ORIGINAL ARTICLE

Experience in the surgical management of juvenile angiofibroma from 2016 to 2022 at a national pediatric reference center in Peru

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ABSTRACT

Introduction: Juvenile angiofibroma is a benign neoplasm with a prominent vascular component, most frequently presenting with nasal obstruction and epistaxis. Studies on this pathology are scarce, with most consisting of case reports or small case series describing a single surgical approach.
Objectives: To describe the clinical characteristics, surgical management, and complications of juvenile angiofibroma in patients treated at the Instituto Nacional de Salud del Niño San Borja (Lima, Peru), from 2016 to 2022.
Materials and Methods: Observational, descriptive study including patients with a histopathological diagnosis of juvenile angiofibroma who underwent surgical treatment during the study period. Sociodemographic, clinical, and surgical variables were collected. Tumor staging was performed using the Andrews-Fisch classification.
Results: Seventy-four male patients with a mean age of 14 ± 1 years (range: 8–17 years) underwent surgical treatment. Sixty-six percent received a Le Fort I osteotomy, and 34 % underwent endoscopic surgery. Nasal obstruction was the predominant symptom in both groups, followed by epistaxis. Among tumors treated with Le Fort I osteotomy, 53 % were classified as stage IIIa, whereas 52 % of those treated endoscopically were classified as stage I. Two patients (4%) died due to surgical complications: one from cavernous sinus rupture during surgery, and the other from persistent status epilepticus on postoperative day four.
Conclusions: The surgical management of juvenile angiofibroma should be guided by the tumor's extension. Endoscopic surgery is recommended for stages I and II, while open surgery is suggested for stages III and IV. Maintaining a high level of clinical suspicion in cases of epistaxis is crucial for providing timely management, preferably through endoscopic surgery in the early stages.

Keywords: Angiofibroma; Surgical Procedures, Operative; Endoscopic Surgical Procedures; Osteotomy, Le Fort (Source: MeSH)

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Experiencia en el manejo quirúrgico del nasoangiofibroma juvenil durante 2016-2022 en un centro pediátrico de referencia nacional en Perú

RESUMEN

Introducción: El nasoangiofibroma juvenil es una neoplasia benigna con un componente vascular prominente, que se presenta con mayor frecuencia con obstrucción nasal y epistaxis. Los estudios sobre esta entidad son escasos, siendo la mayoría reportes de casos o series de casos pequeñas que describen un único abordaje quirúrgico.
Objetivos: Describir las características clínicas, el tratamiento quirúrgico y las complicaciones del nasoangiofibroma juvenil en pacientes del Instituto Nacional de Salud del Niño San Borja (Lima, Perú) atendidos entre el 2016 y 2022.
Materiales y métodos: Estudio observacional, descriptivo. Se incluyeron pacientes con diagnóstico anatomopatológico de nasoangiofibroma que fueron intervenidos quirúrgicamente durante el periodo de estudio. Se recolectaron variables sociodemográficas, clínicas y quirúrgicas. Se utilizó el sistema

Andrews-Fisch para la clasificación del grado de los tumores.
Resultados: Se intervinieron quirúrgicamente 74 casos, todos varones, con un promedio de edad de 14 ± 1 años (8-17 años). El 66 % recibió una osteotomía Le Fort I y el 34 % una cirugía endoscópica. La obstrucción nasal fue el síntoma predominante en ambos grupos quirúrgicos, seguida de la epistaxis. De los tumores intervenidos mediante osteotomía, el 53 % correspondió al grado IIIa, mientras que de los tumores intervenidos mediante cirugía endoscópica, el 52 % correspondió al grado I. Dos pacientes (4 %) fallecieron a consecuencia de complicaciones: uno por ruptura del seno cavernoso durante la cirugía y el otro por desarrollo de un estatus convulsivo persistente en el cuarto día postoperatorio.
Conclusiones: El tratamiento del nasoangiofibroma juvenil es quirúrgico y debe individualizarse según la extensión tumoral. Se recomienda la cirugía endoscópica para los grados I y II, mientras que para los grados III y IV se sugiere la cirugía abierta. Es fundamental mantener un alto nivel de sospecha diagnóstica ante la epistaxis, para brindar un tratamiento oportuno, preferentemente endoscópico en los estadios iniciales.

