Original Research Article

Indian Journal of Anesthesia and Analgesia
2019; 6(4) (Part - I): 1140-1144
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.6419.11

Evaluation of the Anaesthetic Management of Juvenile Nasopharyngeal Angiofibroma in a Tertiary Cancer Care Hospital: A Five Year, Prospective Observational Study

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Abstract

Background: Juvenile nasopharyngeal angiofibroma (JNA) is a rare, benign, vascular tumor in young males with potential life threatening complications. Advances in pre operative imaging, pre operative embolisation, and hypotensive anesthesia have made JNAs amenable to surgical resection with minimal complication. We present anesthetic management of JNAs that have been operated in our institute over the recent years. *Method:* After ethical committee approval, details of patients undergoing surgery for JNA were noted with regard to demographics, preoperative optimization and evaluation, intraoperative management and complications, and postoperative course. Twenty patients were evaluated and included in our study. *Results:* The age of JNA patients ranged from 9-17years. All our patients had undergone preoperative embolisation of the feeding artery. Standard anesthesia induction technique was used in all the patients. Controlled hypotension was achieved with the help of a combination of inhalational anesthetics and vasodilators. Average duration of surgery was 126.7 ± 55 minutes, and mean blood loss was 822 ± 291 ml. Seven patients were extubated in the operating room. The other 13 patients were remained intubated for 24 hours due to extensive surgery with a risk of postoperative hemorrhage, and were monitored in the postoperative intensive care unit. *Conclusion:* JNAs remain a challenge for anesthesiologists because of excessive intraoperative hemorrhage. Invasive monitoring, along with hypotensive anesthesia decreases bleeding and provides a clear field of vision for operating surgeon.

Keywords: JNA; Anesthesia management; Surgery; JNA bleeding; Hypotensive anesthesia.

How to cite this article:

Kavitha Lakshman, Sumitha CS, Rachana ND *et al.* Evaluation of the Anaesthetic Management of Juvenile Nasopharyngeal Angiofibroma in a Tertiary Cancer Care Hospital: A Five Year, Prospective Observational Study. Indian J Anesth Analg. 2019;6(4):1140-1144.

Introduction

Juvenile nasopharyngeal angiofibroma (JNA) is a benign tumor of the young male. The occurrence of JNA is about 0.5% [1-6], among all tumors of the head and neck region [7-10]. The occurrence of JNA in South Asian continent appears to be more than in the West [11]. JNA originates chiefly from the nasal cavity over the posterolateral wall just at the superior aspect of the sphenopalatine foramen. Tumor is locally aggressive, as it grows, erosion of the adjacent bone takes place, allowing extension

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Received on 09.04.2019, **Accepted on** 14.05.2019

into the ethamoid, sphenoid, and maxillary sinuses. From there the tumor may invade into the anterior, middle cranial fossa [8]. Staging of tumor is most commonly done according to system put forward by Radkowski et al. [12], [Table 1]. The etiopathogenesis of JNA is concealed. It might originate from the paraganglionic cells present at the end of maxillary artery, or it may be as per the "angiogenic and histogenetic theory", [8,13]. It is diagnosed based on history, clinical features, evaluation by endoscopy, and imaging modalities such as computed tomography, angiography, and magnetic resonance imaging. Handling of the tumor can lead to profuse bleeding, which is why preoperative biopsy is inadvisable. The most effective treatment modality of JNA Surgical excision [5]. Many surgical approaches are described, which ranges from transpalatal resection to open excision with midface degloving, lateral rhinotomy, and endoscopic resection. Minimally invasive approaches are now the treatment of choice if appropriate size and place tumor, but at centers with limited resources it is not used. The extent and site of tumor along with surgeon's preference will be deciding the type of surgery [8]. Inappropriate exposure can lead to incomplete removal of JNA, leading to recurrence or a massive intraoperative bleeding. Prior to surgery a preoperative angiography along with embolization of the feeding vessels is performed, generally it is done 24 to 72 hours prior to the operation to decrease risk of perioperative bleeding [2,14,15,16].

Our present study was undertaken with the primary aim to include JNA affected patients who are treated with different surgical modalities and to study the perioperative blood loss and its replacement involving different JNA stages, preoperative embolization, and different surgeries. Our secondary aim of the study was to analyze anesthetic management in these patients regarding anesthesia techniques, perioperative monitoring, and fluid replacement.

