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ENDONASAL ENDOSCOPIC RESECTION OF JUVENILE NASOPHARYNGEAL ANGIOFIBROMA

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Abstract. Juvenile nasopharyngeal angiofibroma (JNA) is a benign, highly vascular; and locally invasive tumor: Because the location of these tumors makes conventional surgery difficult, interest in endoscopic resection is increasing, particularly for the treatm ent of lesions that do not ex tend laterally into the infratemporal fossa. We report the results ofour series of 23 patients with JNA (stage IIB or lower) who underwent transnasal endoscopic resection under hypoten sive general anesthesia with out preoperative embolization of the tumor. All tumors were successfully excised. The amount of intra operative blood loss was acceptable. We observed only 1 recurrence, which was diagnosed 19 months postoperatively in a patient with a stage IIB primary tumor: We observed only 3 complications during follow up all synechia. We conclude that endoscopic resection of JNAs is safe and effective. The low incidence of recurrence and complications in this series indicates that preoperative embolization may not be necessary for lesions that have not undergone extensive spread; instead, intraoperative bleeding can be adequately controlled with good hypotensive general anesthesia.

Keywords: juvenile nasopharyngeal angiofibroma, intraoperative bleeding, surgery, recurrence.

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ЭНДОНАЗАЛЬНАЯ ЭНДОСКОПИЧЕСКАЯ РЕЗЕКЦИЯ ЮВЕНИЛЬНОЙ АНГИОФИБРОМЫ НОСОГЛОТКИ

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Аннотация. Ювенильная ангиофиброма носоглотки (ЮАН) — доброкачественная опухоль с высоким содержанием васкуляризации; и местно-инвазивные опухоли. Поскольку расположение этих опухолей затрудняет традиционное хирургическое вмешательство, растет интерес к эндоскопической резекции, особенно для лечения поражений, которые не распространяются латерально на подвисочную ямку. Мы сообщаем результаты нашего исследования из 23 пациентов с ЮАН (стадия IIB или ниже), которым была выполнена трансназальная эндоскопическая резекция под гипотензивной общей анестезией без предоперационной эмболизации опухоли. Все опухоли были успешно удалены. Объем интраоперационной кровопотери был приемлемым. Мы наблюдали только 1 рецидив, который был диагностирован через 19 месяцев после операции у пациента с первичной опухолью стадии IIB: за время наблюдения мы наблюдали только 3 осложнения со всеми синехиями. Мы пришли к выводу, что эндоскопическая резекция ЮАН безопасна и эффективна. Низкая частота рецидивов и осложнений в этом исследовании указывает на то, что предоперационная эмболизация может не потребоваться при поражениях, которые не подверглись обширному распространению; вместо этого интраоперационное кровотечение можно адекватно остановить с помощью хорошей гипотензивной общей анестезии.

Ключевые слова: ювенильная ангиофиброма носоглотки, интраоперационное кровотечение, хирургия, рецидив.

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INTRODUCTION

In 1906, Chaveau introduced the term juvenile nasopharyngeal angiofibroma (JNA) This benign tumor is characterized by aggressive local invasiveness and a tendency toward local recurrence after incomplete resection; it occurs primarily

in adolescent males JNA is a nonencapsulated, submucosal, spreading tumor made up of fibrous connective tissue and an abundance of endotheliumined vascular spaces

Many studies have indicated that JNA originates in the pterygopalatine fossa at the aperture ofthe pterygoid canal. From there, it can extend to surrounding structures, including the nasal cavity, sphenoid sinus and sella, infratemporal fossa, inferior orbital fissure, and intracranial area.

A diagnosis of JNA is suggested by the clas sictriad of epistaxis, nasal obstruction, and a nasopharyngeal mass. The presence of other symptoms depends on the direction and extent of tumor spread. The treatment of choice for localized primary tumors is surgical resection; for extensive masse s and for recurrent tumors, radiotherapy is also recommended.

