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Original Research Article

A Comparative Study of Surgical Management of Juvenile Nasopharyngeal Angiofibroma (Upto Stage IIC) Endoscopic Vs. Open Approach

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Abstract

Introduction: Juvenile nasopharyngeal angiofibroma are rare benign but locally invasive vascular lesion that have traditionally be resected using open surgical approach. However, with availability of super selective Intra-arterial embolization, the advent of improved endoscopic transnasal technique and advances in instrumentation, recent year with end a shift towards the use of less invasive strictly endoscopic method for management of such lesion.

Aims: The purpose of this article is to compare the endoscopic and open approach surgery and to evaluate the advantage disadvantage and complication of both the approach and also assess favourable approach.

Material and Method: This prospective observational study was conducted in the department of ENT and head neck surgery, IPGMER and SSKM hospital Kolkata. confirmed case of JNA undergoing surgical intervention either endoscpic or open approach were studied prospectively for a period of six month after the operation to note any recurrence of disease.

Result: In this study endoscopic approach had minimum blood loss shorter operation time and less postoperative complication.

Conclusion: We concluded that the intraoperative complications like blood loss, postoperative pain, epiphora, loss of tactile sensation of face, need for postoperative blood transfusion or duration of operation were less in Endoscopic approach than open approach surgery in JNA, though number of residual disease or recurrence of disease had been found to be more in endoscopic approach compared to the open one.

Keywords: Juvenile Nasopharyngeal Angiofibroma, Endoscopic Approach, Open Approach.

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Introduction

Juvenile nasopharyngeal Angiofibroma is a benign yet aggressive tumor commonly found in adolescent males age10 to 25, originating from the superior edge of sphenopalatine foramen at the junction of the pterygoid process to the sphenoid advances submucosally and passes through ostias, canals, and nerves and by eroding the bones enter into infratemporal fossa sphenoid basis pterygoid canal, parasellar region and orbit leading to diplopia blindness, facial deformities, exophthalmos and opthalmoplagia. So radical treatment is required despite being a benign in nature to prevent recurrence. A number of conservative modalities such as external modalities such as external beam radiotherapy and hormonal therapy have been used but treatment of choice is surgical resection. This study aims to compare the surgical outcome in open VS Endoscopic approach. Traditional open approach includes Transpalatal Approach, Lateral Rhinotomy & Mid facial degloving. In 1996, Karnel

first reported a case of JNA operated via endoscopic approach. Endoscopic surgery is possible for tumor in stage I & II.

The aim of this study is to compare the outcomes of endoscopic and open surgical approaches in the management of Juvenile Nasopharyngeal Angiofibroma (JNA). Specifically, the objectives are: (A) to evaluate and compare the efficacy of endoscopic versus open approach surgeries in terms of tumor removal, (B) to analyze both intraoperative and postoperative complications associated with each approach, and (C) to determine the most favorable surgical technique based on the extent and stage of the tumor. This comparison will help in establishing an evidence-based preference for surgical management of JNA to optimize patient outcomes and minimize morbidity.

Materials & Methods

A study was conducted with 32 confirmed cases of JNA at IPGMER & SSKM Hospital Kolkata from April 2021 to September 2022. The study design was prospective randomized one.

Inclusion Criteria

- Male patients with age between 10 – 20 years diagnosed with JNA up to stage IIc in Radkowski classification.
- Recurrence cases (if any).

Exclusion Criteria

- Patient aged <10 years & >20 years.
- Female patient of JNA.
- Patient having intracranial extension of the tumor (stage >IIC).
- Patients with co-existing disease of ear, nose or throat.

The study was approved by the Institutional Review Board. Informed, written consents were obtained from all individual participants included in the study. All patients were subjected to a detailed clinical history about their signs & symptoms (nasal obstruction, headache, epistaxis) & complete ear, nose, throat examinations.

Study Variables: Signs & symptoms of JNA patient, ii) pre-operative staging of disease, iii) operative time, iv) Duration of stay in hospital, v) intraoperative blood loss amount, vi) need for perioperative blood transfusion, vii) Drilling of Pterygoid wedge intraoperatively, viii) Tactile sensation of face post operatively, ix) Epiphora post operatively.

Relevant Investigations

1. Routine blood investigations,
2. **CT nose & PNS & MRI brain**: to note site & size of tumor, staging of tumor, whether there is intracranial extension of the tumor or not, management protocol.
3. **CT Angiography**: to assess feeding vessels of the tumor & whether embolization to be done are operatively or not.
4. **HPE (post-operative**): for confirmation.

All patient are followed up for minimum of six month .Weekly endoscopicde debridement for first 4 to 6 week to remove crust.Subsiquently serial nasal endoscopy is performed every 3 month in 1st year along with CT scan of brain and MRI Angiography at 1st month for any residual disease and 6th month for any recurrence of disease.