Methods

After obtaining Institutional Ethics Committee approval, this prospective observational study was conducted to include patients with JNA posted for tumor excision from a single tertiary care institute from the Indian subcontinent performed over a period of 5 years. Study duration was from February 2014 to March 2019. Data regarding patient demographics, symptoms, staging of tumor, pre operative investigations, pre operative embolisation, anaesthetic management, surgical technique, intra operative blood loss, intraoperative blood transfusion, post operative complications, number of days of hospital stay were noted. Inclusion criteria were all JNA patients who are undergoing surgical treatment with consent for inclusion in the study from the patient and parents or guardian. The patients who refuse to give consent were excluded from the study. Statistical analysis: Descriptive quantitative data are presented in form of mean ± standard deviation or quantal data and range of values are expressed in percentage.

Results

A total of 20 patients were included in the study. All the patients were male, with an average weight of 39 ± 9.3 kg and age between 9 and 17 years (Table 2).The presenting symptoms of these patients were nasal bleeding in 10 of them, followed by obstructive symptom of nose in 7 patients and local swelling over the nasal area in 3 patients. Other symptoms noted were change in voice, snoring, and anosmia.

Preoperative laboratory investigation included complete blood count and coagulation profile. Pre anesthetic airway examination revealed swelling in nasal area in 3 patients predicting difficult mask ventilation and 5 patient had anticipated difficult intubation with a Mallampati grade 3 in 4 patients and grade 4 in 1 patient. At the time of surgery, adequate blood was kept standby, 2 units (U) of packed red blood cells (PRBCs) were kept ready for the patient belonging to stage IIA or below, and 4U were arranged for patients of stage IIB and above.

In the operating room, standard monitoring consisted of noninvasive blood pressure, electrocardiogram, pulse oximetry, urinary output measurement and capnography. For patients with stage IIB and above invasive blood pressure and central venous pressure were monitored.

Three different consultant anesthesiologists were involved in the study period. Two large bore cannule were inserted in all patients. Induction of anaesthesia was carried out with propofol in 10 patients (50%) and thiopentone in remaining 10 patients (50%). Patients were preoxygenated for 3minutes rapid sequence intubation (RSI) was done in 3 patients as they had some continuous nasal bleeding. There was no difficult mask ventilation an any patient and none had difficult intubation on direct laryngoscopy. All patients received 2 µg/kg fentanyl.

Intraoperatively, as blood loss preventive strategy, all were positioned in 30 degree reverse trendelenburg position and hypotensive anesthesia was used to minimize surgical site bleeding by using inhalation anaesthetic isoflurane (1% to 3%) all along with the use of hypotensive drugs: esmolol (five patients), nitroglycerine (14 patients) and lignocaine (one patient).

Intraoperative core temperature was maintained using forced air warming devices in all patients. For postoperative analgesia, all the patients received drug IV paracetamol.

Mean intraoperative blood loss in patients with JNA was 822 ± 291 mL, intraoperative transfusion mentioned in Table 2.

Gelofusin was transfused in 4 patients each, and 15 ml/kg fresh frozen plasma was transfused in 4 patients. Three different Head and neck oncology surgeons were involved in the study period. Surgeries performed are as follows: transmaxillary excision (7/20; 35%), lateral rhinotomy (6/20; 30%), sub labial approach (4/20; 20%), and transpalatal excision (3/20; 15%).

At the end of surgery, 13 patients (65%) were kept electively intubated after reversal of neuromuscular blockade with neostigmine and glycopyrrolate and were kept on T-piece. None of them required elective ventilation. All patients were monitored overnight in the ICU and the trachea was extubated the following day after confirming no active nasal bleeding. None of the patient required reintubation or surgical reexploration.

The average duration of surgery was 127 minutes. The average length of stay postoperatively was 5 days.

Table 1: Radkowski Classification of Juvenile Angiofibroma

Stage	Details
IA	Limited to nose and nasopharyngeal area
IB	Extension into one or more sinuses
IIA	Minimal extension into pterygopalatine fossa
IIB	Occupation of pterygopalatine fossa without orbital erosion
IIC	Infratemporal fossa extension without cheek or pterygoid plate involvement
IIIA	Erosion of skull base(middle cranial fossa or pterygoids)
IIIB	Erosion of skull base with intracranial extension with or without cavernous sinus involvement

Source: Radkowski D, McGill T, Healy GB, Ohlms L, Jones DT. Angiofibroma: changes in staging and treatment. Arch Otolaryngol Head Neck Surg. 1996;122(2):122-129.

