*British Journal of Medicine & Medical Research*
*6(7): 730-734, 2015, Article no.BJMMR.2015.250*
*ISSN: 2231-0614*

**SCIENCEDOMAIN** *international*
www.sciencedomain.org

# Gelfoam Embolization - A Preoperative Requisite in Patients with Juvenile Nasopharyngeal Angiofibroma: Report of Three Patients

**Sanjay Porwal[1*], Ranjan Modi[1], Rajsekhar Patil[2], Harikrishna Damodaran[3], Nirlep Gajiwala[4] and Ashok Thakkar[4]**

*[1]Department of Cardiology, JN Medical College, KLE University & KLE's Hospital, Belgaum, Karnataka, India.*
*[2]ENT Department, JN Medical College, KLE University & KLE's Hospital, Belgaum, Karnataka, India.*
*[3]Department of Cardiology, Pariyaram Medical College, Kannur, Kerala, India.*
*[4]Department of Clinical Trials, Sahajan and Medical Technologies Pvt. Ltd., Surat, Gujarat, India.*

***Authors' contributions***

*Authors SP, RM, RP and HD carried out the study in collaboration. Authors NG and AT were involved in technical writing and manuscript preparation. All authors read and approved the final manuscript.*

***Article Information***

DOI: 10.9734/BJMMR/2015/14452
Editor(s):
(1) Costas Fourtounas, School of Health Sciences, University of Thessaly, Greece.
Reviewers:
(1) Anonymous, Turkey.
(2) Patorn Piromchai, Department of Otorhinolaryngology, Faculty of Medicine, Khon Kaen University, Thailand.
(3) Anonymous, India.
(4) Anonymous, USA.
Complete Peer review History: http://www.sciencedomain.org/review-history.php?iid=906&id=12&aid=7638

***Case Study***

***Received 30th September 2014***
***Accepted 22nd December 2014***
***Published 5th January 2015***

## ABSTRACT

We present a case series of three patients who were admitted in the ENT department with the complaints of nasal congestion, nasal bleeding and vertigo. Evaluation of these patients revealed juvenile nasopharyngeal angiofibroma. Patients were advised to undergo excision surgery. We performed preoperative gelfoam embolization in each of these patients to reduce the complications of intraoperative bleeding. All surgeries went well and the blood supply to the area was found to be reinitiated within 5–6 days postoperatively. Here, we highlight the importance of preoperative gelfoam embolization for uneventful surgical excision of juvenile nasopharyngeal angiofibroma.

**Corresponding author: Email: drsanjayporwal@gmail.com;*

*Keywords: Juvenile nasopharyngeal angiofibroma; gelfoam; embolization; tumor; head and neck surgery.*

## 1. INTRODUCTION

Juvenile nasopharyngeal angiofibroma is an uncommon, benign and highly vascular tumor that arises in the form of fibrovascular mass in the sphenopalatine foramen and may extend to the pterygopalatine fossa, paranasal sinus and nasal cavity [1]. It accounts for less than 0.5% of all head and neck neoplasms [2]. The incidence rate of juvenile nasopharyngeal angiofibroma is reported to be between one new case per 6,000 to 60,000 patients referred to otolaryngologists [2]. In this article, we report three cases of juvenile nasopharyngeal angiofibroma patients admitted in the ENT department. In all three cases, the diagnosis was confirmed by imaging studies. Subsequently, preoperative angiography and gelfoam embolization were performed which helped uneventful surgical excision of nasopharyngeal angiofibroma. The outcomes were satisfactory in all three cases. Presenting symptoms and signs of each case is discussed individually, followed by the description of specific preoperative and surgical procedures.

## 2. PRESENTATION OF CASE

### 2.1 Case 1

A 17-year-old boy presented with complaints of difficulty in breathing and epistaxis from right nostril for past two months. He had reported swelling under the right cheek two months back. Upon examination, left deviated nasal septum was noticed. Rhinoscopy revealed a pink-to-red globular mass, which was covering the right choana, posterior border of nasal septum and one-third of the left choana. Computed tomography revealed paranasal sinus disease and an evidence of intensely enhanced soft tissue density in the pterygopalatine fossa on the right side, which was extending into the nasal cavity through the sphenopalatine foramen causing its widening and covering the masticator space. The lesion extended superiorly to cause erosion of the anteroinferior wall of the spheniod sinus on the right side and erosion of the pterygoid plate. The size of the tumor was about 6.9 x 6.5 x 6.3 cm. The patient was diagnosed with stage IIb of juvenile nasopharyngeal angiofibroma (according to the staging scheme proposed by Randowski et al. [3]; Table 1). The tumor was supplied by a branch of the external carotid artery, which was embolized with a mixture of gelfoam powder with saline and contrast medium. Subsequently, he underwent successful resection of the tumor through a combination of mid-face degloving technique and Le Fort I osteotomy.