Palabras clave: Angiofibroma; Endoscopía; Osteotomía Le Fort; Neoplasias Nasofaríngeas (Fuente: DeCS)

INTRODUCTION

Nasopharyngeal angiofibroma, also known as juvenile nasopharyngeal angiofibroma, is a highly vascularized benign neoplasm that originates from the terminal branch of the sphenopalatine artery, located at the sphenopalatine foramen. This tumor occurs predominantly in adolescent males, although cases in other age groups, and exceptionally in female patients, have also been reported. (1-4)

Although benign, this tumor has a soft consistency and, due to its growth, causes bone remodeling through displacement rather than destruction. Nasal obstruction is the predominant symptom, followed by epistaxis; both are the most frequently described complaints among patients. As the tumor grows, it extends from the nasopharynx and nasal cavity toward adjacent structures, involving the maxillary, sphenoidal, and ethmoidal sinuses, as well as the orbit, oropharynx, zygomatic fossa, and pterygomaxillary fossa. (1-9)

At the orbital level, nasopharyngeal angiofibroma may cause exophthalmos or blindness. It can also result in facial asymmetry due to the increased volume of soft tissues as it extends below the zygomatic arch. In advanced stages, intracranial invasion may occur, with involvement of the cavernous sinus and optic chiasm. (1-10)

Contrast-enhanced computed tomography (CT) and magnetic resonance imaging (MRI) are the diagnostic modalities of choice to determine tumor extension, according to the Andrews-Fisch classification (Table 1). MRI is particularly useful for assessing intracranial and orbital involvement, whereas CT allows for better delineation of bone structures.

The therapeutic approach is surgical and aims to achieve complete tumor resection, regardless of stage (2-8). Two main surgical techniques are used worldwide: endoscopic and conventional (open) surgery. However, comparative studies between the two approaches remain limited.

Preoperative embolization represents a crucial step in reducing blood supply, resulting in an approximate 80% decrease in vascularity on post-procedure imaging. Surgery is recommended after 48 hours, due to the inflammatory response following embolization, but should be performed within 10 days to avoid revascularization (2-12).

Open surgery remains a valid option for managing stage III and IV tumors, as it provides direct access for tumor dissection and manipulation. This approach, however, is associated with increased intraoperative bleeding, particularly during bone sectioning and tumor removal, especially when fragmentation is required for extraction. The most commonly used open approaches include Le Fort I osteotomy, facial disassembly, and the midfacial degloving technique (1-14).

Endoscopic surgery has shown favorable outcomes as its use has become more widespread. Initially employed for early-stage tumors, several series have also reported its application in stage III cases or recurrences (1,3,5,8-12).

Complete tumor resection is demanding but achievable with both techniques, and success depends on tumor stage as well as the surgeon's experience. Intraoperative bleeding is typically minimal with the endoscopic approach, whereas greater blood loss is common in open surgery (2-7,13,14).

Reported complications include nasal synechiae, septal perforation, blindness, velopharyngeal insufficiency, and tooth loss. In severe cases, hypovolemic shock may occur due to intraoperative hemorrhage. Regardless of the surgical technique used, recurrences may develop (3-7).

This condition is often diagnosed at advanced stages, requiring specialized management and the participation of experienced professionals; thus, patients are typically referred to tertiary care centers.

Few studies on this pathology have been conducted at the national, regional, or international level, most of which are case reports or case series that employ a single surgical approach (13,14). This study aims to describe the clinical features, surgical techniques, and complications associated with juvenile nasopharyngeal angiofibroma in patients treated at the Instituto Nacional de Salud del Niño San Borja from 2016 to 2022. The goal is to generate nationwide evidence to inform surgical decision-making, improve clinical outcomes, and guide resource allocation in pediatric centers managing this condition.

METHODS

Study design and population

A retrospective descriptive study was conducted based on the review of medical records. All patients with a histopathological diagnosis of juvenile nasopharyngeal angiofibroma who underwent surgical treatment between January 2016 and December 2022 at the Instituto Nacional de Salud del Niño San Borja were identified.

