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A STUDY ON MANAGEMENT OF HEMOPTYSIS WITH BRONCHOSCOPIC ADMINISTRATION OF ADRENALINE AND TRANEXAMIC ACID.

Respiratory Medicine

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ABSTRACT

Introduction: Hemoptysis refers to expectoration of blood originating from the lower respiratory tract. Bronchial arteries are the principal sources of hemoptysis amenable to treatment. Most common cause of hemoptysis in world and India is Tuberculosis.Most common cause of hemoptysis in western world are Bronchitis followed by Bronchiectasis.Hemoptysis irrespective of the amount is an alarming symptom. The present study was designed to compare the efficacy of endobronchial instillation of tranexamic acid with that of adrenaline in controlling acute endobronchial bleeding via FOB. **Aim:** To evaluate the efficacy and safety of bronchoscopic administration of Adrenaline and Tranexamic acid in the management of hemoptysis. **Materials And Method:** This prospective, comparative, observational study was conducted in the Respiratory Medicine Department of Government medical college Kota Rajasthan 2022 July to July 2024. The present study included 100 hemoptysis patients scheduled for bronchoscopy. For management of presenting hemoptysis or bronchoscopy induced bleeding, patients were randomly subdivided into two groups with 50 patients each: the first group received endobronchial administration of Tranexamic acid,whereas the second group received endobronchial administration of Adrenaline. **Results:** In the current study 50% of study population were instilled adrenaline and remaining half were administered with tranexamic acid. Among them, 63% had 1 instillation and 32% had to take 2 instillations. The current study found that 50% of study population didn't have any complications. Most common complication found was tachycardia (20%), followed by tremor (18%), raised BP (6%), muscle cramps (4%), bronchospasm (1%), headache (1%) etc. Recurrence was seen in 54.2% treated with adrenaline and 45.8% treated with tranexamic acid. Mean time taken to achieve hemostasis with adrenaline and tranexamic acid were 240.6 ±45.25 seconds and 243 ± 31.2 seconds respectively. **Conclusion:** The research indicates that Tranexamic acid and Adrenaline may both be helpful in managing hemoptysis by highlighting possible patterns and correlations between these therapies and patient outcomes. The outcomes of management using both Adrenaline and Tranexamic acid were comparable.

KEYWORDS

Bronchoscopy, Hemoptysis, Adrenaline, Tranexamic acid

INTRODUCTION

The term hemoptysis refers to expectoration of blood originating from the lower respiratory tract (below the level of vocal cords i.e. from trachea bronchial tree or lung parenchyma).Based on its severity, hemoptysis is classified as mild, moderate,and severe. Mild hemoptysis is considered as less than 50ml/day. Moderate bleeding is attributed to 50–100 mL/day. Severe/Massive hemoptysis is considered as- > 200-600ml/ day or >150ml/hr or >100ml/day for 3 consecutive days or any amount of blood which can cause airway obstruction /hemodynamic instabiliy/ respiratory failure.[1]

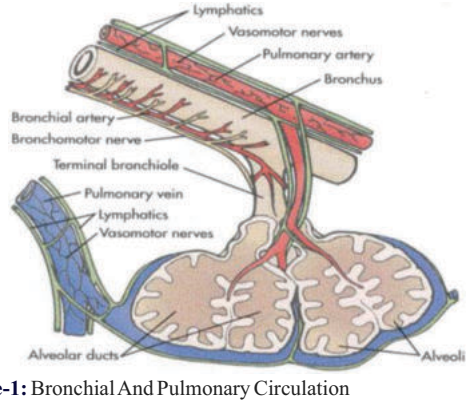

Figure-1: Bronchial And Pulmonary Circulation

The lungs have a dual blood supply: around 99% of perfusion is via the pulmonary arteries (a low-pressure circuit i.e. 15-20/10-5 mm Hg), responsible for gas exchange, and the remaining 1% is from the bronchial arteries (a high-pressure circuit i.e. 120/80 mmHg)[2].Most hemoptysis arises from the bronchial circulation (90%), whereas less common causes of hemoptysis (5%) from the pulmonary circulation and from non-bronchial systemic arteries(5%).Very rarely, hemoptysis has been reported originating from pulmonary and bronchial veins and capillaries[3].

