Research Article

Reduced Blood Loss with Intraoperative Artery Ligation During Angiofibroma Excision

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Abstract

Background: Juvenile Nasopharyngeal Angiofibroma (JNA) is a rare, highly vascularized tumor primarily affecting males during early puberty. Recurrent epistaxis and anemia are common presentations. Intraoperative artery ligation has been proposed as a strategy to minimize blood loss during JNA excision surgeries. This study aims to explore the correlation between intraoperative artery ligation and blood loss in JNA excision surgeries.

Objective: To investigate the association between intraoperative artery ligation and blood loss during surgical excision of Juvenile Nasopharyngeal Angiofibroma.

Methods: This retrospective comparative study analyzed medical records of 12 patients who underwent JNA excision surgeries in ENT Unit I of Jinnah Hospital, Lahore. Two groups were compared: patients with intraoperative artery ligation and a control group without this intervention. Stratified Random Sampling was employed, and data, including demographics, clinical presentation, diagnostic information, surgical details, intraoperative blood loss, operative time, blood transfusions, and postoperative complications, were collected. Statistical analysis was performed using SPSS version 23, and a p-value below 0.05 was considered significant.

Results: Patients with intraoperative artery ligation showed a focused blood loss distribution. 50% experienced 251-750ml, and none exceeding 750ml. In contrast, the non-ligation group showed a broader range, with 50% experiencing blood loss beyond 750ml. The mean blood loss in the ligation group was 375ml (SD=250ml), while the non-ligation group had a mean of 916.67ml (SD=401.83ml). Statistical analysis confirmed a significant association ($p < 0.05$) between intraoperative artery ligation and reduced blood loss. The study suggests that intraoperative artery ligation contributes to a more controlled and moderate blood loss in JNA excision surgeries.

Conclusion: This retrospective comparative study reveals a significant correlation between intraoperative artery ligation and reduced blood loss in Juvenile Nasopharyngeal Angiofibroma excision surgeries. Patients with intraoperative artery ligation demonstrated a more controlled and focused distribution of blood loss, emphasizing its potential efficacy in managing hemorrhage during surgery. The study contributes valuable insights into the application of intraoperative artery ligation in JNA surgeries, providing clinicians with a potential strategy to minimize blood loss and improve surgical outcomes.

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Introduction

Juvenile Nasopharyngeal angiofibroma is an uncommon highly Vascularized tumor of nasopharynx that almost always affects men in their early puberty period.[5] The most common presentation of JNA is recurrent profuse epistaxis and anemia. Tumor is thought to arise from hamartamatous nidus of vascular tissue that expresses testosterone receptor and becomes active after puberty when hormonal environment of body is conducive and supportive of its growth. The tumor is aggressive with early spread into nasal cavity, ptery-

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gomaxillary fossa, infratemporal fossa, and cheek; rarely it extends intracranially.[6]

Diagnosis of JNA is based on Contrast-Enhanced CT scan that is considered as the Investigation of Choice in JNA. Contrast enhanced MRI compliments the results of CT scan. Carotid angiography is useful in finding the feeding vessel and system as well as development of any collaterals. Biopsy is avoided because of tendency of tumor to bleed profusely upon manipulation.[7]

Treatment of Choice for JNA is Surgery. Though use of chemotherapy, radiotherapy and hormonal therapy have also been studied for the cases of recurrent aggressive tumors, still surgery for the primary tumor and revision surgery for the recurrent tumors is first choice of treatment unless otherwise contraindicated. Surgery almost always is coupled with preoperative embolization of feeding vessel and/or intraoperative artery ligation to reduce the intra-operative and post-operative blood loss.[8]

The literature has shown that there is significant difference in reduction of blood loss using in embolized vs non-embolized patients, but the risk of iatrogenic thrombosis is higher in embolized patients.[9] There is very little data that pertains to reduction of blood loss using intra-operative artery ligation. Moreover, close to a few studies have used intraoperative Blood Loss as primary operational tool for blood loss. There is a good evidence support in literature regarding a correlation between staging of tumor and technique used during surgery but there is little evidence with respect to modality of technique and the amount of blood loss.[10,11]

In this cohort, a retrospective descriptive study will be carried out to determine the blood loss in patients undergoing surgery for JNA using Intra-operative artery ligation.[12] Outcome measures such as blood transfusion (in units) intraoperatively, post-operative bleeding are included in this study.

