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Original Research Article

Role of Endoscopic Versus Open Approaches in Extensive Juvenile Nasopharyngeal Angiofibroma: A Comparative Study

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Abstract:

Background: Juvenile nasopharyngeal angiofibroma (JNA) is a rare, benign but locally aggressive vascular tumor predominantly affecting adolescent males. The tumor commonly arises from the posterolateral wall of the nasopharynx and has a strong tendency to extend into the pterygopalatine fossa, infratemporal fossa, orbit, and intracranial region. Surgical excision remains the treatment of choice. Traditionally, open surgical approaches were employed for extensive lesions; however, endoscopic techniques have gained popularity due to improved visualization, reduced morbidity, and shorter recovery time.

Aim: To compare outcomes of endoscopic and open surgical approaches in extensive juvenile nasopharyngeal angiofibroma in terms of operative time, blood loss, complications, recurrence, and hospital stay.

Methods: This prospective comparative study was conducted at Nalanda Medical College and Hospital, Patna, from November 2023 to November 2025. A total of 30 diagnosed cases of extensive JNA were included. Patients underwent either endoscopic excision or open surgical excision depending on tumor stage and surgical feasibility. Preoperative embolization was performed in eligible cases. Data were analyzed using SPSS software. Continuous variables were compared using independent t-test and categorical variables using Chi-square test. A p-value <0.05 was considered statistically significant.

Results: Out of 30 patients, 17 underwent endoscopic excision and 13 underwent open surgery. Mean intraoperative blood loss was significantly lower in the endoscopic group ($p<0.001$). Hospital stay was shorter in the endoscopic group ($p<0.001$). Complication rates were higher in open approaches. Recurrence was slightly higher in open group but was not statistically significant.

Conclusion: Endoscopic surgery is a safe and effective option for extensive juvenile nasopharyngeal angiofibroma with reduced blood loss, fewer complications, and shorter hospitalization. Open approaches remain useful for select advanced lesions with extensive intracranial or lateral extension.

Keywords: Juvenile nasopharyngeal angiofibroma, Endoscopic excision, Open surgery, Embolization, Recurrence, Blood loss.

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Introduction

Juvenile nasopharyngeal angiofibroma (JNA) is an uncommon benign tumor arising almost exclusively in adolescent males and accounts for less than 0.5% of all head and neck tumors. Despite its benign histopathology, JNA exhibits aggressive behavior with progressive local invasion and significant risk of hemorrhage due to its hypervascular nature. The tumor typically originates near the superior margin of the sphenopalatine foramen and spreads along natural tissue planes into adjacent anatomical compartments such as the nasal cavity, paranasal sinuses, pterygopalatine fossa, infratemporal fossa, orbit, and intracranial region. [1]

Clinically, the most common presenting symptoms include recurrent epistaxis, unilateral nasal obstruction, facial swelling, rhinorrhea, conductive hearing loss, and headache. In advanced cases, proptosis, cranial nerve involvement, and visual impairment may occur due to orbital or intracranial extension. [2] The diagnosis is primarily based on clinical suspicion, nasal endoscopy findings, and radiological imaging. Contrast-enhanced computed tomography (CT) and magnetic resonance imaging (MRI) are essential for assessing tumor extent, bone remodeling, intracranial involvement, and vascularity. [3]

Angiography plays a crucial role in identifying feeding vessels, which most commonly arise from

the internal maxillary artery. Preoperative embolization is widely practiced reducing intraoperative bleeding and improve surgical outcomes. [4] Surgery remains the gold standard treatment, with radiotherapy and medical therapy reserved for unresectable or recurrent lesions. [5]

Multiple staging systems have been proposed to categorize tumor extent, including the Radkowski staging system, which is widely utilized due to its clinical relevance and surgical guidance. Tumor staging significantly influences surgical planning and choice of approach. [6] Traditionally, extensive JNA lesions were managed using open approaches such as transpalatal, lateral rhinotomy, midfacial degloving, transmaxillary, infratemporal fossa approaches, and craniofacial resections. While these approaches provide good exposure, they are associated with significant morbidity including facial scarring, blood loss, prolonged hospitalization, and complications such as malocclusion and facial growth disturbances. [7]