Hemoptysis irrespective of the amount is an alarming symptom.Due to the potential for rapid asphyxiation with even a small blood volume, patients may progress to respiratory failure and circulatory collapse.

Adrenaline is a sympathomimetic drug. It causes an adrenergic receptive mechanism on effector cells and mimics all actions of the sympathetic nervous system.With its sympathomimetic action it causes vasoconstriction.Tranexamic acid is a synthetic antifibrinolytic acid applied for the short-term control of bleeding. It inhibits fibrin degradation and consequently prevents blood loss through binding to plasminogen and plasmin[4].

MATERIALS AND METHODS

The study aimed to compare the efficacy of endobronchial instillation of Tranexamic acid versus Adrenaline in controlling acute endobronchial bleeding during bronchoscopy. Conducted at Government Medical College, Kota, from July 2022 to July 2024, this prospective, comparative, observational study included 100 patients with hemoptysis, divided into two groups of 50. The first group received Tranexamic acid, while the second received Adrenaline. The

adrenaline protocol involved administering 20 ml of diluted Adrenaline (1 mg in 200 ml cold saline) up to twice, with 1.5 minutes of observation between doses. The Tranexamic acid protocol involved administering 20 ml of diluted tranexamic acid (500 mg in 15 ml cold saline) up to three times, with the same observation period. Statistical analysis, including Chi-square tests for categorical variables and median and interquartile ranges for continuous variables, was performed using SPSS version 29.0, with a significance level set at $P < 0.05$.

RESULTS

This observational study was conducted among 100 adult patients with hemoptysis .The age group of study population ranges from 21 to 82 years with an average of 54.48 ± 15.43 years. 73.0% of the participants were male and the rest were female (figure 2 and figure 3)

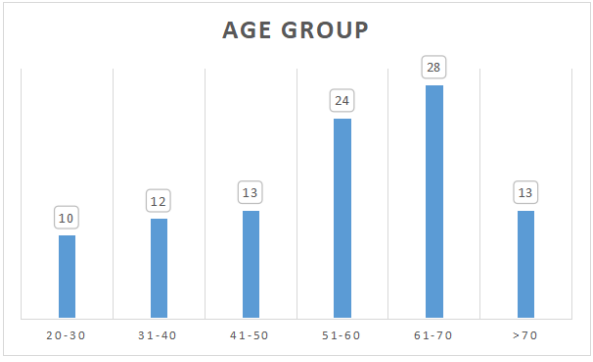

Figure 2: Age Distribution Of Study Participants.

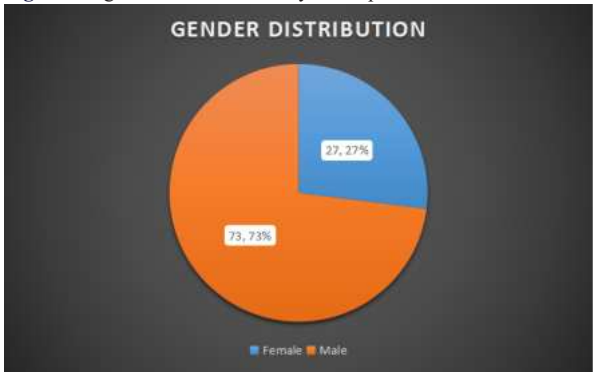

Figure 3: Gender Distribution Of The Study Participants

79% of participants had spontaneous hemoptysis as the aetiology compared to iatrogenic (fig 4).

