

Transnasal microscopic approach for nasopharyngeal angiofibroma

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ABSTRACT:

Introduction: Juvenile nasopharyngeal angiofibroma (JNA) is a rare, benign, vascular tumor originating in the nasopharynx. The treatment of choice for JNA is surgical excision. In the recent years, the surgical management has been greatly influenced by the use of transnasal endoscopic technique.

The aim: The aim of the study was to present our experience with the transnasal microscopic removal of JNA.

Material and methods: Ten patients with JNA aged 12-17 underwent diagnostics imaging and transnasal microscopic tumor excision. Medical records of patients were retrospectively reviewed. The main outcome measures were complications and recurrences. Preoperative embolization of feeding vessels was performed in 7 patients.

Results: According to Andrews' classification, the group included 2 stage I patients, 6 stage II patients and 2 stage IIIA patients with extensive occupation of the infratemporal fossa. 9 patients had no recurrence in 6-11 years follow up. One stage IIIA patient had a recurrence posteriorly to the pterygopalatine process and it was completely removed. No complications during or after surgery occurred.

Conclusion: Transnasal microscopic excision is an effective approach to resect stage I-III A JNA

KEYWORDS:

nasopharyngeal angiofibroma, transnasal microscopic resection

INTRODUCTION

Juvenile nasopharyngeal angiofibroma (JNA) is a rare vascular benign tumor representing less than 0.05% of all head and neck neoplasms [20]. The classic triad of symptoms include one-sided nasal obstruction, recurrent epistaxis and a mass within the nasal passages or nasopharynx in prepubertal boys. JNA originates in the pterygopalatine fossa. Initially, the tumor grows within the nasal cavity and nasopharynx and later spreads through natural fissures and foramina or by destruction of bony structures into the paranasal sinuses, pterygopalatine or infratemporal fossa, the orbit and cranial fossae [18].

Many theories on the origin of JNA have been postulated including carcinogenesis, vascular malformation, hamartoma, proliferation of a persistent vascular plexus resulting from an incomplete regression of the first aortic arch [3, 22]. Consider-

ring morphology, JNA is a benign non-capsulated lesion consisting of a fibrous matrix and abnormal blood vessels. Smooth muscle cells are lacking in the vessel wall, which leads to profuse bleeding.

The mainstay of treatment is surgical resection. Radio- [1, 19] and chemotherapy [9, 21] are second-line therapy. The tumor is usually supplied by the ipsilateral maxillary artery, however, in advanced stages it can be supplied by the contralateral maxillary artery or even the internal carotid artery. Preoperative embolization of the blood supply is an integral part of treatment. Many open surgical techniques can be used depending on the tumor extent [1, 4, 8, 10], or a minimally invasive endoscopic resection may be applied, which has become increasingly popular recently [1, 4, 5, 11].

The aim of this study was to evaluate the transnasal micro-

Tab. I. Staging system for juvenile nasopharyngeal angiofibroma.

Andrews et al., 1989 [2]
(I) Limited to nasopharyngeal vault and/or nasal passages. Bone destruction is minor or limited to sphenopalatine foramen.
(II) Extension into pterygopalatine fossa and/or maxillary, ethmoid or sphenoid sinus with bone destruction.
(III) A. Extension into infratemporal fossa or orbit without intracranial invasion. B. Extension into infratemporal fossa or orbit with extrameningeal (perisellar) intracranial invasion.
(IV) A. Intracranial intrameningeal mass without cavernous sinus, sella turcica or optic chiasma occupation. B. Intracranial intrameningeal mass occupying cavernous sinus, sella turcica or optic chiasma.

**Fig. 1.** Contrast-enhanced axial CT scan demonstrates an enhancing tumor of the nasopharyngeal vault (stage I).

scopic surgery for nasopharyngeal angiofibroma. In the study, we evaluated the surgery itself as well as the long-term follow-up period.

MATERIALS AND METHODS

The study was conducted by reviewing medical records of 10 boys aged 12 to 17, who underwent surgery for nasopharyngeal angiofibroma between 2007 and 2012 at the Department of Otolaryngology and Laryngological Oncology, Medical University of Lublin. All patients reported nasal obstruction for 1 to 3 years before surgery, and seven of them complained about nose bleeding.