Over the past two decades, advancements in endoscopic sinus surgery and instrumentation have enabled endoscopic removal of JNA, even in advanced stages. The endoscopic approach provides superior magnification, improved visualization of tumor margins, reduced blood loss, and less postoperative morbidity. Additionally, the absence of external incisions offers better cosmetic outcomes. [8] However, concerns persist regarding completeness of tumor removal in extensive lesions and the risk of recurrence due to limited lateral access. [9]

Recent literature suggests that endoscopic surgery can be safely performed for selected advanced-stage tumors, particularly when supported by preoperative embolization and experienced surgical teams. [10] Therefore, the present study aims to compare endoscopic and open approaches in extensive juvenile nasopharyngeal angiofibroma, focusing on surgical outcomes, complications, and recurrence rates.

Materials and Methods

Study Design: Prospective comparative hospital-based study.

Study Place: Department of ENT & Head Neck Surgery, Nalanda Medical College and Hospital, Patna.

Study Duration: November 2023 to November 2025.

Sample Size: 30 patients.

Inclusion Criteria

- Male patients aged 10–25 years
- Radiologically confirmed juvenile nasopharyngeal angiofibroma
- Extensive lesions (Radkowski stage II and III)
- Patients who underwent surgical excision (endoscopic or open)

Exclusion Criteria

- Patients unfit for surgery
- Patients with incomplete imaging records
- Patients lost to follow-up before 6 months
- Recurrent tumors operated elsewhere previously

Preoperative Evaluation

All patients underwent:

- Diagnostic nasal endoscopy
- Contrast-enhanced CT scan
- MRI brain/paranasal sinuses if intracranial extension suspected
- Digital subtraction angiography (DSA)
- Preoperative embolization (within 24–48 hours before surgery in eligible cases)

Surgical Approaches

Endoscopic Approach: Tumor excision performed using transnasal endoscopic technique with wide sphenoidotomy, ethmoidectomy, and pterygopalatine fossa dissection as required.

Open Approach

Depending on extension, open surgeries included:

- Transmaxillary approach
- Midfacial degloving
- Lateral rhinotomy
- Infratemporal fossa approach

Outcome Measures

- Operative time (minutes)
- Intraoperative blood loss (ml)
- Blood transfusion requirement
- Hospital stays (days)
- Complications
- Recurrence rate (follow-up at 6 months, 12 months, 18 months)

Statistical Analysis: All collected data were entered into Microsoft Excel and analyzed using SPSS software (version 26.0). Continuous variables such as age, operative time, intraoperative blood loss, number of transfused units, and duration of hospital stay were expressed as mean ± standard deviation (SD), while categorical variables such as clinical symptoms, tumor stage distribution, transfusion requirement, postoperative complications, and recurrence were expressed as frequency and percentage. Comparison of continuous variables between the endoscopic and open surgery groups was performed using the Independent Student's t-test, whereas categorical variables were compared using the Chi-square test or Fisher's exact test when

expected cell frequency was less than five. A p-value <0.05 was considered statistically significant, and results were interpreted with a 95% confidence interval (CI).

Results

A total of 30 patients diagnosed with extensive juvenile nasopharyngeal angiofibroma were included in this study. Patients were categorized into two groups based on the surgical approach used: endoscopic approach (n = 17) and open approach (n = 13).

1. **Demographic Characteristics**

The overall mean age of patients was 16.8 ± 3.1 years (range: 11–24 years). The mean age in the endoscopic group was 16.5 ± 3.2 years, whereas in the open surgery group it was 17.2 ± 2.9 years. The difference in age distribution between the two groups was not statistically significant (p = 0.41).

All patients included in the study were male, consistent with the known epidemiological profile of the disease.

The baseline demographic characteristics are summarized in **Table 1**.

Table 1: Baseline Demographic Profile of Patients (n = 30)

Variable	Endoscopic Group (n=17)	Open Group (n=13)	p-value
Mean Age (years)	16.5 ± 3.2	17.2 ± 2.9	0.41
Age Range (years)	11–23	12–24	-
Male (%)	17 (100%)	13 (100%)	-

As shown in Table 1, both groups were comparable in demographic distribution.