### 2.2 Case 2

A 15-year-old boy presented with complaints of nasal obstruction, compressible nasopharyngeal mass and recurrent nasal bleeding for past two months. He had a history of excision surgery for nasopharyngeal angiofibroma at some other tertiary hospital almost a year back. A recurrent form of juvenile nasopharyngeal angiofibroma was suspected which was extending into the pterygomaxillary fossa through sphenopalatine foramen. A computed tomography scan revealed bony remodeling and anterior bowing of the posterior wall of the maxillary antrum (Holman-Miller sign). A small-sized, recurrent tumor of stage IIa of juvenile nasopharyngeal angiofibroma was diagnosed. The tumor received its blood supply from the ipsilateral internal maxillary artery, which was preoperatively embolized with gelfoam powder (Fig. 1). Subsequently, he underwent surgical excision of the tumor through the transnasal endoscopic approach.

### 2.3 Case 3

A 21-year-old man presented with complaints of epistaxis and vertigo for past four months. The patient underwent thorough examination for nasal cavity and paranasal sinuses. A pale reddish-blue mass was observed in the nasal cavity. Further, the angiofibroma was extended into paranasal sinuses. Characteristic bony remodeling was observed in the multi-slice computed tomography. A small-sized tumor of stage Ib of juvenile nasopharyngeal angiofibroma was identified. The tumor was supplied by the ipsilateral internal maxillary artery, which was successfully embolized with gelfoam powder. Subsequently, he underwent surgical excision of the tumor through the transnasal endoscopic approach.

### 2.4 Surgical Management and Outcomes

Elective surgical excision was planned in all three cases. Patients were advised to undergo preoperative gelfoam embolization in order to

facilitate surgical access. Accordingly, a 7F arterial sheath (length: 90 cm; Boston Scientific, USA) was passed in to the common carotid artery via the aorta using a multipurpose catheter (length: 100 cm; outer diameter: 0.094 inch; Boston Scientific, USA) through transfemoral approach. A 0.014 inch x 190 cm balance-middle-weight (BMW) coronary guide wire (Abbott Vascular, USA) was used to gain access to the angiofibroma. Then, a stride microcatheter 2.6Fr (Asahi-Intecc USA Medical, USA) was passed over the guidewire as close to the tumor as possible. Selective injection through the microcatheter helped visualization of various branches of the angiofibroma. Simultaneously, small gelfoam pledgets (2-3 mm cut from a compressed gelfoam sponge; Pfizer Inc., USA), was mixed with 10 mL of 320 mg iodine/mL contrast-medium, and was back-loaded into a 20 mL syringe to prepare gelfoam slurry by its sequential mixing with saline through a three-way stopcock connected to two 51 cm intravenous connecting tubings, one of which was connected to a 5 mL delivery syringe. Subsequently, the gelfoam slurry was gradually injected through the microcatheter in to the angiofibroma until the forward flow was reduced, but not to the point of cessation. Subsequent injections revealed embolization of the feeding vessel rendering the area almost avascular. In all patients, vascular blushes were reduced significantly after the embolization. All patients were subsequently taken up for the excision surgery within 2–3 days of embolization using various endoscopic transnasal approaches.

**Table 1. Staging system of juvenile nasopharyngeal angiofibroma proposed by Randowski et al. [3]**

| Stage | Stage description |
|---|---|
| IA | Limited to nose and/or nasopharyngeal vault |
| IB | Same as IA with extension into one or more paranasal sinuses |
| IIA | Minimal extension through the sphenopalatine foramen, including a minimal part of the medial part of the pterygopalatine fossa |
| IIB | Full occupation of the pterygopalatine fossa, displacing the posterior wall of the maxilla forward; lateral or anterior displacement of the branches of the maxillary artery; superior extension may occur, eroding orbital bones |
| IIC | Extension through the pterygomaxillary fissure into the cheek and infratemporal fossa or posterior to the pterygoid plates |
| IIIA | Erosion of the skull base with minimal intracranial extension |
| IIIB | Erosion of the skull base with extensive intracranial extension with or without cavernous sinus involvement |