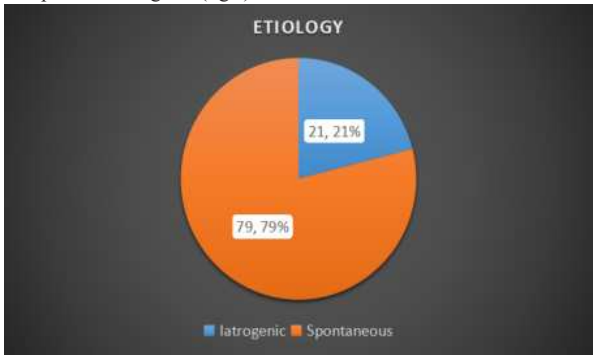

Figure 4: Etiology Of Hemoptysis Among The Participants

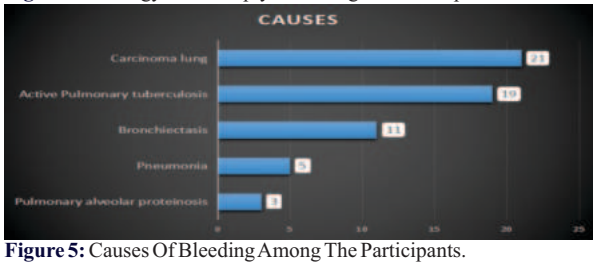

Figure 5: Causes Of Bleeding Among The Participants.

While analysing the reasons for hemoptysis carcinoma lung and active pulmonary TB were identified as the major reasons (figure 5).

64% of the study participants has got mild bleeding and rest of them had moderate bleeding. (see table 1 and figure 6).

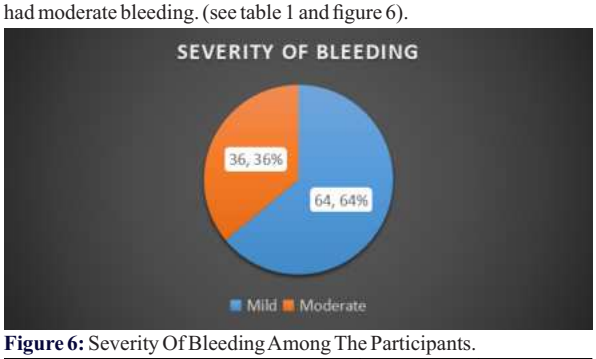

Figure 6: Severity Of Bleeding Among The Participants.

		Frequency	Percent
SEVERITY OF BLEEDING	Mild (<50ml)	64	64.0
	Moderate(50-200ml)	36	36.0
	Total	100	100.0

Of which 50% were instilled Adrenaline and remaining half were administered with Tranexamic acid.Among them, 63% had 1 instillation, 32% had to take 2 instillations and 5% had 3 instillations (Figure 7).

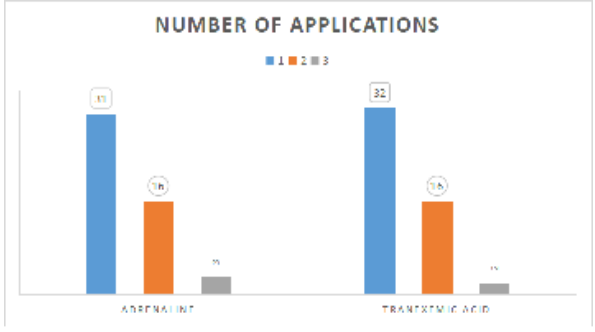

Figure 7: Number of applications.

The mean time for achieving haemostasis was found to be 241.80 ± 38.688 seconds(Table 2 ,figure 8).

Table 2: Mean Time Of Haemostasis In Seconds

	N	Minimum	Maximum	Mean	Std. Deviation
TIME FOR HEMOSTASIS	100	120	330	241.80	38.688

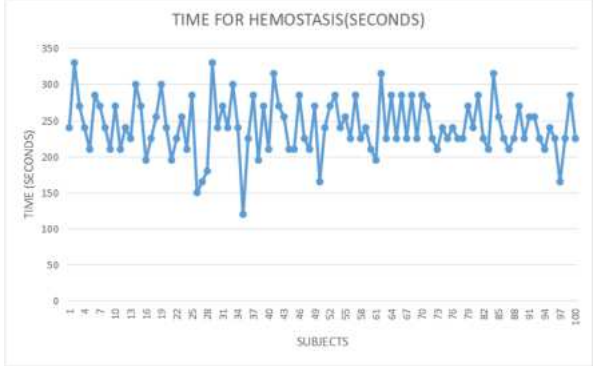

Figure:8- Time To Achieve Hemostasis

Table:3 Recurrence Among The Drugs Instilled

		DRUG INSTILLED		Total
		Adrenaline	Tranexamic acid	
RECURRANCE	No	37	39	76
		48.7%	51.3%	100.0%
	Yes	13	11	24
		54.2%	45.8%	100.0%

Total	50	50	100
	50.0%	50.0%	100.0%

The current study found that only 24% had incidence of recurrence and rest didn't had any recurrence(Table 3,Figure 9).