Outcome will be assessd on the basis of mentioned parameters and procedures and study will be focused to compare between the endoscopc and open approach of surgery in JNA on the basis of duration of stay in the hospital, operative time intraoperative blood loss amount'perioperative blood transfusion requirement,post operative morbidities like loss of tactile stimulation of face and recurrence of disease within the duration of study period

Approaches

- **External/Open approach**: It includes transpalatal approach, Le fort I osteotomies, lateral rhinotomy, midfacial degloving, facial translocation, anterior craniofacial & lateral infratemporal/subtemporal approaches. These approaches involve extensive osteotomies which are associated with increased blood loss, increase operative time& which may interfere with normal facial growth of adolescent patient.

Table 1:

Approach	Indication	Advantage
Transpalatal	Tumor confined to nasopharynx/nasal cavity	Minimal external scar
Transmaxillary	Tumor extending into PPF	Better lateral exposure
Infratemporal fossa	Tumor invading skull base/intracranial	Wide access to lateral & posterior area.

1. **Transpalatal Approach**: Midline palate incision-> elevate mucoperiosteum-> removal of posterior hard palate-> access to nasopharynx (for small, midline tumors [stage I-II].
2. **Transmaxillary (Weber-Ferguson) Approach**: incision along upper lip& cheek-> Elevation of facial flap-> Anterior maxillotomy-

> access to PPF & ITF (for tumor with lateral extension [stage II-III].

3. **Infratemporal Fossa Approach**: Preauricular/temporal incision-> Mandibular sublaxation or osteotomy-> lateral skull base access-> control of internal carotid artery (for large, skull base/intracranial tumors [stage III+].

- **Endonasal endoscopic approach**: There are certain advantages like avoidance of facial incisions, osteotomies, & bone plating which donot expose young patient to facial deformity. Exposure of surgical field is made by first completing an Ethmoidectomy, Sphenoidectomy, & a large middle antrostomy extended posteriorly to expose the crucial area of Sphenopalatine Foramen should be performed. By modulating the opening of the meatal wall of maxillary sinus, lateral exposure of its posterior wall can be effectively increased. Medial maxillectomy can be anteriorly enlarged by sectioning the lacrimal duct at the inferior limit of lacrimal sac or also removing the medial part of anterior maxillary wall with type D endoscopic medial maxillectomy. Moreover, resection of the posterior third of nasal septum allows exposure of the nasopharyngeal portion of the lesion and enables easier use of the4 hand2 nostril technique. Drilling of basisphenoid and pterygoid wedge is recommended to remove microscopic nests of the lesion and prevent their regrowth.

1. **Standard Endonasal Approach**: Endoscopic nasal entry-> medial maxillectomy+_ septectomy-> access to nasopharynx (stage I tumor)
2. **Endoscopic Denker's Approach**: sublabial incision-> removal of anterior & medial maxilla-> wide exposure of nasal cavity+ maxillary sinus (For tumors with anterior/lateral extension)
3. **Endoscopic Transpterygoid Approach**: Medial Maxillectomy-> Removal of Posterior Maxillary wall-> Dissection through PPF to ITF.

Results

In this study out of 32 patients equally divided between 11-15 years & 16-20 years age group respectively. The patient were randomized by simple randomization with single blinding method into two groups of 16 patients each based on the surgical procedures [open and endoscopic approach]

It was found that higher number of patients had mild pain in Endoscopic approach compared to open approach. Blood loss was much more in open approach compared to Endoscopic approach. Hospital stay was more in open approach than the Endoscopic approach which is significant.

Table 2: Distribution of Mean Total Duration of Operation in Minutes

Parameter	Group	N	Mean	SD	P Value
Duration of Operation	Open	16	162.81	28.69	<0.001*
	Endoscopic	16	120.63	14.71	

Table 3: Distribution of Mean Amount of Intra Operative Blood Loss

Parameter	Group	N	Mean	SD	P Value
Duration of Operation	Open	16	219.25	38.3	<0.001*
	Endoscopic	16	139.69	24.18	

Table 4: Association between Peri Operative Blood Transfusion in Open and Endoscopic Surgery for JNA

Need For Peri Operative Blood Transfusion		Group		Total	P Value
		Open	Endoscopic		
Yes	N	12	1	13	<0.001
	%	75	6.3	40.6	
No	N	4	15	19	
	%	25	93.8	59.4	
Total	N	16	16	32	
	%	100	100	100	

Table 5: Association between Pain (Who Ladder Scale) On Post-Operative Day 3 with Open and Endoscopic Surgery For JNA

Pain (Visual Analog Scale) On Post Op Day 3		Group		Total	P Value
		Open	Endoscopic		
Mild	N	2	9	11	0.001*
	%	12.5	56.3	34.4	
Moderate	N	3	7	10	
	%	18.8	43.8	31.3	
Severe	N	8	0	8	
	%	50	0	25	
Very Severe	N	3	0	3	
	%	18.8	0	9.4	
Total	N	16	16	32	
	%	100	100	100	