The only inclusion criterion was confirmation of juvenile nasopharyngeal angiofibroma by histopathological examination. Medical records of patients with diagnoses other than the condition under study or with insufficient data for analysis were excluded from the study.

Procedures, variables, and data analysis

Medical records and corresponding computed tomography (CT) images were reviewed. Data were collected on the following variables: epidemiological characteristics (sex and age), clinical manifestations (signs and symptoms), type of surgery performed (Le Fort I or endoscopic), tumor stage according to the Andrews-Fisch classification, previous surgeries (Le Fort I or endoscopic), preoperative hemoglobin level (g/dL), intraoperative blood loss (mL), number of packed red blood cell units transfused, and postoperative complications.

The Andrews-Fisch classification guides the selection of the surgical approach according to the degree of tumor extension and skull base invasion. The classification categories are detailed in Table 1.

Table 1. Andrews-Fisch classification of juvenile nasopharyngeal angiofibroma

Stage	Description
I	Limited to the nasal cavity and/or nasopharynx.
II	Invades the pterygopalatine fossa or the maxillary, ethmoid, or sphenoid sinuses.
IIIa	Invades the infratemporal fossa or orbit without intracranial involvement.
IIIb	Invades the infratemporal fossa or orbit with extradural (parasellar) intracranial involvement.
IVa	Intracranial tumor without infiltration of the cavernous sinus, optic chiasm, or pituitary gland.
IVb	Intracranial tumor with infiltration of the cavernous sinus, optic chiasm, or pituitary gland.

Source: Andrews et al. (11)

All patients underwent evaluation with contrast-enhanced facial CT scans for surgical planning. In addition, those with stage III or IV tumors also underwent brain magnetic resonance imaging (MRI). The endoscopic approach was indicated for stage I tumors and, in selected stage II cases, at the surgeon's discretion. In contrast, stage III and IV tumors were treated using the Le Fort I osteotomy approach.

Preoperative embolization was required for cases managed endoscopically, but was not deemed indispensable for the open technique. The procedure was performed using polyvinyl alcohol (PVA) particles or Onyx, within a time frame ranging from the day of surgery to up to seven days prior to it.

The variables of interest were tabulated and analyzed using Numbers® software (Apple, USA).

Ethical considerations

This study was conducted in accordance with the fundamental ethical principles outlined in the Declaration of Helsinki, ensuring confidentiality and the exclusive use of information for research purposes. The study protocol was approved by the Institutional Ethics Committee of the Instituto Nacional de Salud del Niño San Borja (code PI-228-2018).

RESULTS

A total of 74 cases of juvenile nasopharyngeal angiofibroma that underwent surgery during the study period were identified; all patients were male. Table 2 presents the frequency distribution and percentages of patients by age range, stratified according to the type of surgery performed.

Table 2. Age distribution according to surgical approach

Age range (years)	Le Fort I osteotomy		Endoscopic surgery	
	n	%	n	%
8–10	2	4.1	1	4
11–12	12	24.5	5	20
13–14	23	46.9	6	24
15–17	12	24.5	13	52
Total	**49**	**100**	**25**	**100**

The mean age of the overall population was 14 ± 1 years (range: 8-17 years). Among patients who underwent endoscopic surgery, the mean age was 14.1 ± 1.8 years, whereas in those treated with open surgery, it was 13.4 ± 1.9 years. Most patients in the endoscopic group were between 15 and 17 years of age, while in the osteotomy group, the predominant age range was 13 and 14 years.

Regarding clinical presentation, nasal obstruction was the predominant symptom across all tumor stages, followed by epistaxis (Table 3).

Forty-nine patients (66%) underwent open surgery using the Le Fort I approach, and 25 (34%) were treated endoscopically. In the Le Fort I group, nasal obstruction was reported in 95.9% of cases, and epistaxis in 67.3%. In contrast, in the endoscopic group, both symptoms occurred in 100% and 92% of patients, respectively. Seventeen patients (23%) had a history of prior surgery for the same pathology.