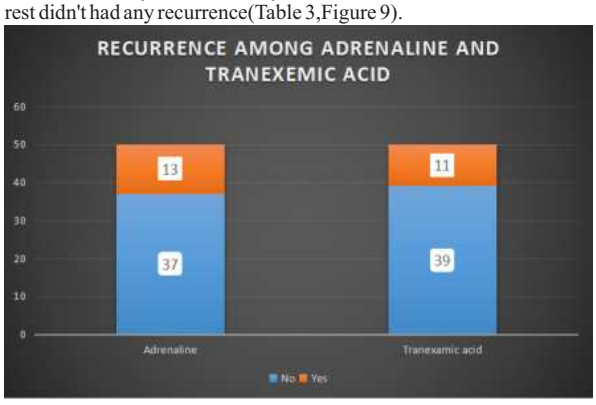

Figure 9: Recurrence Among Adrenaline And Tranexemic Acid.

The study revealed that 50% of the participants experienced no complications. The most common complications were tachycardia (20%) and tremors (18%), with less frequent occurrences of raised blood pressure (6%), muscle cramps (4%), bronchospasm (1%), and headache (1%) (Table 4,Figure 10).

Table:4 Complications Among The Drugs Instilled.

		DRUG INSTILLED		Total
		Adrenaline	Tranexamic acid	
Complications	Bronchospasm	0	1	1
		0.0%	100.0%	100.0%
	Headache	0	1	1
		0.0%	100.0%	100.0%
	Muscle cramps	0	4	4
		0.0%	100.0%	100.0%
	Nil	27	23	50
		54.0%	46.0%	100.0%
	Rise in blood pressure	6	0	6
		100.0%	0.0%	100.0%
	Tachycardia	9	11	20
		45.0%	55.0%	100.0%
	Tremor	8	10	18
		44.4%	55.6%	100.0%
Total		50	50	100
		50.0%	50.0%	100.0%

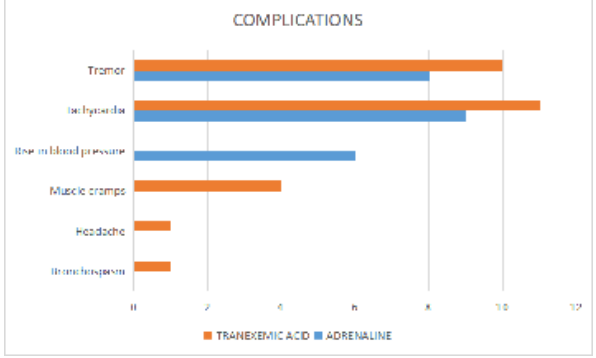

Figure :10 Complications Among The Drugs Instilled.

DISCUSSION

This study aimed to compare the management of hemoptysis using bronchoscopic administration of adrenaline versus tranexamic acid. It involved 100 adult patients with hemoptysis, aged between 21 and 82 years, with a mean age of 54.48 ± 15.43 years. The study population consisted of 73% males and 27% females. The majority (79%) of participants experienced spontaneous hemoptysis rather than iatrogenic causes. The primary diagnoses were carcinoma of the lung and active pulmonary tuberculosis. Bleeding severity was classified as mild in 64% of participants and moderate in the remaining 36%.In the current study 50% of study population were instilled Adrenaline and remaining half were administered with Tranexamic acid. Among them, 63% had 1 instillation and 32% had to take 2 instillations. The current study found that only 24% had incidence of recurrence and rest didn't had any recurrence. The mean time for achieving haemostasis was found to be 241.80 ± 38.688 seconds.

The study revealed that 50% of the participants experienced no complications. The most common complications were tachycardia (20%) and tremors (18%), with less frequent occurrences of raised blood pressure (6%), muscle cramps (4%), bronchospasm (1%), and headache (1%). Among those without complications, 54% were treated with Adrenaline and 46% with Tranexamic acid. Notably, complications such as bronchospasm, headache, and muscle cramps occurred exclusively in patients treated with Tranexamic acid. Tachycardia was observed in 45% of patients treated with Adrenaline and 55% of those treated with Tranexamic acid. Tremors were reported in 44.4% of patients treated with Adrenaline and 55.6% of those treated with Tranexamic acid.