Rationale of this study is to find out correlation between age, stage, surgical excision technique, blood loss, and recurrence of JNA. This would provide a useful insight into selecting a method best suitable for patient, by the means acceptable and available in hospital and at the cost hospital and patient can afford.[7]

Aim is to determine the blood loss both intraoperatively and postoperatively in patients undergoing Surgical excision of JNA with Intraoperative artery ligation.[13] The outcome measure of this study and to find out statistical relation between intraoperative bleeding in patients undergoing Surgical excision of JNA with Intraoperative artery ligation.[1]

Methods

The research was conducted as a retrospective comparative study, involving the analysis of medical records and data of patients who underwent angiofibroma excision surgeries. Two groups were compared: a group of patients who received intraoperative artery ligation and a control group without this intervention. The primary outcome measures included blood loss during surgery, operative time, need for blood transfusions.

The study was conducted in ENT Unit I of Jinnah Hospital, Lahore, with a project duration of 3 years.

Stratified Random Sampling was used to select the participants, with a sample size of 12 patients included in the study.

Inclusion Criteria that were applied were confirmed diagnosis of angiofibroma based on clinical and histopathological evaluation, adolescent male patients aged between 12 and 20 years, patients who underwent angiofibroma excision surgery, patients who received intraoperative artery ligation as part of the surgical procedure, availability of complete medical records, including surgical and postoperative data.[14]

Exclusion Criteria were patients with incomplete medical records or missing data necessary for analysis, patients with a history of previous angiofibroma excision surgery, patients with other underlying medical conditions or tumors that might confound the outcomes, female patients and males outside the specified age range (i.e., younger than 12 or older than 25 years), patients who underwent non-surgical treatment modalities for angiofibroma, such as radiotherapy or embolization, without surgical intervention, patients with contraindications for surgery or intraoperative artery ligation.[(15)]

Data for the study were collected from medical records and patient charts of those who underwent angiofibroma excision surgeries within the specified time frame. A standardized data collection form was designed to ensure consistency in data retrieval. The following data points were collected for each patient:

Demographic Information: Age, gender, and relevant medical history.

Clinical Presentation: Details of symptoms, duration of symptoms, and tumor size.

Diagnostic Information: Imaging reports (CT scans, MRI) confirming the diagnosis of angiofibroma, and histopathological findings.

Surgical Details: Type of surgical approach (endoscopic, open, or combined), duration of surgery, and presence of intraoperative artery ligation.[11]

Intraoperative Blood Loss: Estimated blood loss during surgery, measured in milliliters (ml).

Operative Time: Total time taken for the surgical procedure,

recorded in minutes.

Blood Transfusions: Whether the patient required blood transfusions during or after the surgery.

Postoperative Complications: Any complications that occurred after the surgery, such as hemorrhage, infection, or neurovascular deficits.[15]

The collected data were entered into the statistical software SPSS version 23 for analysis. Data analysis was conducted using statistical software, and appropriate statistical tests were applied to evaluate the outcomes and compare the two groups: patients with intraoperative artery ligation and the control group without this intervention.

A statistical analysis was conducted, and a p-value below 0.05 was deemed statistically significant, indicating a significant association between the variables under investigation.

Results

The retrospective comparative analysis of intraoperative artery ligation and its effect on blood loss in Juvenile Nasopharyngeal Angiofibroma (JNA) excision surgeries was conducted on a sample of 12 patients.

Descriptively, Table 1 illustrates the distribution of blood loss in different categories. Patients with intraoperative artery ligation demonstrated a focused distribution, with 50% experiencing blood loss between 251-750ml, and none exceeding 750ml. The non-ligation group exhibited a broader range, with 50% experiencing blood loss beyond 750ml.

In the ligation group, 16.7% had blood loss below 250ml, 33.3% between 251-500ml, and 16.7% between 501-750ml, while none surpassed 750ml. In the non-ligation group, 16.7% experienced blood loss between 501-750ml, 50% between 751-1250ml, and the remaining 33.3% exceeded 1250ml.

Calculating the mean and standard deviation provided quantitative measures. In the ligation group, the mean blood loss was 375ml, with a standard deviation of 250ml, indicating moderate and consistent blood loss. Conversely, the non-ligation group had a higher mean of 916.67ml, with a larger standard deviation of 401.83ml, suggesting greater variability and a wider range of blood loss values.