Among patients treated via the Le Fort I approach, 53.1% had stage IIIa tumors, whereas in the endoscopic group, 52% had stage I disease. Figure 1 illustrates pre- and postoperative CT findings from a representative patient with a stage IVa tumor treated by Le Fort I osteotomy. Regarding tumor extension, larger areas of involvement were observed in patients who underwent the Le Fort approach. In three cases, nasopharyngeal involvement was absent, as these corresponded to recurrences in other sites (Table 4).

Among patients treated endoscopically, 21 (84%) underwent their first surgical intervention at the institution, while 4

Table 3. Clinical presentation according to tumor stage based on the Andrews-Fisch classification

Clinical presentation	Stage I	Stage II	Stage IIIa	Stage IIIb	Stage IVa	Stage IVb	Total
Nasal obstruction	13	18	24	9	7	1	72
Epistaxis	13	14	16	7	4	1	55
Oropharyngeal mass	0	1	6	2	3	0	12
Facial mass	0	0	3	3	2	0	8
Nasal mass	0	0	1	1	1	0	3
Headache	0	1	0	1	0	1	3
Blindness	0	0	0	1	0	1	2
None	0	0	2	0	0	0	2
Dizziness	0	0	0	0	0	1	1
Otalgia	0	1	0	0	0	0	1

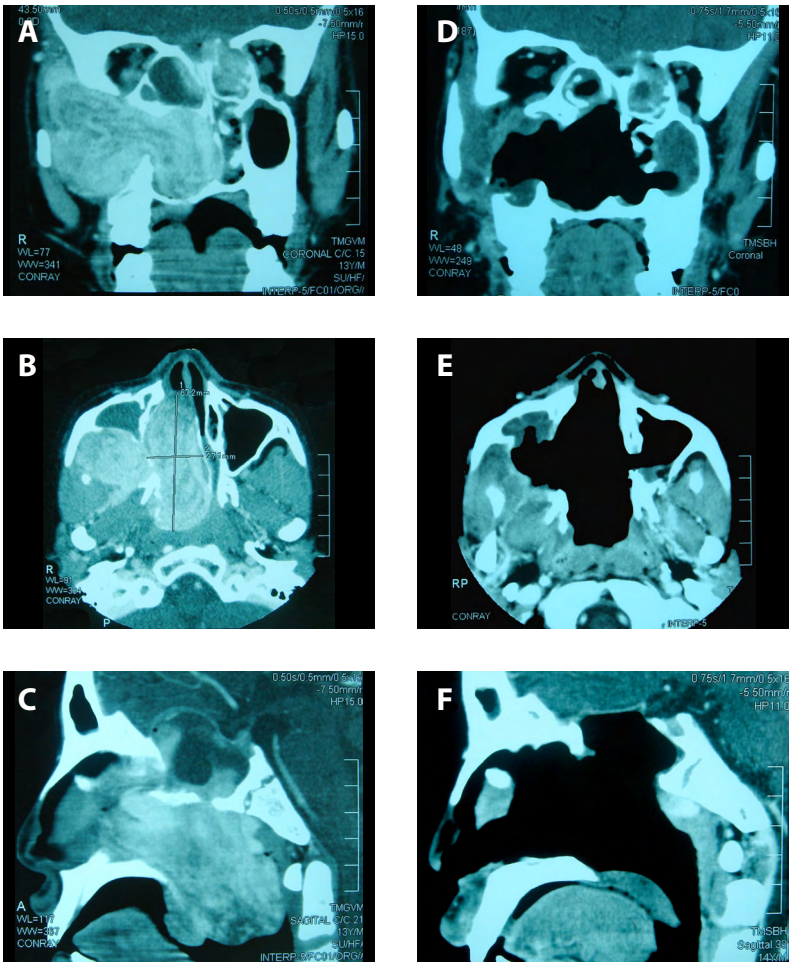

Figure 1. Preoperative and postoperative CT scans of a patient with a stage IVa tumor treated with Le Fort I osteotomy.
Preoperative (**A**-**C**) and postoperative (**D**-**F**) images: coronal (**A**, **D**), axial (**B**, **E**), and sagittal (**C**, **F**) sections.

