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ORIGINAL ARTICLE

Comparison of External Carotid Ligation and Pre Operative Embolization of Feeding Vessel for Controlling Per Operative Heamorhage in Angiofibroma Excision

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ABSTRACT

Background: The prevalence of Angiofibroma of juvenile variety is infrequent tumor of nasopharynx[7]. It grows aggressively and is locally destructive and extends into the cranium as well. Its symptoms usually involve nasal obstruction with or without nasal bleed.
Aims: To compare two methods i.e 1. Carotid artery ligation per operatively and embolization of feeding artery pre operatively in order to assess which method is better in controlling per operative bleeding during its excision.
Design: Comparative study
Study setting: The study was conducted in the Department of Otorhinolaryngology of Jinnah Hospital, Lahore. The duration of the study is from 01st January 2020 to 31st January 2022.
Methodology: A group 20 patients were taken having angiofibroma. 10 patients went for pre operative embolization of the feeding vessel of the angiofibroma after localizing the vessel by having MRA. The other 10 patients had their external carotid artery ligated before excising the angiofibroma. The bleeding which occurred during both procedures was quantified by weighing the gauze pieces soaked per operatively, the blood collected in suction bottle and then comparing the values.
Results: Ten patients who had embolization had far more bleeding during excision as compared to the 10 patients who had their external carotid artery ligated per operatively before excision.
Conclusion: Results showed that pre operative embolization is not a better procedure to control per op bleeding as compared to external carotid artery ligation during angiofibroma excision.
Keywords: Embolization, angiofibroma, per operative ,

INTRODUCTION

Nasopharyngeal angiofibroma is a vascular tumor[1] that despite being benign is locally invasive and has a high risk of persistence and recurrence. It covers up to 0.5% of head and neck cancers. The term juvenile is used for it as it mostly occurs in males age 15 to 25 years of age. This disease is relatively rare and appears mostly in adolescent males as it has been found to be testosterone dependent according to a research[2].

The juvenile nasopharyngeal angio fibroma is segregated into 3 different varieties on basis of clinical observations and radiological observation in the form of CT scans and MRI[8]. The origin of juvenile angiofibroma is from the lateral aspect of the nasopharynx just above the opening of sphenopalatine foramen[12]. The staging of angiofibroma is made on the scale of Fisch[9], which determines the exact size of the tumor. The proposal as advised by Andrew et al, has four segments of angiofibroma. The size of the tumor with local invasion has divided the tumor into grade-I to grade IV. The site of tumor restricted to nasal cavity and sinuses are divided in grade-I and grade-II. However when the juvenile angiofibroma moves into the cranium it moves to level of grade-III. The juvenile angiofibroma that is associated with intracranial complications is labeled as grade-IV tumor. The management of angiofibroma is always surgical. Those complicated cases of juvenile angiofibroma with intra cranial extension might be treated with radiotherapy[10]. The presence of mal-developed sinusoids and vessels in the tumor is main reason behind the high blood loss in the removal of this tumor. However with recent advances of embolization the blood loss in surgical removal of angiofibroma has drastically decreased.

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The anatomy of juvenile nasopharyngeal angiofibroma is still under studies. There are two theories regarding this hemartomatous vs vascular formation theories. But no definite theory is accepted[11].

The histologic origin of angiofibroma involves both vascular and fibrous components and the slides showed spindle cells scattered among collagen fibres and vascular tissue. Histopathologically the angiofibroma varies with some showing abundance of vascular tissue and the rest showing abundance of fibrous tissue.

The bleeding nature of angiofibroma is also because of the vascular anatomy of the tumor. It is directly supplied by the branches from the external carotid system and very rarely from the branches of the internal carotid system. The help of carotid angiogram helps us to identify the vascular nature of the tumor. The internal maxillary artery which arises from the external carotid system is supplies the major part of the tumor. As the tumor increases the size it goes intra cranial and then it gets the blood supply from branches of the internal carotid system, mainly the ophthalmic artery.

The pathogenesis of juvenile angiofibroma is a collection of angiogenesis. The mal-developed vessels and sinusoids make a large part of tumor. The scientific Research narrates vascular malformation and hormones to influence the growth of the tumor. Though the tumor itself is benign but local aggression, and vascularity with expanding nature of the tumor makes it go intra cranial by eroding thick bony walls of the cranium.

Diagnosis of juvenile nasopharyngeal angiofibroma is made both clinically and on diagnostic imaging[13]. CT scan helps in diagnosing the extent and osseus involvement of the tumor whereas MRI helps in diagnosis the soft tissue expansion and extent of the tumor intracranially. Digital subtraction angiography is used to assess the feeding vessel of the tumor in order to help minimize the blood loss during its resection.

