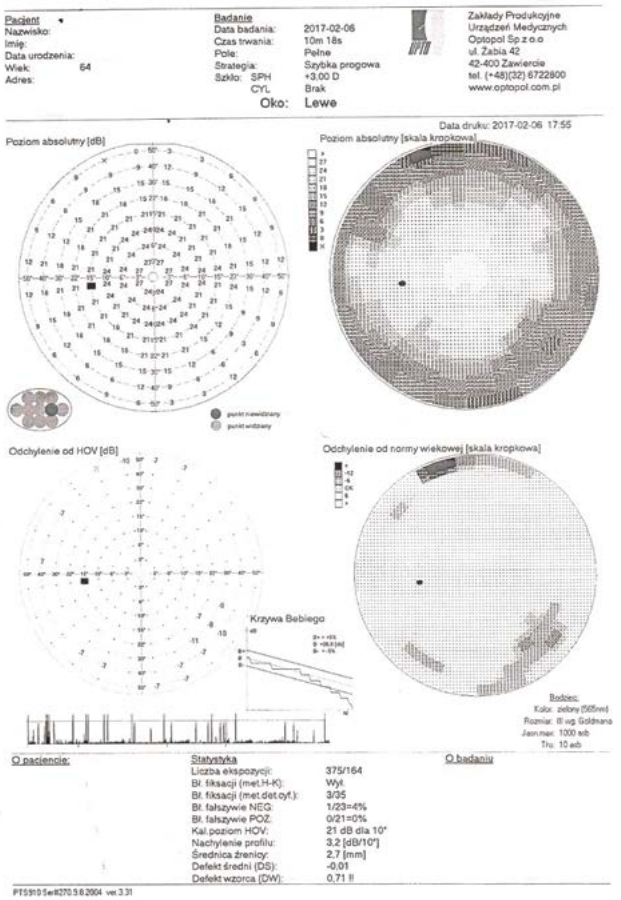

Fig. 7. OL – postoperative visual field test showing improved vision.

DISCUSSION

The location of supra-sadial meningiomas in the centre of the base of the skull is associated with difficult surgical approach due to its complex and deeply embedded anatomy. The base of the skull contains a wealth of critical neurovascular structures within a relatively small area, creating a constant challenge for the surgeon. Traditional surgical approach to the base of the skull has always been associated with significant morbidity and mortality [8].

Transnasal endoscopic technique has evolved to allow skull base surgery with minimal invasiveness, using existing air spaces that provide direct insight into various areas of the skull base [16]. It eliminates the need for an external incision or scar, translocation of the maxillofacial skeleton and brain tissue retraction, as well as damage to critical neurovascular structures. Transnasal bilateral approach, combined with adapted bone resection to allow a relatively wide access, allows dynamic visualization of the surgical field, four-hand dissection technique and additional space for necessary surgical instruments [16]. The endoscopic image allows for enlargement, panoramic and angled view, depending on the optics used [17, 18]. The key element is the use of neuromonitoring, which allows the procedure to be performed safely.

Interdisciplinary neurosurgical and laryngological surgeries allow the procedure to be performed in a minimally invasive manner,

which results in a shorter recovery time with satisfactory treatment outcomes [12]. The location of these tumours supports the use of transnasal approach for less traumatization of brain tissue. Another potential benefit of transnasal surgery is early decompression of visual structures and a lower likelihood of damage to brain vessels that occur in this region. Intraoperative liquorrhoea, significant during the procedure, could have easily been sealed with layered plasters, mucosal-cartilage lobe from the nasal septum, which reduced the likelihood of the leakage remaining. The introduction of HBF for reconstruction of broad skull base defects reduced the incidence of postoperative fluid flow from 20% to 5–7% [19, 20].

It should be noted that the use of endoscopic approach to cranial base tumours requires extensive experience in optician surgery. It is also advisable to work with a rhinosurgeon who has extensive experience in sinus endoscopy as well as the ability to reconstruct the skull base defects with liquorrhoea sealing.

The endoscopic method results in characteristic iatrogenic complications. They occur both within the nasal cavity and in the neurovascular structures. The most common are drying and scab formation within the nasal cavity (95% of patients within 1 month after surgery). Others are relatively rare and include intranasal adhesions (9%), maxillary nerve hypoaesthesia (2%), palatal hypoaesthesia (7%), exudative otitis (2%), and taste disruptions (7%) [21]. Advanced drying and the formation of extensive scabs requires aggressive treatment, associated with frequent nasal cleansing and nasal irrigation.

The endoscopic method is limited by the size of the tumour, its advancement, covering the internal carotid artery and optic nerve canal, low pneumatizattion of the sphenoid bone and the inability to employ neuromonitoring [1, 11].

CONCLUSIONS

With the use of the transnasal endoscopic method, a minimally invasive procedure was performed to remove the tumour completely, and the patient achieved virtually complete resolution of the symptoms. Vision improvement occurred immediately after the procedure. Moderate discomfort, resulting from transnasal approach, including the removal of the mucosal-cartilage lobe of the septum, resolved after a few weeks.

Endoscopic transnasal operations allow access to the base of the skull, which is fraught with fewer complications and a shorter recovery period compared to traditional transcranial access. However, it requires extensive experience in endoscopic neurosurgical operations.

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