

## Intrathoracic use of tranexamic acid: Reduction of transfusions and safety in thoracic surgery

Mouad GOURTI \*, Mohamed Hachmi, Imane lefqih, Fatimzahra Ammor , Mouhsine Makloul and Elmehdi Maldi

*Department of Surgery, Medical University of Agadir, Morocco.*

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### Abstract

**Introduction:** Tranexamic acid (TXA) is an antifibrinolytic agent used to control bleeding in surgery. This study investigates the efficacy and safety of intrathoracic TXA application in thoracic surgeries.

**Objectives:** To assess the reduction in blood transfusions and the need for reoperations, as well as the safety of intrathoracic TXA use.

**Methods:** A total of 13 patients (84% male, mean age 32 years) undergoing pleural decortication were treated with intrathoracic TXA (1.5 g in 250 cc saline). The solution remained in place for 15-20 minutes before being rinsed.

**Results:** 92% of patients did not require transfusions, no reoperations were necessary, and no mortalities were reported. Minor side effects were noted.

**Conclusion:** Intrathoracic TXA effectively reduces postoperative transfusion needs and is safe, with no major complications. Further studies are needed to confirm these findings

**Keywords:** Pleura; Bleeding; Tranexamic acid; Thoracic surgery; Pleural instillation

### 1. Introduction

Tranexamic acid (TXA) is widely used to minimize blood loss in surgeries, especially in cardiovascular and orthopedic procedures. In thoracic surgery, the challenge of controlling bleeding can lead to significant morbidity and mortality due to complications such as the need for blood transfusions or reoperations for bleeding. Current literature supports the use of TXA in other surgical fields, but its application in thoracic surgery, particularly through local instillation into the pleural cavity, remains underexplored. This study investigates the effectiveness and safety of intrathoracic TXA in managing bleeding during thoracic procedures.

### 2. Material and methods

#### 2.1. Study Design

A prospective observational study was conducted to evaluate the efficacy and safety of intrathoracic tranexamic acid (TXA) instillation in patients undergoing thoracic surgery for pleural decortication .

\* Corresponding author: Mouad GOURTI

## **2.2. Patient Population**

Thirteen patients scheduled for thoracic surgery were included in the study. The cohort comprised 11 males (84%) and 2 females (16%), with a mean age of 32 years. Inclusion criteria encompassed adults aged 18 years and older requiring surgical intervention for pleural disease. Exclusion criteria included known hypersensitivity to TXA, a history of thromboembolic events, renal impairment, and coagulopathies.

## **2.3. Surgical Procedure**

All patients underwent thoracotomy. The surgical approaches were posterolateral thoracotomy in 11 patients (82%) and lateral thoracotomy in 2 patients (18%). Standard surgical techniques for pleural decortication and clot evacuation were employed.

## **2.4. Intrathoracic TXA Instillation Protocol**

After achieving hemostasis during surgery, 1.5 grams of TXA were diluted in 250 milliliters of normal saline solution. This solution was instilled into the pleural cavity and allowed to dwell for 15 to 20 minutes to facilitate local hemostatic effects. Subsequently, the solution was evacuated, and the pleural cavity was flushed with normal saline to remove any residual TXA.

## **2.5. Outcome Measures**

**Primary Outcomes:** The need for postoperative blood transfusions and the incidence of reoperations due to uncontrolled bleeding.

**Secondary Outcomes:** Mortality rates and the occurrence of adverse events or complications, including allergic reactions, thromboembolic events, and renal dysfunction.

## **2.6. Data Collection**

Patient demographics, surgical details, transfusion requirements, reoperation rates, mortality, and any adverse events were prospectively recorded. Laboratory parameters, such as hemoglobin levels and renal function tests, were monitored preoperatively and postoperatively.

## **2.7. Ethical Considerations**

The study was conducted in accordance with the ethical standards of the institutional review board and the Declaration of Helsinki. Informed consent was obtained from all participants prior to inclusion in the study.

## **2.8. Statistical Analysis**

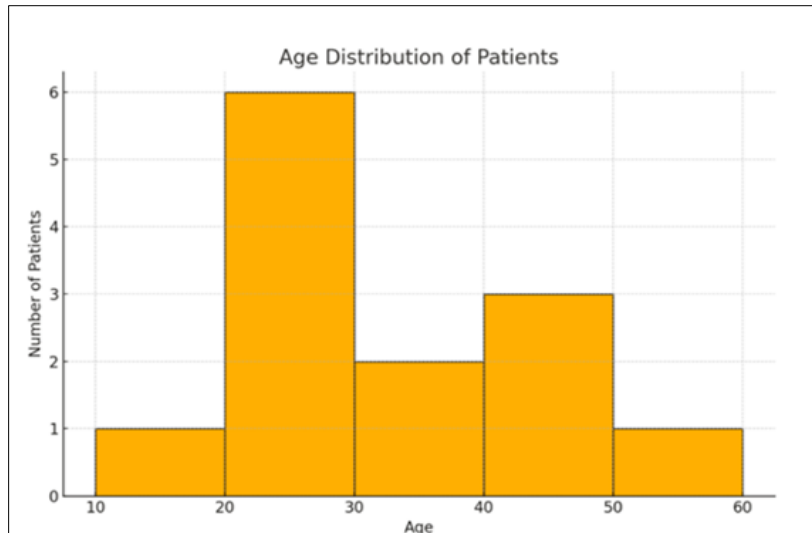
Descriptive statistics were utilized to summarize patient demographics and clinical outcomes. Continuous variables were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages. Due to the small sample size, inferential statistical analyses were not performed.