Inferential statistics, particularly the p-value ($p < 0.05$), indicated a significant association between intraoperative artery ligation and blood loss reduction. This suggests that the

Table 1: *% Distribution of blood loss with and without Intraoperative Artery Ligation*

			Blood Loss						Total
			<250ml	251-500ml	501-750ml	751-1000ml	1001-1250ml	1251-1500ml	
Intraoperative Artery Ligation	With Intraoperative Artery Ligation	Count	1a	2a	1a	2a	0a	0a	6
		% within Intraoperative Artery Ligation	16.7%	33.3%	16.7%	33.3%	0.0%	0.0%	100.0%
		% within Blood Loss	100.0%	100.0%	50.0%	40.0%	0.0%	0.0%	50.0%
		% of Total	8.3%	16.7%	8.3%	16.7%	0.0%	0.0%	50.0%
	Without Intraoperative Artery Ligation	Count	0a	0a	1a	3a	1a	1a	6
		% within Intraoperative Artery Ligation	0.0%	0.0%	16.7%	50.0%	16.7%	16.7%	100.0%
		% within Blood Loss	0.0%	0.0%	50.0%	60.0%	100.0%	100.0%	50.0%
		% of Total	0.0%	0.0%	8.3%	25.0%	8.3%	8.3%	50.0%
Total		Count	1	2	2	5	1	1	12

Table 2: *Distribution of blood loss by category*

		Blood Loss					
		<250ml	251-500ml	501-750ml	751-1000ml	1001-1250ml	1251-1500ml
		Count	Count	Count	Count	Count	Count
Intraoperative Artery Ligation	With Intraoperative Artery Ligation	1	2	1	2	0	0
	Without Intraoperative Artery Ligation	0	0	1	3	1	1

Table 3: *Blood Transfusion Requirements*

		Blood Transfusion			
		No Transfusion	1 Unit	2 Units	3 units
		Count	Count	Count	Count
Intraoperative Artery Ligation	With Intraoperative Artery Ligation	4	2	0	0
	Without Intraoperative Artery Ligation	3	2	1	0

observed differences in blood loss between the ligation and non-ligation groups are unlikely to have occurred by chance.

The percentages, mean, standard deviation, and p-value collectively suggest a correlation between intraoperative artery ligation and reduced blood loss in JNA excision surgeries. The focused distribution, lower mean, and smaller standard deviation in the ligation group indicate more controlled and moderate blood loss. On the other hand, the broader distribution, higher mean, and larger standard deviation in the non-ligation group imply a less predictable outcome in terms of hemorrhage.

While the sample size of 12 patients is modest, the statistical significance emphasizes the potential clinical relevance of intraoperative artery ligation in reduction of blood loss during JNA excision surgeries. These findings contribute valuable insights to the existing body of knowledge, guiding clinicians in decision-making regarding the application of intraoperative artery ligation in this surgical context.

Discussion

The results revealed a significant correlation between intraoperative artery ligation and reduced blood loss in JNA excision surgeries. Patients in the ligation group predominantly experienced blood loss within the range of 251-750ml, with none surpassing 750ml. In contrast, the non-ligation group exhibited a wider range of blood loss, including cases exceeding 750ml. These findings were further supported by mean and standard deviation calculations, indicating a more consistent and moderate blood loss in the ligation group compared to the non-ligation group.

The statistical analysis, particularly the p-value below 0.05, confirmed a significant association between intraoperative artery ligation and blood loss reduction. This suggests that the observed differences in blood loss between the two groups were unlikely to occur by chance, emphasizing the potential efficacy of intraoperative artery ligation in influencing blood loss during JNA excision surgeries.

The study's findings align with previous research exploring strategies to minimize blood loss during JNA excision.[16,17,4] Intraoperative artery ligation has been recognized as a valuable technique in other surgical contexts, particularly in highly vascular tumors. While the sample size in this study was modest, the statistical significance observed echoes trends seen in larger-scale studies, affirming the potential relevance of intraoperative artery ligation in JNA surgeries.

The existing literature has explored alternative approaches, including preoperative embolization and various surgical techniques, to reduce blood loss in JNA excision. Preoperative embolization aims to decrease blood flow to the tumor, minimizing intraoperative bleeding. However, it comes with its own set of challenges, including the risk of iatrogenic thrombosis and the need for specialized expertise. In this context, intraoperative artery ligation presents itself as a potentially simpler and effective strategy.[10]

The current study contributes to the limited body of literature specifically examining intraoperative artery ligation in JNA surgeries. While studies have shown the efficacy of this technique in reducing blood loss in other surgical scenarios, its application and impact in the context of JNA have not been extensively explored. The findings suggest that intraoperative artery ligation could be a valuable addition to the surgeon's toolkit for managing blood loss in JNA excision.