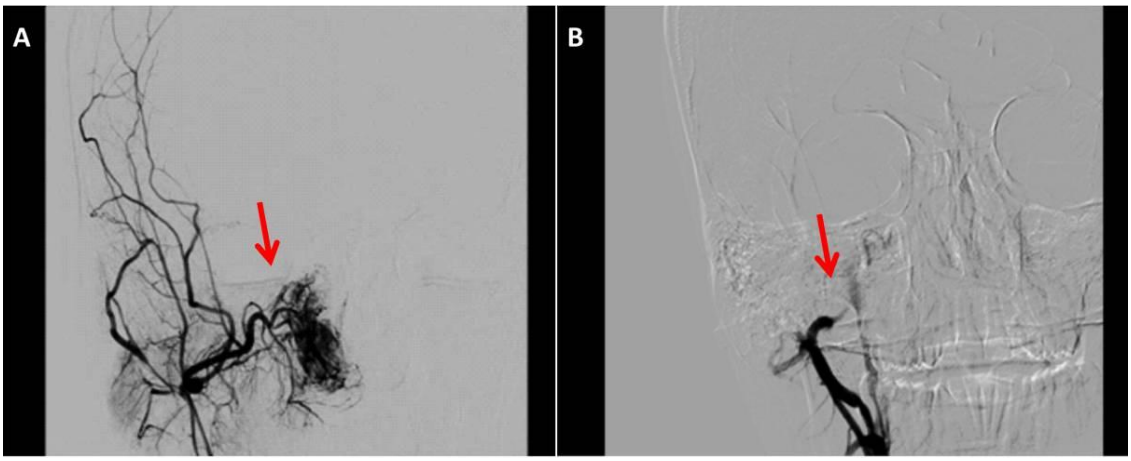


**Fig. 1. (A) A digital subtraction angiogram before gelfoam embolization demonstrates a large artery feeder arising from the ipsilateral internal maxillary artery with a tumor blush (arrow). (B) Post-gelfoam embolization angiogram illustrates selective occlusion of the feeding vessel, rendering the area almost avascular, and reduced tumor blush (arrow)**

All surgeries went well without any procedural complications. The overall blood loss was minimal in each patient (<300 mL). Early postoperative computed tomography was performed which revealed complete removal of the nasopharyngeal mass. The blood supply to the area was found to be reinitiated in 5–6 days after the operation. All patients were labeled as cured and were discharged within one week of surgical excision. No complication or recurrence was observed in postoperative follow-up after 3 months.

## 3. DISCUSSION

Juvenile nasopharyngeal angiofibroma is documented since antiquity by Hippocrates (5th century BC) [1]. The most common presenting symptoms include the triad of unilateral nasal congestion, nasopharyngeal mass and recurrent epistaxis. In advance stages, nasopharyngeal angiofibroma may present with facial deformity, proptosis, headache and deafness [1]. Computed tomography and magnetic resonance imaging are the widely used diagnostic modalities to detect the preoperative extent of tumor growth, bony changes, and staging of the angiofibroma [2]. In addition, preoperative angiography is performed to identify the feeder vessels and to delineate the tumor size and location [1]. In our cases, patients presented mainly with a characteristic triad of symptoms and the diagnoses were confirmed by computed tomography and digital subtraction angiography.

Surgical excision of tumor is considered as the treatment of choice; however, it is associated with extensive hemorrhage as the head and neck region is surrounded by highly vascular channels. The major arterial supply to nasopharyngeal angiofibroma is the ipsilateral internal maxillary artery, with occasional additional vessels from branches of the internal carotid or contralateral external carotid system [4]. We emphasize that the preoperative identification of blood supply plays an important role in selecting the appropriate surgical strategy. In our patients, branches of external coronary artery were identified as the feeding vessel. Accordingly, the excision was planned by endonasal surgical approach in two cases and degloving transfacial approach in the other case. To prevent the potentially lethal bleeding arising from feeding vessels during the procedure, we recommend preoperative embolization in all patients undergoing high risk vascular surgeries.