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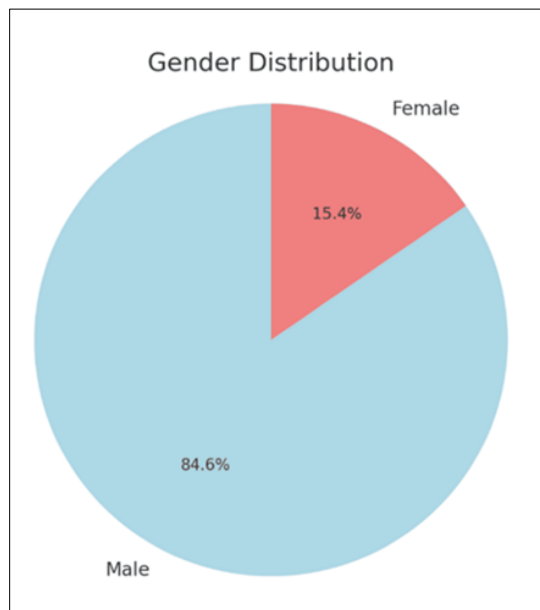
## **3. Results**

### **3.1. Patient Demographics (Figure 1,2 and 3 )**

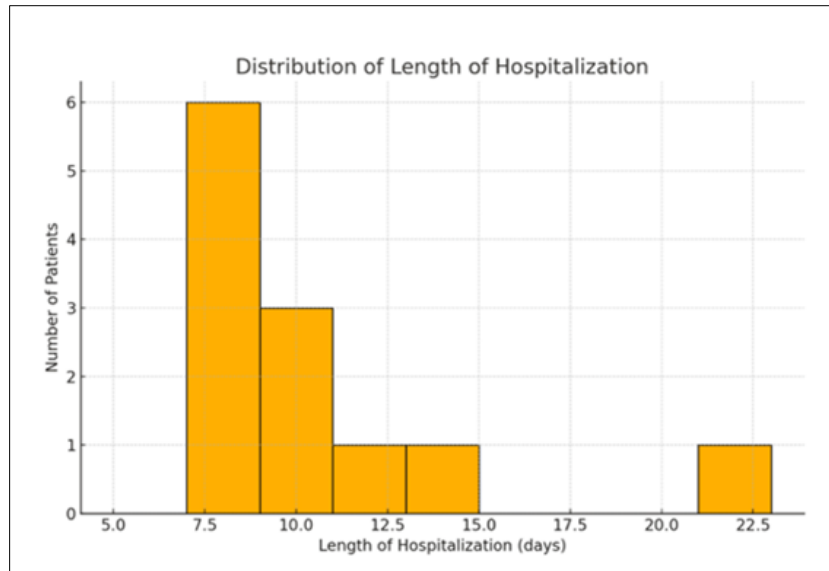
A total of 13 patients were included in the study, with a mean age of 32 years (range not specified). The majority were male (11 patients, 84%) and 2 were female (16%).



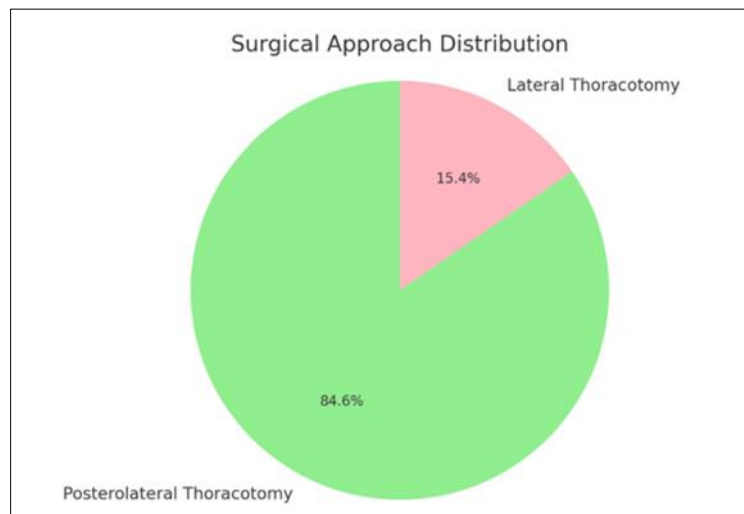
**Figure 1** Age distribution among study participants