Table 2: Intraoperative details of the patients

Sl. No	Age in Years	Stage	Weight(Kg)	Surgical Approach	Duration in mins	Blood Loss in ml	Intra Operative Transfusion (Units)	Preop Embolisation
1	9	1B	40	LR	60	200	0	Y
2	10.8	1B	30	LR	70	400	0	Y
3	11	1B	35	LR	75	700	2	Y
4	13	1B	50	LR	90	600	2	Y
5	14.2	1B	42	LR	120	750	2	Y
6	17	1B	59	LR	120	800	2	Y
7	10	2A	36	SL	240	900	2	Y
8	9.8	2A	28	SL	120	1000	3	Y
9	14	2A	26	SL	90	750	3	Y
10	12	2A	30	SL	180	1400	4	Y
11	13.5	2A	33	TM	120	900	3	Y
12	15.6	2B	56	TM	120	650	0	Y
13	16.1	2B	50	TM	240	1450	3	Y
14	14.3	2B	38	TM	240	700	2	Y
15	10	2B	48	TM	120	800	2	Y
16	13	2B	35	TM	120	900	2	Y
17	12.5	2B	40	TM	90	750	1	Y
18	14.3	1B	31	TP	100	800	1	Y
19	12.2	1B	43	TP	110	800	2	Y
20	14.6	1B	33	TP	110	1200	3	Y

Abbreviations: Sl No-serial number; kg-kilogram; mins-minutes; ml-milliliter; Y-yes; LR - Lateral Rhinotomy; SL- Sub labial approach; TM- Trans maxillary; TP – Transpalatal.

Table 3: Comparison of various surgical approaches

Surgical procedure	Mean duration	Blood loss
Transpalatal	106 ± 5.7	933 ± 230
Sublabial	157 ± 66.5	1012 ± 278
Lateral rhinotomy	89 ± 25.77	575 ± 231
Transmaxillary	150 ± 62.44	878 ± 269

Discussion

In the present study, average blood loss in JNA surgeries is 822 ± 291 mL. Preoperative embolization was performed in all JNA patients. Postoperative period, 35% of patients are kept electively intubated in view of massive blood loss or extensive surgical procedure, with tracheal extubation done next day. In contrast to the previous studies regarding analysis of anesthetic management of patients with JNA published over a decade ago and involving 10 patients [17], our study involved a much larger group of 20 patients and is the first prospective observational study on JNA patients. The previous study included JNA cases with only lateral rhinotomy whereas the present study included different types of surgical procedure undertaken for JNA [17]. The previous study reported an average blood loss of 3,200 mL, much more than 822 mL reported in the present study. There is no mention regarding blood loss according to the JNA stage in the previous study in contrast to our study. We speculate that the recorded lesser blood loss in our study could be due to: our study including various types of surgeries other than lateral rhinotomy like transmaxillary approach, sublabial approach, transpalatal approach and had much shorter mean surgical time (127 min versus 6 hours) and all our head and neck surgeons had expertise of more than 10 years' experience in surgical excision of JNA. All patients were remined intubated in the previous study compared with only 65% in the present study. This is due to increased blood loss and longer duration of surgery in the previous study. Two IV cannulas were inserted in all patients in the previous study and in our study this suggests the notoriety of the association of JNA with blooding. Preoperative angiography was performed 48 hours before the surgery in all the patients in our study it helps in delineating the vascular supply and enables in embolization of feeder vessels of external and internal carotid arteries there by reduces intraoperative bleeding. To minimize intraoperative bleeding and to provide a good surgical field, the anesthesiologist needs to use hypotensive anesthesia in these patients. Various drugs have been described in the literature for inducing intraoperative hypotensive anesthesia [18,19]. In our institute we maintained hypotensive anaesthesia with isoflurane and hypotensive agents like nitroglycerine, esmolol. Face distortion due to local swelling may lead to difficult mask ventilation, but we didn't have any patient in our study. In active epistaxis due to JNA, a rapid-sequence induction is preferred as these patients are considered "full stomach" [20]. Though, all our patients were electively operated 3 patients were actively bleeding, rapid-sequence intubation was carried out in these patients. Long duration of surgery along with blood transfusions decreases the core body temperature, which can prolong recovery time. Hypothermia should be avoided using warm fluids, forced airwarming devices. One of the limitation of the study. is that it was carried out at a single center, hence the results may not be applied to other center. The uniformity of the results may be affected as multiple surgeons and anaesthesiologist were involved in the study.

Conclusion

We conclude that with advanced preoperative imaging, preoperative emboilisation, surgical technique and hypotensive anesthesia along with vigilant intraoperative management, JNA can be managed with minimal complication. Lower stages of JNA, minimally invasive surgery along with intraoperative blood conservative strategy, JNA can be extubated on table. Massive blood loss and blood transfusion further delays recovery.

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