2. **Clinical Presentation**

The most common presenting complaints were recurrent epistaxis and unilateral nasal obstruction, seen in almost all patients. Epistaxis was present in 94.1% of patients in the endoscopic group and 96.1% in the open group. Nasal obstruction was observed in 100% of patients in both groups.

Symptoms suggestive of advanced disease such as facial swelling, headache, and proptosis were relatively more common in the open surgery group.

The distribution of presenting symptoms is shown in Table 2.

Table 2: Clinical Presentation of Patients

Symptom/Sign	Endoscopic (n=17)	Open (n=13)	p-value
Epistaxis	16 (94.1%)	13 (96.1%)	0.72
Nasal obstruction	17 (100%)	13 (100%)	-
Rhinorrhea	9 (52.9%)	7 (53.8%)	0.94
Facial swelling	5 (26.4%)	6 (42.3%)	0.18
Headache	6 (35.2%)	8 (57.7%)	0.09
Proptosis	2 (11.7%)	3 (23.1%)	0.24
Hearing loss	4 (20.5%)	5 (34.6%)	0.23

As demonstrated in Table 2, the clinical presentation was broadly comparable between the two groups.

3. **Tumor Stage Distribution (Radkowski Classification)**

Tumor staging was performed using the Radkowski staging system. The majority of patients belonged to Stage IIB and Stage IIIA. Stage III tumors were relatively more frequent in the open surgery group.

The tumor stage distribution is presented in Table 3.

Table 3: Tumor Stage Distribution (Radkowski Classification)

Stage	Endoscopic (n=17)	Open (n=13)	p-value
Stage IIA	4 (23.5%)	2 (15.4%)	0.29
Stage IIB	8 (47.0%)	5 (38.5%)	0.66
Stage IIIA	4 (23.5%)	5 (38.5%)	0.34
Stage IIIB	1 (5.8%)	1 (7.6%)	0.41

As shown in Table 3, there was no statistically significant difference in stage distribution between groups.

4. **Operative Parameters**

Operative outcomes were evaluated in terms of operative time, intraoperative blood loss, transfusion requirement, and residual tumor.

Similarly, mean intraoperative blood loss was

significantly lower in the endoscopic group (520 ± 180 ml) compared to the open group (980 ± 250 ml) ($p < 0.001$) (Figure 1).

The mean operative time was significantly shorter in the endoscopic group (165 ± 35 minutes) compared to the open group (210 ± 40 minutes) ($p < 0.001$) (Figure 2).

The blood transfusion requirement was significantly higher in the open group (65.4%) compared to the endoscopic group (23.5%) ($p = 0.002$) (Figure 3).

These operative outcomes are summarized in Table 4.

Table 4: Comparison of Operative Outcomes Between Groups

Parameter	Endoscopic (n=17)	Open (n=13)	p-value
Operative time (minutes)	165 ± 35	210 ± 40	<0.001*
Blood loss (ml)	520 ± 180	980 ± 250	<0.001*
Blood transfusion required	4 (23.5%)	9 (65.4%)	0.002*
Mean units transfused	1.2 ± 0.4	2.4 ± 0.7	<0.001*
Residual tumor intraoperatively	1 (5.8%)	2 (15.4%)	0.21

As seen in Table 4, the endoscopic approach demonstrated significantly superior intraoperative outcomes.