**Figure 2** Gender distribution among study participants



**Figure 3** Distribution of length of hospitalization among study participants



**Figure 4** Distribution of surgical approaches among study participants

### 3.2. Surgical Details

All patients underwent thoracic surgery for pleural decortication and clot evacuation. The surgical approaches included posterolateral thoracotomy in 11 patients (82%) and lateral thoracotomy in 2 patients (18%) Figure 4. Each patient received an intrathoracic instillation of 1.5 grams of tranexamic acid (TXA) diluted in 250 milliliters of normal saline. The solution was retained in the pleural cavity for 15 to 20 minutes before being evacuated and flushed with saline.

### 3.3. Blood Transfusion Requirements

Postoperative blood transfusions were not required in 90% of the patients (12 out of 13). Only one patient (10%) needed a blood transfusion during the postoperative period.

### 3.4. Reoperations Due to Bleeding

None of the patients required reoperation for uncontrolled bleeding. Hemostasis was effectively maintained in all cases without the need for additional surgical intervention.

### 3.5. Mortality

There were no deaths reported during the study period. All patients survived the postoperative period without life-threatening complications.

### 3.6. Adverse Events and Side Effects

Minor side effects were observed in some patients. Two patients (15%) experienced postoperative nausea and vomiting (PONV), which was managed conservatively. Mild pain and discomfort were reported but were within expected postoperative levels and managed with standard analgesia protocols. No allergic reactions were noted. Importantly, there were no significant complications such as thromboembolic events or renal dysfunction observed in any of the patients.

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## 4. Discussion

The study on the intrathoracic use of tranexamic acid (TXA) in thoracic surgery provides robust evidence for its efficacy in reducing postoperative blood transfusions and controlling surgical bleeding without increasing the rate of complications. These findings align with outcomes from similar studies across various surgical fields, such as orthopedics and oral surgery, demonstrating the versatility of TXA in managing blood loss.

In Sabry et al.'s study on total knee arthroplasty (TKA) [1], topical application of TXA significantly reduced both visible and hidden blood loss, resulting in fewer transfusions ( $p < 0.0004$ ) and improved postoperative hemoglobin levels. Similarly, in our research on thoracic surgery patients, 90% did not require blood transfusions postoperatively. These consistent outcomes underscore the efficacy of local TXA administration across different surgical procedures by reducing fibrinolysis at the wound site, which in turn minimizes systemic absorption and potential side effects [1,2,3].

Studies focusing on oral surgery, particularly in anticoagulated patients, further validate TXA's ability to control bleeding effectively and safely. One randomized trial showed that both 2-day and 5-day TXA mouthwash regimens post-dental extractions were equally effective at preventing postoperative bleeding. This finding is mirrored in our thoracic surgery patients, who experienced no significant complications such as thromboembolic events or reoperations for bleeding, reinforcing TXA's safety profile even in high-risk populations [3,4].

Additionally, the localized application of TXA in patients undergoing oral surgery without altering their anticoagulation therapy resulted in no instances of postoperative bleeding, further corroborating the safety and efficacy of TXA, as seen in our thoracic surgery patients. None of the patients required reoperation, and only minor side effects were observed, which demonstrates TXA's potential in delicate surgical scenarios [1,3,5].

The absence of significant complications like wound infections or thromboembolic events in our study further strengthens the case for local TXA use. This reflects findings from TKA and oral surgery studies, where localized TXA administration minimized systemic complications [3,5]. Together, these results support the notion that TXA's mechanism of action-targeting fibrinolysis at the wound site-can be broadly applied, offering effective hemostasis without compromising patient safety.

This evidence supports the expanding role of TXA in thoracic surgery and other specialties, promoting it as a safe and effective agent for controlling surgical bleeding across different patient populations and surgical types.

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## 5. Conclusion

In thoracic surgery, the intrathoracic administration of tranexamic acid (TXA) successfully regulates surgical bleeding and dramatically lowers the need for postoperative blood transfusions without raising the risk of complications. More than 90% of the patients in our study did not need blood transfusions after surgery, and none of them required a second operation because of uncontrollable bleeding. There were few and easily controlled minor side effects, and there were no serious side effects such as wound infections or thromboembolic episodes. Intrathoracic instillation of TXA is a safe and effective method for controlling surgical bleeding in thoracic surgery, offering significant benefits in patient care without increasing the risk of complications. Its integration into surgical practice holds promise for improving patient outcomes and resource utilization across various surgical fields.

## **Compliance with ethical standards**

### *Acknowledgments*

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### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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