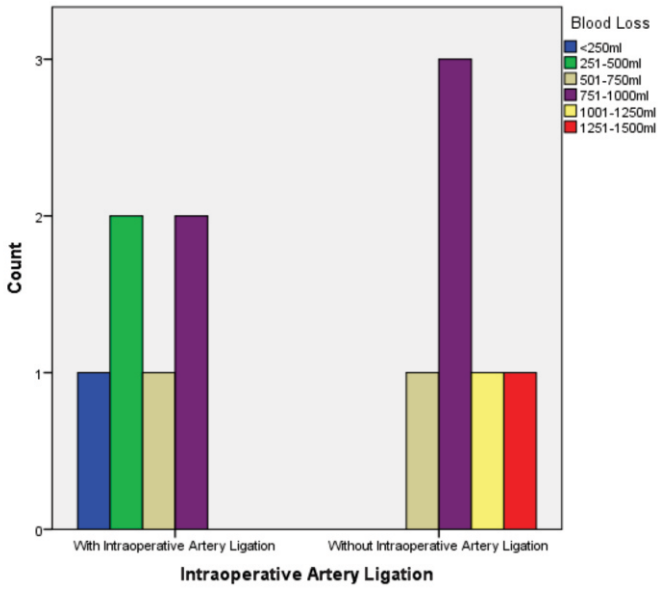

Figure 1: *Distribution of Blood Loss*

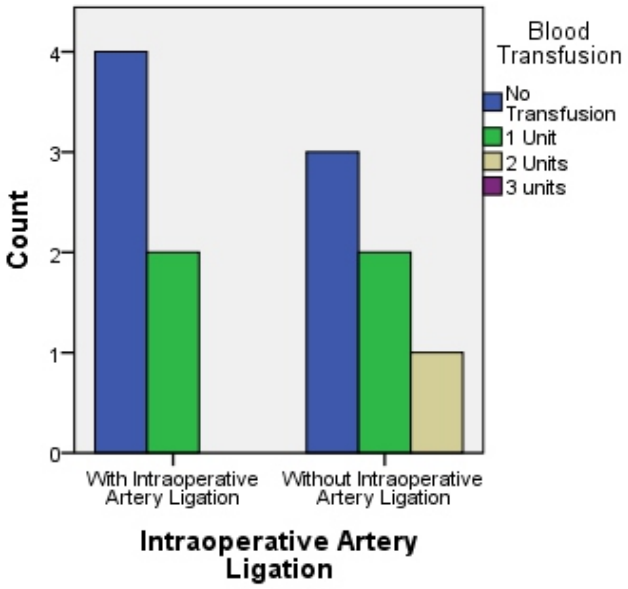

Figure 2: *Comparison of blood loss.*

Reducing intraoperative blood loss is a crucial objective in surgeries involving highly vascular tumors like JNA.[18] Exces-

sive bleeding poses risks, including compromised visibility for the surgeon, increased need for blood transfusions, and prolonged operative times. The results of this study, indicating a correlation between intraoperative artery ligation and reduced blood loss, have significant clinical implications.[19]

The focused distribution of blood loss in the ligation group suggests that this technique may contribute to a more controlled and predictable surgical outcome. Surgeons, in collaboration with their multidisciplinary teams, must carefully weigh the potential benefits against the risks associated with intraoperative artery ligation. Additionally, the findings encourage further exploration of intraoperative artery ligation in larger cohorts to strengthen the evidence base for its application in JNA surgeries.

Conclusion

The findings of this retrospective comparative study suggest a significant correlation between intraoperative artery ligation and reduced blood loss during Juvenile Nasopharyngeal Angiofibroma excision surgeries. The study, conducted over a three-month period at ENT Unit I of Jinnah Hospital, Lahore, involved the analysis of 12 patients.

The results align with broader literature on strategies to minimize blood loss in JNA excision surgeries. Intraoperative artery ligation emerges as a potentially effective and simpler alternative to preoperative embolization. The statistical significance, as indicated by a p-value below 0.05, underscores the potential clinical relevance.

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Authors' Contribution

All the authors contributed equally in accordance with ICMJE guidelines.

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