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Pulmonary Medicine

ROLE OF INTRAVENOUS AND NEBULISED TRANEXAMIC ACID IN THE MANAGEMENT OF HEMOPTYSIS, AT A TERTIARY CARE HOSPITAL: A PROSPECTIVE STUDY

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ABSTRACT **Background:** Hemoptysis is a common respiratory emergency that ranges from mild blood-streaked sputum to life-threatening pulmonary hemorrhage. Tranexamic acid (TXA), an antifibrinolytic agent, has been used intravenously for the management of nonmassive hemoptysis. Nebulized Tranexamic acid has recently emerged as a promising alternative owing to its direct local hemostatic effect with minimal systemic exposure. However, comparative data between nebulized and intravenous Tranexamic acid remain limited. **Methods:** A prospective randomized controlled study was conducted among 60 adult patients presenting with nonmassive hemoptysis. Patients were randomized equally into two groups: nebulized Tranexamic acid (n=30) and intravenousTranexamic aci (n=30)receiving either IV Tranexamic acid TXA (500 mg every 8 hours) or nebulized Tranexamic acid (500 mg every 8 hours).The primary outcome was time to cessation of hemoptysis. Secondary outcomes included total Tranexamic acid dose required, reduction in hemoptysis volume, duration of hospital stay, need for blood transfusion, invasive interventions, complications, and recurrence within 72 hours. **Results:** Sixty patients completed the study. Baseline demographic and clinical characteristics were comparable between the two groups. Nebulized Tranexamic acid demonstrated a shorter mean time to cessation of hemoptysis compared with intravenous Tranexamic acid. Reduction in daily hemoptysis volume, total Tranexamic acid dose requirement, hospital stay, and recurrence rates were comparable between the groups. No major adverse effects were observed. **Conclusion:** Nebulized tranexamic acid appears to be as effective as intravenous tranexamic acid in the management of nonmassive hemoptysis and may serve as a safe, noninvasive therapeutic alternative.

KEYWORDS : Hemoptysis, Tranexamic Acid, Nebulization, Intravenous Therapy, Randomized Controlled Trial, Pulmonology.

1. INTRODUCTION

Hemoptysis is defined as expectoration of blood originating from the lower respiratory tract. It is a common clinical problem encountered in pulmonology practice and may arise from infections, pulmonary tuberculosis, bronchiectasis, malignancy, and inflammatory lung diseases. While massive hemoptysis requires urgent intervention, nonmassive hemoptysis contributes significantly to patient anxiety, hospital admissions, and healthcare burden.

Tranexamic acid is a synthetic lysine analogue that inhibits fibrinolysis by blocking plasminogen activation. Intravenous Tranexamic acid has been widely used in the treatment of hemoptysis. Nebulized Tranexamic acid provides direct topical action at the bleeding site, potentially reducing systemic adverse effects and achieving faster hemostasis.

Recent studies suggest that nebulized Tranexamic acid may be effective in controlling pulmonary bleeding; however, comparative evidence with intravenous Tranexamic acid TXA remains limited. This study was undertaken to compare the efficacy and safety of nebulized versus intravenous Tranexamic acid in patients with nonmassive hemoptysis.

2. Aim and Objectives

2.1 Aim

To evaluate the effectiveness and safety of intravenous and nebulised Tranexamic acid in the management of patients presenting with Hemoptysis at a tertiary care hospital .

2.2 Objectives

- To asses the effective ness of intravenous and nebulised tranexamic acid in controlling hemoptysis .
- To asses the time taken for cessation of bleeding after initiation of intravenous and nebulised tranexamic acid therapy.
- To determine the reduction in frequency and volume of hemoptysis episodes following treatment.
- To assess the need for additional interventions such as bronchoscopy or Bronchial artery embolization after treatment with tranexamic acid.
- To evaluate the safety profile and adverse effects associated with intravenous /nebulised tranexamic acid therapy.

3. MATERIALAND METHODS

3.1 Study Design and Setting

This Hospital based prospective study was conducted over a six months window (DECEMBER 2025 to MAY 2026) within the outpatient and wards of pulmonology medicine department in Santhiram medical college and General hospital, Nandyal.

3.2 Study Population

The study comprised 60 Patients with symptoms of hemoptysis came to opd and admitted in the wards of pulmonology medicine in Santhiram medical College and general hospital, Nandyal .

Sampling Technique: Simple random sampling.

Randomization

Patients were randomized into: Group A: Intravenous Tranexamic acid (n=30) Group B: Nebulized Tranexamic acid (n=30)

Intervention

Intravenous Group :Tranexamic acid 500 mg intravenously every 8 hours.
Nebulized Group :Tranexamic acid 500 mg diluted in 5 mL normal saline administered via nebulization every 8 hours.
Follow-up: 72 hours post-discharge via telephone.
Measurement: Hemoptysis volume was measured using 100 ml measuring cups replaced every 8 hours.

Outcome Measures

Primary Outcome:
Time to cessation of hemoptysis.
Secondary Outcomes:

- Reduction in hemoptysis volume.
- Total Tranexamic acid dose requirement.
- Hospital stay.
- Need for blood transfusion.
- Need for invasive procedures.
- Recurrence within 72 hours.
- Adverse events.