(16%) had previous surgeries. Two had previously undergone a transpalatine approach and two an endoscopic resection. In one endoscopic case, intraoperative conversion to an open Le Fort I approach was required due to profuse nasal bleeding and limited visualization of the surgical field. All endoscopic cases underwent preoperative embolization, with a mean interval of 2.2 days between procedures (range: 1-6 days). Tumor recurrence occurred in three patients (12%), involving the pterygopalatine fossa, all of which were subsequently treated with open surgery.

Table 4. Distribution of tumor stages and involved regions according to surgical approach

Andrews-Fisch classification	Le Fort I osteotomy		Endoscopic surgery	
	n	%	n	%
Stage I	1	2	13	52
Stage II	5	10.2	12	48
Stage IIIa	26	53.1	0	0
Stage IIIb	9	18.4	0	0
Stage IVa	7	14.3	0	0
Stage IVb	1	2	0	0
Total	**49**	**100**	**25**	**100**
Involved region	n	%	n	%
Nasopharynx	46	93.9	25	100
Sphenoid sinus	43	87.8	6	24
Nasal cavity	41	83.7	17	68
Ethmoid sinuses	41	83.7	3	12
Pterygomaxillary fossa	39	79.6	10	40
Oropharynx	31	63.3	8	32
Maxillary sinuses	29	59.2	0	0
Middle cranial base	20	40.8	0	0
Orbital cavity	17	34.7	0	0
Zygomatic fossa	9	18.4	0	0
Buccal region	6	12.2	0	0
Anterior cranial base	2	4.1	0	0

In the 49 cases managed through open surgery, tumor resection was performed via Le Fort I osteotomy with opening of the nasal floor on the affected side. For osteosynthesis, titanium plates and screws were used in 40 cases (81.6%), wire cerclage in 5 cases (10.2%), and resorbable materials in 4 cases (8.2%). All patients maintained adequate occlusal stability and resumed a soft diet between the second and third postoperative day after discharge from intensive care. Three patients (6.1%) required an additional frontoparietotemporal craniotomy to access the intracranial tumor component. In these cases, partial resection was achieved, and treatment was completed with radiosurgery one month after the last operation.

One unexpected event occurred in a patient who presented massive bleeding (1500 mL) through the oral and nasal cavities one day before surgery. The patient was intubated, packed, transfused, and underwent surgery on the following day. In nine patients (18.4%) from the Le Fort group, preoperative embolization was not performed due to technical equipment failures. The mean interval between embolization and surgery was 2.4 days. Among the 49 patients treated by the Le Fort approach, 36 (73.6%) underwent their first surgery at the institution. Four patients (8.2%) had previously undergone two endoscopic procedures (one combined with a Le Fort osteotomy), and nine (18.4%) had only one prior Le Fort I surgery.

Among patients with a previous surgical history, eight procedures (six Le Fort, one endoscopic, and one combined) were performed at the same institution, and five procedures (one Le Fort and four endoscopic) were performed at other centers, all of which were categorized as recurrent surgeries (Table 5). The interval between the first and second procedure ranged from six to 30 months (mean: 14.4 months).

Table 5. Surgical history according to surgical approach

Previous surgeries	Le Fort I osteotomy		Endoscopic surgery	
	n	%	n	%
Le Fort I osteotomy	9	18	0	0
One endoscopic surgery	2	4	2	8
Transpalatine approach	0	0	2	8
Two endoscopic surgeries	1	2	0	0
Two endoscopic + one Le Fort I surgery	1	2	0	0
Total	**13**	**27**	**4**	**16**

Note: The table includes only patients with recurrent tumors.

Table 6 presents the distribution of patients according to the number of transfused packed red blood cell (PRBC) units and intraoperative blood loss, stratified by surgical approach. Most patients in the Le Fort group received 3-5 PRBC units (49%), with a mean of 2.4 ± 2.9 units (300 mL each) and a range of 0-18 units. The mean preoperative hemoglobin level was 12.9 g/dL, and the mean intraoperative blood loss per patient was 1441 mL.

In the endoscopic group, 76% received 1-2 PRBC units, with a mean of 1.6 ± 1.2 units (300 mL each) and a range of 0-4. The mean preoperative hemoglobin level was 9.3 g/dL, and the mean blood loss per patient was 348 mL. Most patients experienced blood loss ranging from 0 to 999 mL in both groups: 51% in the Le Fort group and 96% in the endoscopic group (Table 6).