Because the location of these tumors makes conventional surgery difficult, interest in endoscopic resection is increasing, particularly for lesions that do not extend laterally to the infratemporal fossa. In this article, we report the results of our series of transnasal endoscopic resections with out preoperative embolization of the tumor in patients with JNA that did not extend laterally into the infratemporal fossa.

THE PURPOSE

In this article, we report the results of our series of transnasal endoscopic resections with out preoperative embolization of the tumor in patients with JNA that did not extend laterally into the infratemporal fossa.

MATERIAL AND METHODS

Our series included 23 patients with histopathologically proven JNA (stage IIB or lower) who underwent transnasal endoscopic resection without tumor embolization at our center from February 2000 through August 2004 . All patients were male. Their ages ranged from 10 to 26 years (mean: 16.2). No patient underwent radiotherapy.

Staging. Tumor staging was based on the results of computed tomography (CT) and/or magnetic resonance imaging (MRI) . Tumors were staged according to the system described by Radkowski et al (figure). Five tumors were staged as IA, 9 as IB, 4 as IIA, and 5 as IIB (table 1).

TABLE 1

Radkowski staging

Stage	Description
IA	Involvement limited to the nose and/or naso-pharynx
IB	Extension into one or more sinuses
IIA	Minimal extension into the pterygopalatine fossa
IIB	Occupation of the entire pterygopalatine fossa with or without erosion of the orbital apex
IIC	Involvement of the infratemporal fossa with or without extension to the cheek or posterior to the pterygoid plates
IIIA	Erosion of the skull base (the middle cranial fossa/base of the pterygoids); minimal intra-cranial extension
IIIB	Erosion of the skull base; extensive intra-cranial extension with or without cavernous sinus invasion

Surgical technique. Hypotensive general anesthesia was administered (target mean arterial pressure 55 to 65 mm Hg) with the patient in the reverse Trendelenburg position. Topical vasoconstriction was achieved by placing a cottonoid pledget soaked in I:I,000 epinephrine solution for 10 minutes.

The surgical technique varied slightly from case to case, depending on the tumor's size and degree of extension, but alldissections followed a series of the same basic steps .The tumor was slowly pulled down with a retractor to expose the sphenopalatine foramen. If the sphenopalatine artery was evident through the sphenopalatine foramen, it was cauterized. We did clip the artery IMAX. The tumor was detached from the nasal mucosa and sphenoid sinus and pushed medially and inferiorly.

If extension to the lower part of the pterygopalatine fossa was present, the posterior portion ofthe inferior turbinate was resected. The sema neuver sex posed the superior, inferior, and medial border soft he tumor.The posterior wall of the maxillary sinus was resected, and the retromaxillary periosteum was elevated, which provided access to the infratemporal fossa.

Table 2

Results of treatment with endoscopic transnasal technique

PT	Stage	Units transfused	Blood loss	Follow up	Recurrence	Complication
1	IA	0	550	46	-	-
2	IA	0	850	42	-	-
3	IA	0	570	36	-	-
4	IA	0	660	20	-	-
5	IA	0	700	54	-	-
6	IB	0	550	35	-	-
7	IB	0	620	32	-	-
8	IB	1	800	40	-	-
9	IB	0	450	35	-	-
10	IB	1	1150	42	-	-
11	IB	0	650	30	-	-
12	IB	0	750	35	-	-
13	IB	0	550	22	-	-
14	IB	0	600	12	-	-
15	IA	0	820	16	-	-
16	IA	0	1000	44	-	-
17	IA	1	1100	17	-	Synechia
18	IA	2	1050	43	-	-
19	IB	2	1200	47	+	Synechia
20	IB	2	1050	24	-	-
21	IB	1	1100	22	-	Numbness
22	IB	2	1050	18	-	-

The tumor and surrounding soft tissue were pulled inferomedially, and the pterygopalatine fossa was cleaned. The entire tumor was removed via the mouth. The nasal cavity was packed with Merocel for 48 hours.