Embolization can be either temporary or permanent and can be done by variety of agents. Among these agents, gelfoam is well established and widely used since 35 years [5]. The gelfoam slurry causes mechanical obstruction in the injected vessel leading to slowing of blood flow and hastening of thrombus formation to provide a temporary embolization with the recanalization occurring within few weeks. In addition, the gelfoam is inexpensive, readily available, easy to work with, and can be injected through the microcatheter [5,6]. Preoperative embolization not only reduces blood loss during the surgery but also shortens the operative time by allowing the easy identification of surgically important structures, thereby facilitating the tumor removal [7]. However, in previous literature it was noted that preoperative embolization in patients with juvenile angiofibroma increased the risk of incomplete removal of tumor and lead to high recurrence rates [8]. This was due to the reduced definition of the tumor border after the embolization, particularly in cases of deep invasion [8]. Recently, Andrade et al. [9] has reported that surgical excision was successful in patients with stage I and II of nasopharyngeal angiofibroma even without using preoperative embolization. In another report, Ashrafi et al. had highlighted the complications of preoperative embolization and described a case of postembolization infarction in a patient of nasopharyngeal angiofibroma [1]. In spite of the reported risks of incomplete excision and other complications, embolization has remained the treatment of choice [10]. In our patients, gelfoam embolization significantly reduced the blood loss and allowed complete surgical removal of the tumor.

## 4. CONCLUSION

Patients suspected with juvenile nasopharyngeal angiofibroma should be evaluated for characteristic triad of symptoms and the diagnosis should be confirmed by imaging modalities and digital subtraction angiography. Preoperative identification of feeding vessel for the tumor is necessary in deciding the right surgical approach in patients with juvenile nasopharyngeal angiofibroma. We conclude that preoperative embolization should be performed for the successful attainment of avascular field in patients with juvenile nasopharyngeal angiofibroma. It minimizes the intraoperative blood loss and makes the surgical excision easier.

## CONSENT

All authors declare that 'written informed consent' was obtained from the patients for publication of this case report and accompanying images.

## ETHICAL APPROVAL

Not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES


1. Ahmed Ashrafi SK, Suhail Z, Khambaty Y. Postembolization infarction in juvenile nasopharyngeal angiofibroma. J Coll Physicians Surg Pak. 2011;21(2):115-6. DOI: 02.2011/jcpsp.115116. Pubmed ID: 21333247.
2. Antoniades K, Antoniades DZ, Antoniades V. Juvenile angiofibroma: Report of a case with intraoral presentation. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2002;94(2):228-32. Pubmed ID: 12221391.
3. Radkowski D, McGill T, Healy GB, Ohlms L, Jones DT. Angiofibroma. Changes in staging and treatment. Arch Otolaryngol Head Neck Surg. 1996;122(2):122-9. Pubmed ID: 8630204
4. Panda NK, Gupta G, Sharma S, Gupta A. Nasopharyngeal Angiofibroma-changing Trends in the Management. Indian J Otolaryngol Head Neck Surg. 2012;64(3):233-9. DOI: 10.1007/s12070-011-0338-z. 23998026.
5. Vaidya S, Tozer KR, Chen J. An overview of embolic agents. Semin Intervent Radiol. 2008;25(3):204-15. DOI: 10.1055/s-0028-1085930. Pubmed ID: 21326511.
6. Bauer JR, Ray CE. Transcatheter arterial embolization in the trauma patient: A review. Semin Intervent Radiol. 2004;21(1):11-22. DOI: 10.1055/s-2004-831401. Pubmed ID: 21331105.
7. Giavroglou C, Constantinidis J, Triaridis S, Daniilidis J, Dimitriadis A. [Angiographic evaluation and embolization of juvenile nasopharyngeal angiofibroma]. HNO. 2007;55(1):36-41. DOI: 10.1007/s00106-006-1410-y. Pubmed ID: 16775738.
8. Lloyd G, Howard D, Phelps P, Cheesman A. Juvenile angiofibroma: The lessons of 20 years of modern imaging. J Laryngol Otol. 1999;113(2):127-34. Pubmed ID: 10396561.
9. Andrade NA, Pinto JA, Nobrega Mde O, Aguiar JE, Aguiar TF, Vinhaes ES. Exclusively endoscopic surgery for juvenile nasopharyngeal angiofibroma. Otolaryngol Head Neck Surg. 2007;137(3):492-6. DOI:10.1016/j.otohns.2007.03.003. Pubmed ID: 17765782.
10. Hodges JM, McDevitt AS, El-Sayed Ali AI, Sebelik ME. Juvenile nasopharyngeal angiofibroma: Current treatment modalities and future considerations. Indian J Otolaryngol Head Neck Surg. 2010;62(3):236-47. DOI: 10.1007/s12070-010-0073-x. Pubmed ID: 23120720.




*Peer-review history:*
*The peer review history for this paper can be accessed here:*
*http://www.sciencedomain.org/review-history.php?iid=906&id=12&aid=7638*