Table 6: Association between Pain (Who Ladder Scale) On Post-Operative Day 21 with Open and Endoscopic Surgery For JNA

Pain (Visual Analog Scale) On Post Op Day 3		Group		Total	P Value
		Open	Endoscopic		
Mild	N	2	9	11	0.001
	%	12.5	56.3	34.4	
Moderate	N	3	7	10	
	%	18.8	43.8	31.3	
Severe	N	8	0	8	
	%	50	0	25	
Very Severe	N	3	0	3	
	%	18.8	0	9.4	
Total	N	16	16	32	
	%	100	100	100	

Table 7: Association between Residual Disease (Based on CT scan Findings) After 6 Weeks Post-Operative with Open and Endoscopic Surgery for JNA

Residual Disease Based on CT Scan Findings After 6 Weeks Post OP		Group		Total	P Value
		Open	Endoscopic		
YES	N	2	7	9	**0.**049
	%	12.5	43.8	28.1	
NO	N	14	9	23	
	%	87.50	56.2	71.9	
TOTAL	N	16	16	32	
	%	100	100	100	

Table 8: Association Between Recurrence of Disease (Based on CT Scan Findings) After 6 Months Post Operative with Open and Endoscopic Surgery for JNA

Recurrence of Disease Based on CT Scan Findings After 6 Months Post OP		Group		Total	P Value
		Open	Endoscopic		
YES	N	3	7	10	0.126
	%	18.8	43.8	31.2	
NO	N	13	9	22	
	%	81.2	56.2	68.8	
TOTAL	N	16	16	32	
	%	100	100	100	

Discussion

This study was undertaken with the objective of evaluate the advantage disadvantage and complication of both endoscopic and open approach surgery of a JNA patient and also asses the favourable approach. In our study out of 32 patient all are male and equal number of patients were in both age group between 11-15 years & 16-20 years which is 16(50%) each. 8(25%) patients from both age groups selected randomely for endoscopic and open approach. In our study, we found time taken for endoscopic approach was an average 120.63±14.71

minutes. On the otherhand open approach required an average of 162.81 minutes [table 1] this is stistically significant. Average intraoperative blood loss in case of OPEN approach was 219.25±38.30 whereas that of endoscopic approach was 139.69±24.18, hence indicating more amount of blood loss in open surgery which was significant(<0.001).A similar experience was obtained in study by Ye L et al [2011] Boghani Z et al[2013] Ardehali MM et al [2014] and Singh ID et al [2017].Also in the study by Singh ID et al preoperative embolization was done to reduce blood loss.

In our study in endoscopic approach1 patient (6.3%) required perioperative blood transfusion whereas in open approach 12 patient (75%) required perioperative blood transfusion. This finding is quite similar to the study of Cohen-Cohen s et al [2022] where only 2 patient (9%) required blood transfusion (endoscopic approaches) compaired to 18 (22%) in open approaches and Garofalo P et al (2015). It was observed that among those who underwent endoscopic surgery higher number of patients 9(56.3%) had mild pain (Visual Analog Score),7(43.8%) patients had moderate pain on post operative day 3 whereas among the patients who underwent open surgeries almost half of them8(50%) had a pain severe according to Visual Analog Scale and among rest2 (12.5%) patients had mild 3 (18.8%) had moderate and even 3(18%) patient had very severe category of pain on post operative day 3,and this was statistically significant.

And finally, when the follow up of patient were done in outdoor procedure on post operative day 21 13 out of 16 who had endoscopic surgery did not complain any pain while 8(50.0%) patient still have mild and 2(12.5%) had moderate category of pain according to Visual Analog Scale even on post operative day 21.

This was statistically significant (p=0.033). It was found that lower number of patients had residual disease based on CT finding after 6 weekp0st operative in open choice of surgery where 2 patients had residual disease, but this was not statistically significant (p value= 0.049).

We also found that less no of patients had recurrence of disease based on CT findings after 6 months post operative in endoscopic choice of surgery which was 7(43.8%) compaired to open choice of surgery where 3(18.8%) patient recurrence of disease but this was not significant (p=(0.126%).

Reyes C et al (2019 in his study also found the endoscopic approach has a statistical significant lower recurrence rate in patients without intracranial compromise when compared with the open approach (13 vs28% p<0.02). No statistical difference was seen in patient with intracranial compromise(p=0.5)

Conclusion

After detailed procedural approach it was concluded that intraoperative complications like blood loss, post-operative pain, need for post operative blood transfusion, hospital stay, duration of operation were less in ENDOSCOPIC approach than OPEN approach surgery in JNA though number of residual disease or recurrence of disease had been found to be more in endoscopic approach compared to the open one.

Limitations: In spite of every sincere effort there are notable shortcomings like sample size was only 32 which is insufficient for this type of study and it is done in single centre also hospital bias as it was conducted in tertiary care hospital.

Conflicts of interest: The authors declare no conflicts of interest.

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