In all patients, we performed anterior and posterior rhinoscopy; contrast-enhanced computed tomography (CECT) scans were obtained for 7 patients, while magnetic resonance ima-

ging (MRI) was used in 3 patients. All boys underwent angiography of the internal and external carotid arteries one or two days before surgery, and the tumor-feeding arteries were embolized in 7 patients.

SURGICAL TECHNIQUE

The tumor was accessed through the nasal passage using a microscope in all 10 patients. In most of them, the anterior portion of the medial concha was removed. When the tumor was infiltrating the sphenoid sinus or pterygopalatine fossa, it was pressed down and the sphenoid sinus was opened above the mass. In patients with pterygopalatine or temporal fossa occupation, extended medial antrostomy was performed, removing the posterior wall of the maxillary sinus, mobilizing the lateral portion of the tumor and then removing the whole mass. Transnasal excision en bloc was impossible in some instances (Fig. 1) and required mass displacement into the oropharynx before removing it transorally. Bleeding was reduced by coagulation and posterior nasal packing.

RESULTS

Imaging studies revealed a tumor mass in either the nasal passage or nasopharynx in all patients. The tumor was located inside the sphenoid sinus in 7 cases and within the pterygopalatine fossa in 3 cases. In 2 patients, the tumor occupied the infratemporal fossa (Fig. 2, 3). In one patient, the tumor recurred posteriorly to the pterygoid processes. The lesion was removed through the sublabial transantral approach after removing the pterygoid process.

The patients were followed up postoperatively over 6 to 16 years. During that period, no relapse was observed on imaging studies (Fig. 4). According to Andrews' classification, the group included 2 stage I patients, 6 stage II patients and 2 stage IIIA patients with extensive occupation of the infratemporal fossa (Tab. I.) [2]. The surgery itself and the postoperative period remained uneventful in all cases.

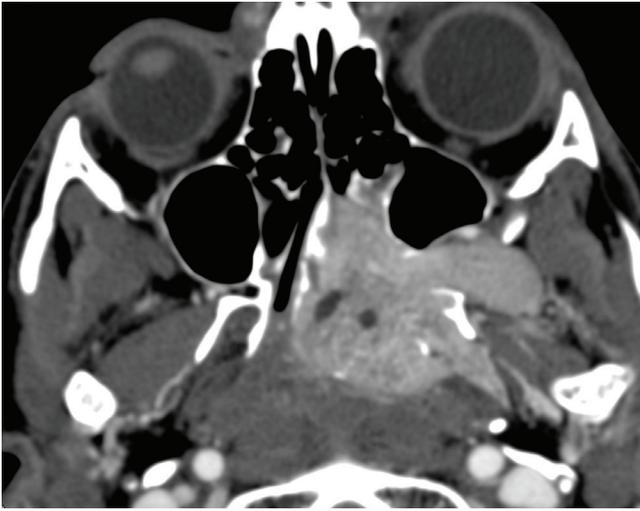


Fig 2. Contrast-enhanced axial CT scan shows an extensive contrast-enhancing tumor (stage IIIA).

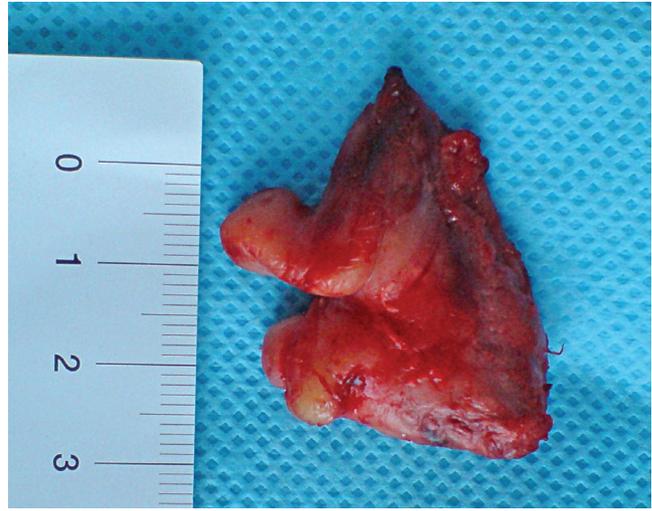


Fig 3. Postoperative image of the excised tumor, stage IIIA.