The first follow-up endoscopic evaluation was performed 3 weeks postoperatively and repeated 2 months later. Subsequent follow ups with CT or MRI were scheduled for the third month and then every 6 months up to 2 years and once yearly the reafter. Overall, the length of individual follow-ups ranged from 13 to 57 months (mean: 33).

Outcome variables included estimated perioperative blood loss, recurrences, and complications. Any patient whose symptoms returned or who exhibited an expanding tumoronimaging wasconsideredtohaveexperienc edare- currence and was therefore a candidate for reoperation.

RESULTS AND DISCUSSION

The estimated average amount of intraoperati ve blood loss per patient and the average number of blood transfusion packs required per patient were positively correlated with tumor stage (table I):

- Stage I A 666 ml blood loss: 0 packs for transfusion
- Stage I B 680 ml blood loss: 0.2 packs for transfusion
- Stage II A 1068 ml blood loss: 0.75 packs for transfusion
- Stage II B 1100 ml blood loss: 1.8 packs for transfusion

During follow up, 3 patients developed asymptomatic synechia between the nasal septum and one of the turbinates.

Only I patient (4.3%) experienced a recurrence. This patient's primary tumor had been staged as IIB.The recurrence was diagnosed 19 months postoperatively after the patient had complained of repeated episodes of epistaxis and occasional nasal

obstruction. The patient underwent reoperation and remained diseasefree at 28 months.

A diagnosis of JNA requires close attention to symptoms. In most case s, the aforementioned triad of epistaxis , nasal obstruction, and a nasopharyngeal mass in a young male is suggestive of JNA.The presenceofanteriorbowingofthe posterior wall of the maxillary sinus on imaging (Holman- Miller sign) is a known pathognomonic finding."

Many surgical approaches to JNA have been used, including the transpalatal approach, medial maxillectomy, midfacial degloving, LeFort I surgery,' lateral rhinotomy, and the infratemporal fossa approach. However, transnasal endoscopic resection is becoming an attractive alternative to these external approaches as our surgical expertise and our knowledge of the intranasal anatomy impro ve. Still , the pro per role of endoscopic resection for the management of angiofibromas remains a subject of debate.

Hypotensive general anesthesia. We did not perform pre operative embolization because we believe that intraoperative bleeding of lesions that have not spread extensively can becon trolled by good hypotensive general anesthesia. Hypotensive general anesthesia may be appropriate for several types of operations, including head and neck surgery, neurosurgery, large orthopedic procedures, and a variety of plastic surgical procedures. The possible comp lications of hypotensive general anesthesia primarily involve the nervous system. The most common are dizziness and cerebral thrombosis. Less common complications include hemiplegia, retinal thrombosis, and even death.

During hypotensive general anesthesia, a target blood pressure of 50 to 65 mm Hg is safe for young, otherwise healthypatients.This type of anesthesia is probably more risky in the elderly and in those who have underlying organ dysfunction." In our study, no patient experienced any anesthesia-related complication.

Preoperative embolization. Another reason to avoid embolization is that it has potenti al compli cations of its own.I-They include nerve injury (e.g., facial nerve palsy) and devitalization of tissues such as the overlying skin and nasalmucosa.Intentional embolizationofthebranchesof the internal carotid artery may result in accidental embo- lization of the brain and ophthalmic artery.

Even so, embolization does have its proponents, as several authors have described their favorable experiences with emboli zation during transnasal endoscopic excision of JNAs (table 2). For example, Li et al reported that patients with stage IIC or lower lesions who underwent preoperative embolization lost significantly less blood intraoperatively than did those who were not embolized (mean: 637 and 1,136 ml, respectively; $p < 0.05$).15Also, among patients who required transfusion, embolized patients required significantly less blood (mean: 400 and 836 ml; $p < 0.01$).

