

Unilateral Endoscopic Optic Nerve Decompression for Idiopathic Intracranial Hypertension: A Series of 10 Patients

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Key words

- Decompression
- Endoscopic
- Idiopathic intracranial hypertension
- Minimal invasive
- Optic nerve
- Pseudotumor cerebri
- Surgical

Abbreviations and Acronyms

CSF: Cerebrospinal fluid
CT: Computerized tomography
IIH: Idiopathic intracranial hypertension
LP: Lumboperitoneal
OND: Optic nerve decompression
ONSF: Optic nerve sheath fenestration
VP: Ventriculoperitoneal



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INTRODUCTION

Idiopathic intracranial hypertension (IIH), also known as pseudotumor cerebri or benign intracranial hypertension is a syndrome characterized by elevated intracranial pressure without a mass lesion or increased intraventricular volume and normal cerebrospinal fluid (CSF) composition (2). IIH most commonly affects obese women in the third or fourth decades of their lifetime with an overall incidence of 0.9 per 100,000 (9, 27). Most frequent symptoms are headache, visual disturbance, and diplopia due to abducens nerve palsy, rarely tinnitus and hearing

■ **OBJECTIVE:** Several surgical treatment modalities, including lumboperitoneal or ventriculoperitoneal shunt surgery, subtemporal decompression, endovascular venous sinus stenting, optic nerve decompression (OND), were used in the management of idiopathic intracranial hypertension (IIH). Each surgical technique has different advantages and disadvantages. Endoscopic OND is rarely used in the management of IIH. There are only four reported cases. The aim of this study is to describe the surgical results of patients treated with this less invasive surgical technique.

■ **METHODS:** A series of 10 consecutive cases of unilateral OND was reviewed. Between December 2008 and December 2012 these patients underwent the endoscopic approach without nerve sheath opening. Presenting symptoms, neurological examination findings, magnetic resonance venography imaging results, fundoscopic and visual acuity examination findings, and automated perimetry test results were recorded. Perioperative results, including complications and length of hospital stay, were evaluated. Findings at follow-up evaluations were also recorded.

■ **RESULTS:** This report is the first series of unilateral OND performed using the endoscopic approach. The mean patient age was 34.1 years (range, 9–49 years); there were nine female and one male patients. Visual impairment was the main symptom in this patient group, whereas headache was a secondary complaint. The patients were first managed with medical treatment for at least 3 months. Unilateral endoscopic OND was performed on the side with the most visual failure. Mean follow-up was 28.4 months (range, 8–55 months). The visual field defects and visual acuity improved in eight of nine patients, whereas papilloedema improved in seven of nine patients. Also headaches resolved in four of seven patients. There were no complications in this relatively small series.

■ **CONCLUSIONS:** The surgical treatment of IIH by using the unilateral endoscopic OND technique is a safe and effective method in the hands of experienced surgeons with advanced endoscopic skills. A collaboration with the ophthalmology team is needed for the follow-up. Further studies with larger patient numbers is needed to compare unilateral endoscopic OND technique with the current techniques used in the surgical management of IIH.

loss (11, 24, 29). Papilloedema and a measured CSF pressure of more than 250 mm H₂O, but normal CSF composition, are the diagnostic criteria of this syndrome. There is no evidence of mass, structural or vascular lesions on magnetic

resonance imaging or on computerized tomography (CT) investigations, and no other identified cause of intracranial hypertension is found (12). Although the pathogenesis of the disease is still unclear, several proposals for the mechanism were

made as follows: increased CSF secretion, decreased CSF absorption, idiopathic brain swelling, and increased intracranial venous pressure, due to venous sinus stenosis or increased abdominal pressure (13, 21).

Despite lack of knowledge about the pathogenesis, different treatment modalities are used in the management of IIH. Medical treatment, based on reducing CSF secretion or increasing CSF resorption, administering loop diuretics, carbonic anhydrase inhibitors, or corticosteroids are commonly used (4). Medical treatment combined with weight loss through diet or surgical intervention have limited effects on long term (18). Surgical interventions are CSF diversion procedures such as lumboperitoneal (LP) or ventriculoperitoneal (VP) shunt insertion, subtemporal decompression, endovascular dural venous sinus stenting, or optic nerve sheath fenestration (ONSF), which have several advantages or disadvantages as discussed previously in the literature (4, 11). ONSF is commonly used by ophthalmologists since first defined by De Wecker in 1872 (8), but significant complications were reported with this approach (1, 3, 5, 6, 26, 30, 31). The endoscopic approach is rarely preferred in the surgical management of IIH. To our knowledge there are only four reported cases of optic nerve decompression (OND) using the endoscopic approach (15, 18, 25). In the present study, we review our experience with unilateral OND performed using the endoscopic approach in a series of 10 patients, without opening the optic nerve sheath, where improvement in headache and bilateral visual function was achieved.