DISCUSSION

For many years, the main and universal approach to angiofibroma was lateral rhinotomy. After surgery, the patients were left with a scarred face or sunken cheeks. Over time, rhinotomy was replaced by transpalatal approach for small tumors [10] or sublabial degloving for large tumors [1]. Tumors extending intracranially, usually to the middle fossa, presented a serious challenge to the surgeon. Minor intracranial extensions were excised from anterior approach. For larger extensions into the middle fossa, Fish [2, 8] introduced the infratemporal fossa approach into clinical practice. Another milestone in nasal and sinus surgery was the transnasal approach. The very first such operations were conducted using endoscopes for inflammatory lesions in chronic sinusitis with polyps [13] as well as for the inverted papilloma [12]. The reports on transnasal microsurgery are limited, however, this method is described as safe and effective in centrally located nasal and sinus tumors, as well as for orbit decompression or cerebrospinal fluid leak repair [15]. Transnasal approach proved challenging in well-vascularized nasopharyngeal angiofibroma. Initially, only small and medium-size tumors were resected in this way [7, 23]. For large tumors, open or endoscopy-assisted open surgery were applied [4, 5, 11]. Technological advances and increasing expertise in transnasal techniques broadened the indication list for this technique so that the external approach is less and less common. Some surgeons use endoscopy to excise tumors with extensive infratemporal and intracranial involvement [16, 17]. At our facility, transnasal microscopic approach was found to be effective in all patients with Andrews' stage I and II JNA as well as in one patient with extensive infratemporal occupation (IIIA).



Fig 4. Contrast-enhanced coronal MRI scan 2 years after resection of the stage II tumor shows a defect of the base of the sphenoid sinus with no signs of recurrence.

Excision of an intracranial tumor is usually a multistep procedure requiring two or more steps [24].

In most centers, the supplying arteries are embolized prior to the transnasal surgery to increase the tumor visibility within the operative field. Some authors do not use preoperative embolization [7], especially for minor tumors, which was the case in three of our patients. The advantages of the transnasal approach include less blood loss during surgery and smaller bone defects of the viscerocranium [5, 7]. Microsurgery allows to adjust the zoom and to perform double-hand manipulations during surgery. Endoscopy provides wider visual field (visuali-

zing at an angle, 'around the corner'), and while the assistant holds the device, it is possible to operate using both hands.

Important indicators for approach evaluation are the complication rate and the relapse rate. A relapse usually results from an incomplete tumor removal during the first surgery. El Sharkawy et al. [7] reported two cases (11%) of postoperative relapse among 10 patients. Kopeć et al. [14] observed one case of recurrence (10%) in 10 patients following endoscopic transnasal surgery. Low relapse rate may be due to the fact that this method is used to treat only minor tumors. In our study group, the tumor recurred in one patient with IIIA JNA.

Our previous research [25] showed that relapse rate is significantly higher in tumors located posteriorly to the pterygoid process. Boghani et al. [4] published a review of 87 articles pre-

senting surgical outcomes in 1047 patients operated on using three methods: transnasal endoscopy, endoscopy-assisted open surgery and classic open surgery. Endoscopic surgery is associated with less blood loss and lower relapse rate compared to open surgery. However, the relapse rate following endoscopic and open surgeries did not differ significantly when the results were compared for the same-stage tumors. Also, Cloutier et al. [6] reported that the relapse and complication rates in patients with endoscopic approach were similar to those in patients with open surgery. Therefore, the postoperative relapse rate depends on the tumor extent (especially whether intracranial extensions are present) rather than the surgical approach [24]. When the tumor involves important anatomical structures such as the internal carotid artery or the optic chiasma, some authors recommend to leave a residual mass around those structures for later stereotactic radiation therapy [1, 16].

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