3.3 Inclusion and Exclusion Criteria

Inclusion Criteria:

1. Patients aged ≥18 years.
2. Patients presenting with mild to moderate hemoptysis.
3. Patients willing to participate and provide informed consent.

Exclusion Criteria:

1. Patients with massive hemoptysis requiring immediate invasive intervention.
2. Known hypersensitivity to tranexamic acid.
3. Patients with active thromboembolic disease.
4. Patients with severe renal impairment.

5. Pregnant women.
6. Patients who refuse consent.

3.4 Clinical and Laboratory Protocols

Clinical Assessment Included: Detailed history, Quantity and duration of hemoptysis, Smoking history, Tuberculosis history, Comorbid illnesses.

Laboratory Investigations: Complete blood count, PT/INR, Renal function tests, Liver function tests, Chest radiograph, CT thorax when indicated, Sputum examination, Bronchoscopy when required

4. RESULTS

A total of 60 patients with nonmassive hemoptysis were enrolled in the study and randomized equally into the intravenous tranexamic acid (IV TXA) group (n=30) and nebulized tranexamic acid (Neb TXA) group (n=30). The baseline demographic characteristics were comparable between the two groups. The mean age of patients in the IV tranexamic acid group was 52.1 ± 13.2 years, while that in the Neb tranexamic acid group was 50.4 ± 12.8 years (p=0.62). Male predominance was observed in both groups, accounting for 66.7% and 70.0% of patients in the IV tranexamic acid and Neb tranexamic acid groups, respectively. Smoking history was present in 16.7% of patients in the IV tranexamic acid group and 26.7% in the Neb tranexamic acid group.

Pulmonary tuberculosis was the most common etiology of hemoptysis in the study population, accounting for 50.0% of cases in the IV tranexamic acid group and 53.3% in the Neb tranexamic acid group.

Table 1: Primary Outcome Time of Cessation of Hemoptysis

Out come	IV Tranexamic acid (n=30)	Nebulized Tranexamic acid (n=30)	P value
Mean cessation time (hours	7.2 ± 4.9	5.6 ± 4.3	0.17
Cessation within 8 hours	20(70%)	25(83.3%)	0.21
Required second dose	8 (26.7%)	4(13.3%)	0.19
Required third dose	2(6.7%)	1(3.3%)	0.55

Table 2: Secondary Outcomes

Outcome	IV Tranexamic acid (n=30)	Nebulized tranexamic acid (n=30)	P Value
Total TXA dose (mg)	670 ± 290	590 ± 250	0.31
24-hour Hemoptysis Volume (mL)	4.2 ± 1.8	40.2 ± 22.5	0.48
Hospital Stay (days)	4.2 ± 1.8	3.9 ± 1.6	0.44
Blood transfusion required	1(3.3%)	0	0.31
Bronchial Artery Embolization	0	0	-
ICU Admission	0	0	-

Nebulized tranexamic acid achieved earlier cessation of hemoptysis than intravenous tranexamic acid (5.6 vs 7.2 hours)Nebulized tranexamic acid showed faster cessation of hemoptysis compared with intravenous tranexamic acid. Reduction in hemoptysis volume and total tranexamic acid dose requirement were comparable between groups.The mean total tranexamic acid dose required was slightly lower in the nebulized group (590 ± 250 mg) compared to the intravenous group (670 ± 290 mg).

Both intravenous and nebulized tranexamic acid demonstrated good safety and tolerability. Adverse effects were mild and uncommon. No serious adverse events, thromboembolic complications, or treatment discontinuations were reported, confirming the favorable safety profile of both treatment modalities.

Recurrence of hemoptysis within 72 hours following treatment was uncommon in both groups. Two patients (6.7%) in the IV tranexamic acid group experienced recurrent hemoptysis compared to one patient (3.3%) in the nebulizedtranexamic acid group. The majority of patients remained free from recurrence during the follow-up period, with recurrence-free rates of 93.3% and 96.7% in the IV tranexamic acid and Neb tranexamic acid groups, respectively.

5. DISCUSSION

The present study demonstrates that nebulized TXA is an effective alternative to intravenous TXA in patients with nonmassive hemoptysis. The local delivery of TXA directly to the bronchial mucosa may facilitate rapid clot stabilization and hemostasis.

The findings of this trial indicate that localized, topical application of tranexamic acid via nebulization is a viable alternative to systemic intravenous administration for nonmassive hemoptysis. The targeted delivery achieved rapid hemostasis (mean cessation time of 5.70 hours) that was statistically comparable to IV delivery, without necessitating higher total drug doses. The Comparable hospital stay, recurrence rates, and complication profiles lack of adverse effects, complications, or need for invasive procedures in the nebulized cohort suggests that nebulized TXA may be considered a safe and practical treatment option.The advantages of nebulized TXA include ease of administration, reduced systemic adverse effects, and avoidance of intravenous access.it is a safe and effective frontline intervention in emergency settings, primarily for etiologies such as pulmonary tuberculosis

Further multicenter studies with larger sample sizes are required to establish definitive recommendations.

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