Two patients (4%) experienced complications with fatal outcomes. The first case involved cavernous sinus rupture during surgery, resulting in massive bleeding that required packing and suturing of the lesion. The patient subsequently developed massive cerebral edema during the postoperative period and died four days after surgery. The second case corresponded to a patient with a history of epilepsy who developed persistent status epilepticus on postoperative day

4, with no previous episodes. The patient was later diagnosed with brain death and died nine days after the convulsive crisis.

In one endoscopic case, intraoperative conversion to a Le Fort I approach was required due to profuse bleeding that limited visualization of the surgical field.

Table 6. Volume of blood loss and number of transfused blood units according to surgical approach

Number of transfused blood units	Le Fort I osteotomy		Endoscopic surgery	
	n	%	n	%
1–2	14	28.6	19	76
3–5	24	49	6	24
6–9	7	14.3	0	0
≥10	4	8.2	0	0
Total	**49**	**100**	**25**	**100**
Blood loss volume (mL)	n	%	n	%
0-999	25	51	24	96
1,000 - 1,999	14	28.6	1	4
2,000 - 2,999	6	12.2	0	0
3,000 - 3,999	2	4.1	0	0
>4,000	2	4.1	0	0
Total	**49**	**100**	**25**	**100**

Patient follow-up was conducted at 2, 6, and 12 months postoperatively and then annually for three years, including clinical evaluation and contrast-enhanced CT or MRI as indicated at semiannual and annual visits. No recurrences were observed beyond three years of follow-up.

DISCUSSION

This study described the surgical management of juvenile nasopharyngeal angiofibroma (JNA) using two treatment modalities selected according to tumor stage. All patients were adolescent males, with nasal obstruction as the predominant symptom in both surgical groups.

Most cases were managed through open surgery with Le Fort I osteotomy, while a smaller number were treated endoscopically. In the national literature, only small series have been reported, including two pediatric studies in which Le Fort I osteotomy was used as the sole or predominant surgical approach (28 out of 29 patients). (13,14) In addition, two theses described the use of techniques other than Le Fort osteotomy or endoscopic surgery for JNA management. One reported the use of a transpalatine approach, alone or combined with other techniques in most cases, while the other employed a midfacial degloving approach combined with facial disassembly and transpalatine surgery (15,16).

According to international literature, JNA predominantly affects males and typically presents during adolescence or in nearby age groups. In this regard, the ages observed in this series (mean: 14 years) are consistent with reports by Iovanescu *et al.* (1) (mean: 15 years) and Mello-Filho *et al.* (2) (mean: 15.08 years), which describe a typical presentation during adolescence. In contrast, previous studies (1,4) have reported that cases may also occur in children younger than twelve years, as evidenced by the nine patients in our series, all of whom presented with advanced-stage tumors.

Although these tumors are histologically benign, they display aggressive and locally destructive behavior. In this series, only 14 cases (18.7%) were classified as stage I, which is comparable to the 21.2% reported by Mell-Filho *et al.* (2), whereas most cases corresponded to more advanced tumors (stages III and IV).

Endoscopic surgery is currently considered the preferred technique, largely due to earlier diagnosis allowing identification of initial or intermediate lesions (17). However, several studies have reported its application in advanced-stage tumors (18-20), and even in combination with other approaches such as midfacial degloving (3). For this procedure, preoperative embolization is recommended to reduce intraoperative bleeding.

In our series, one patient with a stage I tumor, despite having undergone embolization, experienced intraoperative bleeding of 900 mL, which compromised endoscopic visualization. In this case, conversion to a Le Fort I osteotomy was necessary, allowing tumor resection and bleeding control.

Similarly, three patients with stage I tumors could not undergo endoscopic surgery due to technical equipment failures that prevented embolization; therefore, a Le Fort I approach was selected. This underscores the importance of ensuring that the surgical team is prepared to address such technical contingencies, which may occur unpredictably in clinical practice.