Given the extensive vascularity a biopsy is not considered safe for its diagnosis. When endoscopically viewed it appears like a reddish and friable mass.

It can be treated by open surgical method or by endoscopic techniques[14], depending upon the size of the tumor[3]. Among the open surgical methods are the mid facial degloving approach, weber fergeuson method, tranpalatal or transmaxillary approach. The technique which we should use depends upon the size and site of origin of tumor. Small sized tumors which are only limited to the nasal cavity or nasopharynx can be treated endoscopically. In order to minimize bleeding during its removal as it is a very vascular tumor, two methods can be adopted i) pre operative embolization and ii) external carotid artery ligation. Both methods have their advantages and disdvantages.

The recent advances of embolization have helped in peroperative loss during the surgical removal of angiofibroma. But many hindrance to the procedure can occur due to multiple blood supply and catheter usage.

Aiming at assessing and analyzing the better method to reduce blood loss during its removal we studied a group of patients presented with nasopharyngeal angiofibroma at Jinnah Hospital Lahore.

METHODS

In order to assess the better method to reduce blood loss we studied 20 patients who presented in the outdoor department of Jinnah Hospital Lahore with the complain of nasal bleed and nasal mass. Investigations for proper pre operative workup was carried out for the patients. CT scan was done initially to first diagnose on the basis of imaging whether it's a angiofibroma or not. Further MRA was done to check the feeding vessel so that blood supply to the tumor can be located and later can be occluded to minimize blood loss during the excision per operatively. All the patients were adolescent males and had angiofibroma of the category FISCH I. We divided the patients in 2 groups. All the patients in group B underwent pre operative embolization 24 hours before the surgery. Whereas on the other hand group A patients underwent external carotid artery ligation per operatively at the time of surgery before excision of the tumour.

Blood was arranged for all patients as the tumor bleeds during excision. Therefore blood group cross match and arrangement of blood was necessary for each patient.

The patients in group B who were planned to have pre operative embolization of the feeding vessel were sent to Lahore general hospital (LGH) for embolization as this facility was not available in our hospital. We managed to adjust time with the radiology team in LGH to give time of embolization one day before the surgery was planned. So one day before the surgery the patients in group A got embolized and were carefully transferred back to Jinnah Hospital under strict supervision of the doctor with all the protocols.

On the other hand in patients in group A consent for external carotid artery ligation was taken before surgery and during the surgery before excision of the tumor a neck incision was given. Dissection of the neck layers was carried out to carefully expose the area of carotid artery bifurcation. Next the external carotid artery was ligated to cut of the blood supply of the tumor. Now the blood loss during the surgery is calculated by two methods

1. Fluid collected in suction bottle
2. By weighing the gauze piece used in the surgery before and after the procedure.

As collection in bottle also contains the saline used during the surgery to wash the operative area so we estimate blood loss by subtracting the total saline used in the surgical procedure from the total amount of collected fluid.

Similarly we weigh one 4x4 gauze piece in wet state in order to get the weight of one gauze piece. Then at the end of the surgery we weigh all the gauze pieces used (soaked) during surgery and subtract from it's the weight of wet but unused gauze pieces in order to get the blood loss.

The total amount of blood loss was added by adding the two amounts calculated. The data was then analyzed using ssp and results were calculated and statistically analyzed.

RESULTS

Total 20 patients having angiofibroma were included in the study. The segregation of two groups was made. The Group-A was labeled as (Carotid artery ligation) and the Group-B was labeled as (Embolization). In the first group labeled as group-A, had 10(100%) males and 0(0%) female, while in group-B, there were 10(100%) males and 0(0%) female. Mean age in group-A patients was 16.60±3.24 year and 16.40±3.31 year in group-B patients. In group-A, 4(40%) were in <15 years, while 6(60%) were in ≥15 years age group. In group-B, 4(40%) were in <15 years, while 6(60%) were in ≥15 years age group. According to blood loss, in Carotid artery ligation group, mean blood loss was 510.00±69.92ml and 850.00±105.40ml in Embolization group. The value of P was less the 0.5 and was labeled at 0.00001 that meant a significant value.