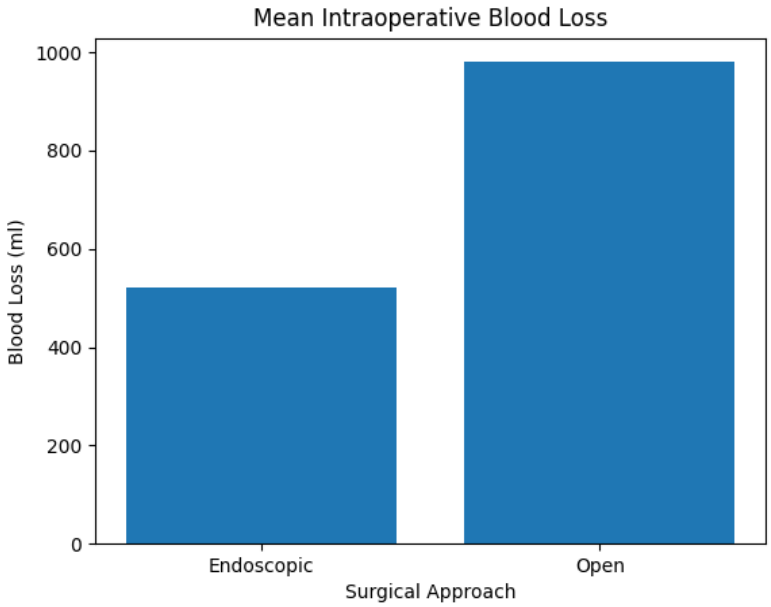

Figure 1: Comparison of Mean Intraoperative Blood Loss

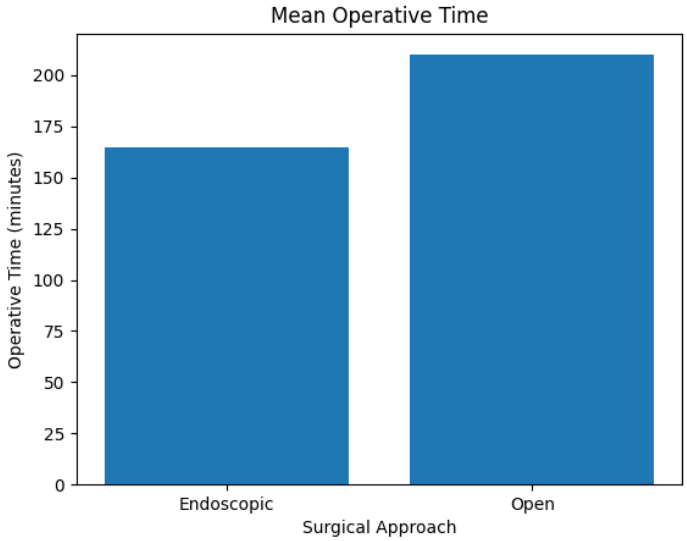

Figure 2: Comparison of Mean Operative Time

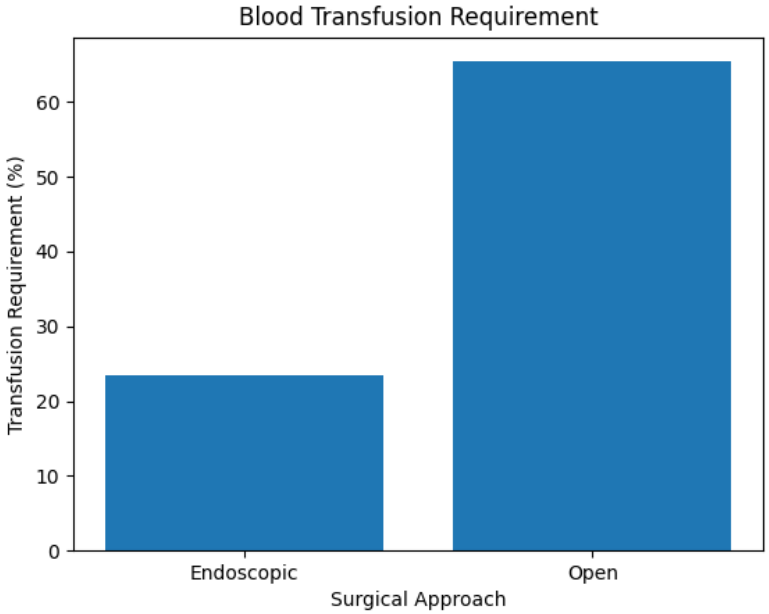

Figure 3: Blood Transfusion Requirement

5. **Hospital Stay and Postoperative Recovery**

The mean duration of hospital stay was significantly shorter in the endoscopic group (4.6 ± 1.2 days) compared to the open group (9.3 ± 2.1 days) ($p < 0.001$).

This is summarized in Table 5.

Table 5: Comparison of Hospital Stay

Parameter	Endoscopic	Open	p-value
Hospital stays (days)	4.6 ± 1.2	9.3 ± 2.1	<0.001*

The difference in hospital stay is graphically illustrated in Figure 4.