Recurrence rates were 54.2% in the Adrenaline group and 45.8% in the Tranexamic acid group. The mean time to achieve hemostasis was 240.6 ± 45.25 seconds for Adrenaline and 243 ± 31.2 seconds for Tranexamic acid. Although research comparing these treatments for hemoptysis is limited, relevant studies are reviewed below.

A randomized controlled trial by Fekri MS et al. in Iran found no significant difference in bleeding control times between adrenaline (136.66 ± 83.5 seconds) and tranexamic acid (133.9 ± 77.91 seconds) (P = 0.908). The number of injections was also similar: 1.80 ± 0.74 for adrenaline and 2.08 ± 0.66 for tranexamic acid (P = 0.352). In noniatrogenic cases, 48% received tranexamic acid and 44% received adrenaline; in iatrogenic cases, 52% received tranexamic acid and 56% received adrenaline. No significant differences were observed in bleeding control for either case type (P = 0.77). Tranexamic acid was as effective as adrenaline and required less frequent administration.[5]

Another experimental study by Badovinac S et al. showed that in both groups, 83.1% of the patients had their bleeding stopped. The intensity of the bleeding and the number of applications required for bleeding control were similar in both groups. Adrenaline and tranexamic acid were more effective in controlling moderate bleeding (86.7% and 88.7%, respectively; P =.008 and P =.012, respectively) and required more applications for severe bleeding (3.0 ± 0 and 2.4 ± 0.5, respectively) than moderate bleeding (1.7 ± 0.8 and 1.7 ± 0.8, respectively) control (P =.006 and P =.002, respectively). For both groups, they did not observe any drug-related side effects. To manage noncatastrophic iatrogenic endobronchial bleeding following cold saline failure, they found no significant difference between adrenaline and tranexamic acid. This adds to the body of research that tranexamic acid can be used safely and efficiently during FB.[6]

Similar study conducted by Korraa EE et al. in Egypt showed that the heart rate, oxygen saturation, and systolic and diastolic blood pressures did not significantly differ between the groups treated with adrenaline and tranexamic acid. However, both groups' heart rates increased significantly following the bronchoscopy. After bronchoscopy, only the adrenaline group saw a substantial (P=0.001) increase in systolic blood pressure. This result was consistent with what our study showed. The amount of tranexamic acid and adrenaline administered had a substantial and direct correlation with the amount of bleeding that was generated during a bronchoscopy and the amount of time needed to achieve hemostasis. All patients who received TA did not have any drug related intrabronchoscopic or post bronchoscopic problems.[7]

The discrepancies between our study's results and those of other studies could be caused by differences in sample sizes, patient demographics, treatment regimens, follow-up periods, and the particular endpoints that were evaluated. Different results may arise concerning the comparative efficacy and adverse event profiles of Tranexamic acid and Adrenaline in the treatment of hemoptysis due to these variances. Our research intends to provide subtle insights that could improve clinical practices and guide future investigations in this crucial field of Respiratory Medicine by closely assessing both parallels and differences with other studies.

CONCLUSION

This present compared bronchoscopic administration of Adrenaline

and Tranexamic acid for managing hemoptysis. The findings suggest that both treatments are effective, with comparable outcomes. However, as the study was non-randomized, its results may be influenced by confounding variables and biases.Current literature on this topic is limited, underscoring the need for further future study should try to validate the findings from this study using rigorous methodology in order to identify causal linkages and define the best application of these treatments in clinical practice.

LIMITATIONS

The study has several limitations that affect its validity and generalizability. The lack of randomization prevents establishing causal relationships and introduces potential confounding variables and biases, such as selection bias. Variability in patient characteristics and disease severity creates significant data heterogeneity, complicating result interpretation. Additionally, observational studies may not fully capture long-term outcomes or adverse effects, restricting the assessment of treatment safety and efficacy. The findings may also have limited applicability to broader patient populations or different healthcare settings. While offering valuable real-world insights, these limitations necessitate cautious interpretation of the study's conclusions on managing hemoptysis with Adrenaline and Tranexamic acid.

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