Table 1: Comparison of gender distribution between groups

Gender	Group of patients		Total
	Carotid artery ligation	Embolization	
Male	10(100%)	10(100%)	20(100%)
Female	0	0	0
Total	10(100%)	10(100%)	20(100%

Table 2: Comparative age analysis of group-A and group-B

Age	Group of patients		Total
	Carotid artery ligation	Embolization	
<15yrs	4(40%)	4(40%)	8(40%)
≥1 yrs	6(60%)	6(60%)	12(60%)
Total	10(100%)	10(100%)	20(100%

Table 3: Comparison of blood loss between groups

Groups	n	Mean	Std. Deviation
Carotid artery ligation	10	510.00	69.92
Embolization	10	850.00	105.40

P value 0.00001

DISCUSSION

The benign lesion of naso pharynx angiofibroma is a disease of adolescent age group. The angiofibroma is a locally invasive tumor that finds its pathway through natural fissures and foramen. The diagnosis of angiofibroma is made on basis of CT angiogram. The extent of tumor can be diagnosed on basis of CT scan. The surgical management of the tumor is dependent on the radiological evidence of the tumor JNA[4]. Morbidity of angiofibroma is due to nasal obstruction, difficulty in breathing, repeated epistaxis and the tumor extending into paranasal sinuses and sometimes intracranially causing visual blindness and other cranial neuropathies.

Diagnosis of JNA is dependent on good clinical evaluation and proper history of the patient. Most of the cases presented to us were adolescent males[15] with complains of nasal obstruction and recurrent epistaxis. CT scan nose and paranasal sinuses with FESS protocol was carried out for these patients to view the extent of the disease. These improved radiography techniques have shown that 20% of the tumors showed intracranial extent. Definitive diagnosis was based on angiography which shows the feeding vessel and also aids in its embolization[17]. The characteristic angiographic appearance is a blush that appears on digital subtraction angiogram. The main feeding vessel in most of the cases is ipsilateral internal maxillary artery with few branches coming from the internal carotid artery.[20]

Surgery is the mainstay of treatment of JNA. Numerous surgical approaches have been used for its removal like

transpalatal or transmaxillary etc. but these open surgical approaches have been used for large size tumors only and also has disadvantages of increase in hospital stay and increase blood loss. The management of angiofibroma requires selection accuracy in surgical technique, proper staging of tumor, pre operative assessment of bleeding loss in the patient and dissection technique using sub-periosteal approach. Small sized tumors are removed endoscopically. On the other hand radiotherapy is used for large sized unresectable tumors , mostly tumors going intracranialy or the tumors which have carotid angiogram showing tumor supplied by branches of internal carotid system. Radiotherapy is also used post operatively for tumors who are not completely excised and some part is left behind due to difficulty in excising them.

In both these methods of JNA removal there is always an increased risk of blood loss[5]. For this purpose embolization is adopted using Teflon pistons in the external carotid system for removal of juvenile angiofibroma[16], or per operative ligation of external carotid artery ligation is done.

In previous researches it was found that pre operative embolization reduces blood loss upto 50% during removal of small sized tumors. However large sized angiofibromas do not benefit from this method[6].

Moulin et al. calculated in his research that large size tumors can only benefit from this method of preoperative embolization after comparing blood loss in patients subjected to embolization versus patients who don't undergo embolization. In contrast the research done by Petruson et. al does not show any wide difference in blood loss for embolized patients and the non embolized patients.

Mc comb el al is of the view that the method of preoperative embolization is not advised as the margins of the tumor fail to get identified and the risk of getting a relapse tumor increases Also embolization increases fibrosis and leads to difficulty in achieving accurate plane of dissection.

However, embolization has been observed to be a method that has both advantages and disadvantages such as hematomas, blindness, hemiplegia, stroke, cranial nerve palsies and even death[19]. The technique of embolization has its own side effects[18] which includes mild symptoms like fever to morbidity like blindness and death.

In our study we also found that those patients who underwent embolization preoperatively have greater blood loss during surgery as compared to the group patients who had external carotid artery ligation per operatively before excision. This is because in embolized patients the surgical plane dissection becomes difficult and increase chances of residual tumor.also all the feeding vessels are not totally embolized and this poses a greater chance of blood loss during the surgery and hence high rate of morbidity and mortality. Also the risks associated with embolization pose a greater threat to the life of the patient. Secondly the procedure of embolization is cost effective whereas carotid artery ligation does not cost any extra amount of money to the patient. Embolization can only be done for small sized tumors and is not effective for large sized tumors whereas carotid artery ligation is always effective regardless of the size of the tumor. Therefore per operative external carotid artery ligation is a better method to minimize per operative heamorhage in angiofibroma excision.

CONCLUSION

It was concluded from our study that in order to minimize blood loss during removal of juvenile nasopharyngeal angiofibroma per operative external carotrid artery ligation is better than using angiography technique to embolize the external carotid system. This is because embolization has its own risks as well moreover it does not ensure complete occlusion of the feeding vessel. On the other hand when external carotid artery is ligated per operatively before excision of angiofibroma it completely occludes the blood supply to the tumor and hence results in less per operative blood loss.

Conflict of interest: Nil

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