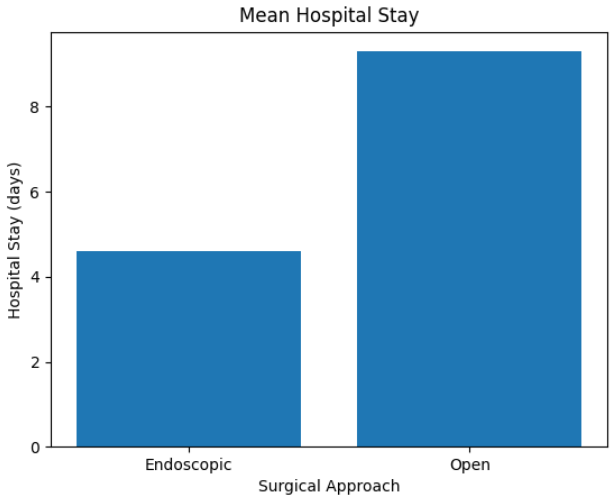

Figure 4: Comparison of Mean Hospital Stay

6. **Postoperative Complications**

Postoperative complications were observed more frequently in the open surgery group. Facial numbness and palatal fistula were significantly more common in open approaches.

The complication profile is presented in Table 6.

Table 6: Postoperative Complications in Both Groups

Complication	Endoscopic (n=17)	Open (n=13)	p-value
Facial numbness	1 (5.8%)	3 (23.1%)	0.01*
Palatal fistula	0 (0%)	2 (15.4%)	0.04*
Septal perforation	1 (5.8%)	1 (7.6%)	0.71
Wound infection	1 (5.8%)	2 (15.4%)	0.08
Postoperative bleeding	1 (5.8%)	3 (23.1%)	0.11
CSF leak	0 (0%)	1 (7.6%)	0.25

As demonstrated in Table 6, complication rates were higher in open surgery, with facial numbness and palatal fistula showing statistical significance.

7. **Recurrence and Follow-up Outcomes**

Patients were followed at 6 months, 12 months, and 18 months postoperatively.

Recurrence was slightly higher in the open surgery group, although the difference was not statistically significant.

The recurrence data is summarized in Table 7.

Table 7: Recurrence Rate Comparison

Follow-up Period	Endoscopic (n=17)	Open (n=13)	p-value
6 months	1 (5.8%)	1 (7.6%)	0.38
12 months	1 (5.8%)	2 (15.4%)	0.41
18 months	1 (5.8%)	2 (15.4%)	0.21

As shown in Table 7, recurrence rates were lower in the endoscopic group, though the difference did not reach statistical significance.

Summary of Results

Overall, the endoscopic approach demonstrated superior outcomes when compared to the open surgical approach. It was associated with significantly reduced intraoperative blood loss, shorter operative time, and a markedly lower requirement for blood transfusion. In addition, patients who underwent endoscopic excision experienced fewer postoperative complications and a significantly shorter duration of hospital stay, reflecting faster recovery and reduced morbidity. Importantly, despite these advantages, the recurrence rates observed with the endoscopic approach were comparable to those seen with open surgery. Collectively, these findings indicate that the endoscopic technique provides better perioperative and postoperative outcomes while maintaining equivalent oncological effectiveness in the management of extensive juvenile nasopharyngeal angiofibroma.

Discussion

Juvenile nasopharyngeal angiofibroma is a surgically challenging tumor due to its rich vascularity and complex anatomical extensions. Surgical excision remains the primary modality of treatment, and the selection of surgical approach depends largely on tumor extent, staging, and surgeon experience. [11] Traditionally, open approaches have been used for extensive lesions because they provide wide access and better lateral exposure. However, these approaches are associated with higher morbidity, longer hospital stay, and cosmetic deformity. [12]

The introduction of endoscopic surgery has revolutionized JNA management. Improved endoscopic optics allow superior visualization of tumor margins and vascular pedicles, which facilitates complete resection while reducing intraoperative bleeding. In the present study, intraoperative blood loss was significantly lower in the endoscopic group, supporting the findings of previous studies which have reported reduced blood loss and transfusion requirements in endoscopic surgeries. [13]