Likewise, Liu et al reported that preoperative embol ization was associated with significantly less intraoperati ve bleeding in patients with stage IA tumors (mean: 275 and 840 ml, respecti vely).16They also compared the amount of blood loss in 17 patient s with stage IE and high ertumors-8 of these patient s had und ergone emboli zation of feedin g arteriesand9had undergoneligation ofanexternalcarotid artery- but they found no significant difference.

Nicolai et al reported that the amount of intraoperative blood loss in 15 patients, all of whom underwent preoperative embolization, ranged from 80 to 600 ml (mean: 372) .17 Moulin et al also reported a significant decre ase in intraoperative blood 10ss.IK

Both Siniluoto et al" and Elasfour et aForeported that embolization not only reduced intraoperative blood loss, but it also contributed to improved surgical results.

Tranbahuy et al recommended intratumoral embol ization. Hazarika et al reported that preoperative embolizition follo wed by KTP endoscopic excision of JNA is superior to radical approaches.

Staging. As all of our patients were staged as IIB or lower, our findings support the effectiveness of the transnasal endoscopic approach for tumors that have extended to the nasal cavity, nasopharynx, paranasal sinuses, and pterygopalatine fossa. Other authors have recommended this procedure for tumor suptostage II C,citing the benefits of fewer postoperative complications and a more rapid recovery and earlier discharge in addition to less bleeding. However, involveme nt of the infratemporal fossa, anterior skull base, and orbit still requires a more invasive surgical approach,"

although Onerci et al reco mmended endoscop ic resection for lesions with minimal extension into the cra nium."

Recurrence. Scholtz et al performed transnasal endoscopic excision on 7 patients with IN As that had extended into the nasal cavity, the nasopharynx, the pterygopalatine fossa , and the ethm oid, sphenoid, and maxillary sinuses.III They reported no recurrences.

Likewise, Wormald and Van Hasselt reported no recurrences in 7 patients with lesions that had extended into the nasal cavity, paranasal sinuses, and pterygopalatine fossa , including those with minim al invasion into the infratemporal fossa."

Finally, Nicolai et al reported only I recurrence in 15 patients. The recurrent lesion was small and did not extend laterally. That patient had undergone conservative surgery that had not included dissection of the pterygopalatine fossa; also, the middle turbinate was spared. The amount of intraoperative blood loss in these 15 patients, all of whom underwent preoperative embolization, ranged from 80 to 600 ml (mean: 372).

Complications. In our study, we observed only 3 complications a ll synechia. Others have also reported a low incidence of complications.

CONCLUSION

In summary, we conclude that the transnasal endoscopic technique is an acceptable approach to the resection of JNAs without extensive lateral extension. Our study demonstrated a low degree of bleeding, a low recurrence rate, and minimal complications.

Although we did not perform preoperative embolization of the feeding arteries, we did not encounter massive intraoperative bleeding. Therefore, we believe that intraoperative bleedin g can be adeq uately co ntrolled with good hypotensive general anesthesia in patients whose tumor does not extend into the infratemporal fossa or cranium.

Recovery and earlier discharge in addition to less bleeding. However, involveme nt of the infratemporal fossa, anterior skull base, and orbit still requires a more invasive surgical approach," although Onerci et al recommended endoscop ic resection for lesions with minimal extension into the cra nium.

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CONFLICT OF INTERESTS

The authors declare the absence of obvious and potential conflicts of interest related to the publication of this article.

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AVAILABILITY OF DATA AND MATERIALS

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AUTHORS' CONTRIBUTIONS

All authors contributed to the design and interpretation of the study and to further drafts. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

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Авторы заявляют, что данная работа, её тема, предмет и содержание не затрагивают конкурирующих интересов.

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Авторы заявляют об отсутствии финансирования при проведении исследования.

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Все авторы внесли свой вклад в подготовку исследования и толкование его результатов, а также в подготовку последующих редакций. Все авторы прочитали и одобрили итоговый вариант рукописи.

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