In our population, most patients present with stage III or IV tumors, often with prolonged disease evolution, recurrent severe epistaxis, and extensive lesions, reflecting barriers to timely access to specialized care. In contrast, early-stage cases (I or II) are rare and usually detected incidentally or through clinical suspicion.

Delayed diagnosis, whether due to delayed consultation by parents or lack of early recognition by healthcare providers, often leads to presentation at advanced stages (III-IV), explaining the high proportion of open surgeries. Although endoscopic surgery is increasingly used (21,22), its implementation depends on the availability of both endoscopic equipment and preoperative embolization facilities. As an early detection strategy, any male pediatric patient presenting with epistaxis should be promptly referred to a specialist.

For stage I and II tumors with limited lateral extension, endoscopic surgery is the first-line treatment, reserving open surgery for cases in which endoscopic resection is not feasible. For stage III and IV tumors, open surgery via Le

Fort I osteotomy remains the procedure of choice because it provides superior access to the lateral facial regions where tumor extension occurs, in comparison with other approaches or their combinations, as reported by Mello-Filho *et al.* (2).

Although intraoperative blood loss in open surgery is greater than in endoscopic procedures, even after preoperative embolization, it is important to highlight that larger tumors are inherently associated with higher bleeding risk and greater likelihood of serious complications. Involvement of the middle cranial base is a determining factor for achieving complete or partial resection (5-7).

Intracranial extension usually occurs through displacement of brain tissue rather than dural invasion. In such cases, when the meninges remain intact, resection can be performed through the nasopharyngeal route, with caution due to the proximity of vital structures. Radiosurgery also represents a therapeutic option for treating residual, unresectable lesions involving the cavernous sinus or optic chiasm (6,7).

After hospital discharge, follow-up was standardized at 2 and 6 months postoperatively and annually for 3 years, including clinical evaluation and contrast-enhanced imaging. Each patient underwent at least three imaging studies during follow-up. No data were available beyond the 3-year period, which constitutes a limitation of this study.

Additional limitations include the descriptive design and relatively small sample size, which restrict the scope and generalizability of the findings. Furthermore, no analyses were performed to assess associations between variables or to compare patient subgroups; therefore, interpretation of results is limited to a strictly descriptive approach. Nevertheless, given the rarity of this condition in the pediatric population, this study contributes meaningful data to the existing literature by providing relevant information on the clinical characteristics and surgical management of this uncommon entity.

During the study period, two patients died: one due to cavernous sinus rupture and the other from persistent status epilepticus. Cavernous sinus rupture, which may cause massive hemorrhage, represents a particularly high risk in stage IV tumors because this region lies within the tumor mass and is difficult to access via the Le Fort I approach. As a management strategy, partial tumor preservation in the cavernous sinus region may be advisable, followed by subsequent resection through a cranial approach or treatment with radiosurgery. In the presence of persistent status epilepticus, pharmacological therapy remains the first-line treatment; however, in this patient, medical management failed to control the complication.

CONCLUSIONS

The treatment of juvenile nasopharyngeal angiofibroma is primarily surgical, with the choice of approach determined by the extent of the tumor. Endoscopic surgery is recommended for stage I and II tumors according to the Andrews-Fisch classification, provided there is no maxillary sinus involvement that limits access to the internal maxillary artery. For stage III and IV tumors, open surgery is advised, with possible craniotomy at a later stage in cases of intracranial extension, and complementary radiosurgery when residual macroscopic disease remains unresectable.

Small, medially located recurrences can be managed endoscopically, whereas larger or laterally located lesions generally require a Le Fort-type approach. During endoscopic procedures, technical complications or hemorrhage that impede visualization of the surgical field may necessitate conversion to open surgery.

A high index of diagnostic suspicion must be maintained in adolescents presenting with epistaxis in order to ensure timely treatment, preferably through an endoscopic approach during early stages.

This study provides relevant evidence for the national context, given the substantial series of juvenile nasopharyngeal angiofibroma cases analyzed, despite being limited to the experience of a single center.

Future research should focus on multicenter studies with larger patient cohorts to enable comparative analyses and assess associations between surgical techniques and postoperative clinical outcomes. Such studies would help strengthen follow-up strategies and optimize clinical results in this population.

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