Preoperative embolization plays an important role in reducing blood loss, particularly in extensive lesions. Several authors have emphasized embolization as a critical adjunct that improves surgical field visibility and decreases perioperative transfusion requirements. [14] Our findings align with existing evidence that embolization combined with endoscopic removal offers a favorable surgical outcome, particularly for Radkowski stage II and select stage III tumors. [15]

Operative time was shorter in endoscopic group compared to open surgery in this study. This may be attributed to reduced soft tissue dissection and absence of external incisions. Similar results have been documented in comparative studies where endoscopic surgery resulted in shorter operative duration and faster recovery. [16]

Hospital stay was significantly lower in the endoscopic group, which reflects reduced postoperative pain, minimal tissue trauma, and fewer wound-related complications. Open

approaches often require prolonged postoperative care due to facial incisions, nasal packing, and risk of infection. Studies have shown that endoscopic approaches significantly reduce hospitalization duration and improve postoperative quality of life. [17]

Complication rates were higher in open surgery group, particularly facial numbness and palatal fistula. Open approaches can result in greater disruption of facial structures, maxillary osteotomies, and palatal incisions, contributing to sensory deficits and fistula formation. Endoscopic surgery, being minimally invasive, reduces the risk of such complications. Similar complication trends have been reported in published literature comparing open and endoscopic approaches. [18]

Recurrence is a major concern in JNA surgery, especially in advanced lesions. Recurrence usually occurs due to residual tumor tissue in difficult-to-access areas such as the cavernous sinus, infratemporal fossa, or skull base. Several authors have suggested that recurrence rates are comparable between open and endoscopic surgery when performed by experienced surgeons. [19] In our study, recurrence was slightly higher in open group, though not statistically significant. This suggests that endoscopic surgery provides comparable tumor clearance, even in extensive lesions.

Endoscopic removal has expanded its indications over the years. While earlier studies restricted endoscopic surgery to small lesions, modern advancements and extended endoscopic approaches have enabled surgeons to remove tumors with significant lateral and skull base extension. [20] However, open approaches still remain essential in cases with extensive intracranial extension, vascular encasement, or lesions beyond endoscopic reach. [21]

The choice of surgical approach should be individualized based on tumor stage, radiological extent, surgeon expertise, and availability of embolization facilities. A multidisciplinary approach involving ENT surgeons, radiologists, and neurosurgeons is recommended for complex advanced lesions. [22]

Limitations of this study include its single-center nature and limited follow-up duration. Longer follow-up is required to determine true recurrence rates, as recurrence may occur even after 2–3 years. Additionally, randomized trials are difficult due to ethical and anatomical considerations, but multicenter prospective studies can provide stronger evidence.[23]

Overall, the present study demonstrates that endoscopic surgery is a safe and effective modality for extensive JNA, offering reduced morbidity and faster recovery. These findings are consistent with global trends favoring minimally invasive surgery in head and neck tumors. [24] Future research should focus on long-term outcomes, recurrence predictors, and refinement of extended endoscopic skull base techniques. [25]

Conclusion

Endoscopic excision is a safe, effective, and minimally invasive technique for the management of extensive juvenile nasopharyngeal angiofibroma. Compared to open approaches, endoscopic surgery significantly reduces intraoperative blood loss, transfusion requirement, postoperative complications, and hospital stay. Open surgical approaches remain valuable for selected advanced cases with extensive intracranial or lateral extension. Preoperative embolization is strongly recommended to optimize surgical outcomes.