METHODS

Between December 2008 and December 2012, 12 patients with the diagnosis of IIH were operated on in our institution using the endoscopic OND technique. Two patients were lost to follow-up, therefore 10 patients were included in the study. All patients had experienced ongoing symptoms of visual impairment and/or headache for at least 3 months by the time of referral. Patients were eligible for surgery if they suffered persistent or worsening symptoms, despite conservative medical therapy.

Preoperative Evaluation

Patients were diagnosed with IIH at different institutions with clinical examination and cranial magnetic resonance imaging, then referred to our clinic. All patients were evaluated with neurological examination, additional magnetic resonance venography, examination for visual acuity and funduscopy, and automated perimetry test before the surgery. Surgical indications for endoscopic OND were similar to those for shunting procedures in IIH.

Operative Technique

The patients are positioned on the operation table in the supine position with a slight head elevation. After induction of anesthesia and orotracheal intubation, 0.05% oxymetazoline soaked packs were inserted into the middle and inferior meatus to achieve vasoconstriction and decongestion of the nasal mucosa. For further decongestion and vasoconstriction, 1% lidocaine with 1:100,000 epinephrine is injected to the anterior attachment of the middle turbinate, to the medial and inferior part of the uncinate process, and to the root of the middle turbinate. The entire operation is performed using a 0-degree endoscope (Karl Storz and Co., Tutlingen, Germany), standard endoscopic sinus surgery instrumentation, and powered sinus debrider. An intraoperative CT device (CereTom Neurologica Corp., Danvers, Massachusetts, USA) and a surgical image-guided navigation system is used in all of the procedures (Brain Lab, Feldkirchen, Germany).

Surgery began with the removal of the uncinate process. After the identification of the natural maxillary ostium, a standard endoscopic sphenoidectomy was performed. All of the anterior and posterior ethmoid cells were taken away for the exposure of the lamina papyracea, anterior wall of the sphenoid, and skull base. Care was taken to preserve the lamina papyracea and the underlying periorbita. The ostium of the sphenoid was opened as much as possible to achieve maximal view of the lateral sphenoid sinus wall. The optic canal lies as a protuberance on the surface of the lateral sphenoid sinus wall, superior to the carotid canal. At the level of the sphenoid ostium lies the annulus of Zinn, covered with a thicker bone than

the lamina papyracea, where the extraocular muscles are attached and along which the optic nerve passes. The distal 1-cm part of the lamina papyracea was removed with a curette or elevator. Up from the level of the annulus of Zinn the bone gets thicker, therefore before the removal of this bone it must be thinned with a diamond burr of a microdebrider or a long-handed drill. In the meantime, intensive irrigation is essential to prevent thermal damage to the underlying optic nerve. The limit of the drilling procedure is up to the opticocarotid recess. When the overlying bone is thinned adequately, a microcurette is used to fracture the bone in a medial direction and the fractured bone segments are removed with forceps to accomplish the medial decompression of the optic nerve. We do not recommend the additional incision of the optic nerve sheath because of the risk of injury to the ophthalmic artery and the optic nerve and the possibility of CBF leakage.

Follow-Up Protocol

Patients were discharged from the hospital the day after the operation. Follow-up examinations were performed on the third week, on the third month, and then regularly at 3-month intervals. Fundoscopic examination and visual acuity examination were repeated at each follow-up visit. Automated perimetry test was performed at 3, 6 months, and 1 year postoperatively. Patients were also questioned about the subjective relief of their symptoms.

RESULTS

There were one male and nine female patients with an average age of 34.1 years (range, 9–49 years). All patients had experienced ongoing symptoms of visual impairment and/or headache for at least 3 months by the time of referral. All patients were treated medically with carbonic anhydrase inhibitors before their referral. One patient had a history of a LP shunt procedure for IIH; her symptoms were relieved temporarily for 1 year, then her visual function deteriorated, therefore endoscopic OND was performed. Patients' demographics and symptoms were summarized in Table 1. Visual impairment was the main symptom in our

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