References

1. Windfuhr JP, Remmert S. Juvenile angiofibroma: current treatment modalities and future directions. Acta Otolaryngol. 2004;124(6):664–673.
2. Schick B, Kahle G. Radiological staging and management of juvenile angiofibroma. Eur Radiol. 2000;10(7):1223–1231.
3. Lloyd G, Howard D, Phelps P, Cheesman A. Juvenile angiofibroma: imaging and management. Clin Otolaryngol Allied Sci. 1999;24(6):495–503.
4. Moulin G, Chagnaud C, Gras R, et al. Juvenile nasopharyngeal angiofibroma: preoperative embolization. AJNR Am J Neuroradiol. 1995;16(2):405–411.
5. McAfee WJ, Roberts DB, Kupferman ME, et al. Treatment outcomes for juvenile nasopharyngeal angiofibroma. Head Neck. 2010;32(9):1170–1175.
6. Radkowski D, McGill T, Healy GB, et al. Angiofibroma: changes in staging and treatment. Arch Otolaryngol Head Neck Surg. 1996;122(2):122–129.
7. Chandler JR, Goulding R, Moskowitz L, Quencer RM. Nasopharyngeal angiofibromas: staging and management. Ann Otol Rhinol Laryngol. 1984;93(4):322–329.
8. Nicolai P, Berlucchi M, Tomenzoli D, et al. Endoscopic surgery for juvenile angiofibroma: when and how. Laryngoscope. 2003;113(5):775–782.
9. Snyderman CH, Pant H, Carrau RL, et al. Endoscopic skull base surgery for juvenile nasopharyngeal angiofibroma. Otolaryngol Clin North Am. 2006;39(3):639–656.
10. Onerci M, Yücel T, Ogretmenoğlu O. Endoscopic surgery for juvenile nasopharyngeal angiofibroma. Int J Pediatr Otorhinolaryngol. 2003;67(11):1219–1225.
11. Fisch U. The infratemporal fossa approach for

nasopharyngeal tumors. Laryngoscope. 1983;93(1):36–44.
12. Danesi G, Panciera DT. Surgical approaches to juvenile nasopharyngeal angiofibroma: a comparative study. Otolaryngol Head Neck Surg. 2000;123(4):418–423.
13. Kamel R. Endoscopic transnasal surgery in juvenile nasopharyngeal angiofibroma. Laryngoscope. 1996;106(8):962–968.
14. Siniluoto TM, Luotonen JP, Tikkakoski TA, et al. Preoperative embolization in juvenile nasopharyngeal angiofibroma. Radiology. 1993;187(3):721–726.
15. Lund VJ, Stammberger H, Nicolai P, et al. European position paper on endoscopic management of juvenile nasopharyngeal angiofibroma. Rhinology. 2010;48(1):1–20.
16. Douglas R, Wormald PJ. Endoscopic resection of juvenile nasopharyngeal angiofibroma: outcomes and follow-up. Otolaryngol Head Neck Surg. 2006;134(4):593–597.
17. Roger G, Tran Ba Huy P, Froehlich P, et al. Endoscopic management of juvenile nasopharyngeal angiofibroma: pediatric experience. Laryngoscope. 2002;112(10):1811–1817.
18. Andrade NA, Pinto JA, Nóbrega MO, et al. Recurrence rates after endoscopic and open surgery for juvenile nasopharyngeal angiofibroma. Braz J Otorhinolaryngol. 2007;73(5):623–629.
19. Wormald PJ, Van Hasselt A. Endoscopic removal of juvenile nasopharyngeal angiofibroma. Am J Rhinol. 2003;17(5):279–284.
20. Nicolai P, Villaret AB, Farina D, et al. Endoscopic surgery for advanced stage juvenile nasopharyngeal angiofibroma. Otolaryngol Head Neck Surg. 2010;142(2):170–176.
21. Carrau RL, Snyderman CH, Kassam AB. Endoscopic skull base approaches for juvenile nasopharyngeal angiofibroma. Laryngoscope. 2008;118(1):27–35.
22. Mishra A, Bhargava D, Upadhyay A. Multidisciplinary approach in extensive juvenile nasopharyngeal angiofibroma. J Laryngol Otol. 2013;127(6):567–573.
23. Gupta A, Agarwal AK, Jain A. Long-term follow-up outcomes in juvenile nasopharyngeal angiofibroma surgery. Indian J Otolaryngol Head Neck Surg. 2015;67(2):145–151.
24. Boghani Z, Husain Q, Kanumuri VV, et al. Juvenile nasopharyngeal angiofibroma: systematic review and analysis of management. Laryngoscope. 2013;123(4):859–865.
25. Szymańska A, Szymański M, Czekajska-Chehab E, et al. Endoscopic surgery for juvenile nasopharyngeal angiofibroma: recent advances. J Craniofac Surg. 2016;27(5):e466–e471.