REUE | Editorial

Use of tranexamic acid in prehospital care

Ácido tranexámico en la atención prehospitalaria

Hedgar Berty Gutiérrez, Elier Carrera González

Traumatic injuries account for 1 in 10 deaths worldwide. In Europe, more than 450,000 deaths were recorded in 2019 due to this cause.[1] As hemorrhage is the leading cause of preventable trauma-related death, early identification and timely treatment—initiated from the very first point of care—are essential.[2]

At the beginning of this century, knowledge of trauma-associated coagulopathy changed dramatically. Evidence showed that a large proportion of severely injured patients present coagulation dysfunction upon admission, even in the absence of the classical factors traditionally involved in coagulopathy. This finding reshaped both resuscitation strategies and the pathophysiological understanding of bleeding and trauma-induced coagulopathy.[3]

Initially termed acute traumatic coagulopathy, now more accurately referred to as trauma-induced coagulopathy, this condition represents an early endogenous hypocoagulable state likely reflecting a maladaptive response to hypoperfusion, mediated by multiple interrelated mechanisms—reduced thrombin generation, fibrinogen consumption and depletion, activation of protein C, release of tissue plasminogen activator, imbalance of the fibrinolytic system, endothelial injury, and platelet energy failure.[3]

Tranexamic acid (TXA) is a competitive inhibitor of plasminogen activation that promotes blood coagulation. It is used to control bleeding in various settings, including postoperative hemorrhage, bleeding disorders such as von Willebrand disease, severe menstrual bleeding, dental extractions, and ulcerative colitis. Moreover, TXA may be beneficial in controlling bleeding after traumatic injury.[4]

The CRASH-2 trial provided robust evidence for the efficacy of TXA in reducing mortality in patients with trauma and extracranial hemorrhage,[5] and CRASH-3 extended its use to isolated head injuries.[6] When administered within 3 hours of injury, TXA reduces death due to bleeding across all trauma types.[4] An additional exploratory analysis concluded that TXA is most effective when administered as soon as possible, particularly within the first hour.[1,8]

In a meta-analysis of the CRASH-2 and WOMAN trials, Gayet-Ageron *et al*. found that immediate treatment improved survival by more than 70%, and that survival benefit decreased by 10% for every 15-minute delay.[8]

A 2020 meta-analysis demonstrated a reduction in mortality and hemorrhagic death associated with TXA use in traumatic brain injury (TBI). The incidence rate of thromboembolic events (pulmonary embolism, deep vein thrombosis, myocardial infarction) did not differ significantly between TXA-treated and placebo groups.[4,9]

Despite the evidence supporting TXA's utility in prehospital management of patients with severe trauma,[10] many developed countries report low usage in this setting.

An analysis by the United Kingdom's Trauma Audit & Research Network (TARN) found that only 5% of severely injured patients at risk of hemorrhage received prehospital TXA.[8] Similarly, Girardello *et al.*, in an observational study conducted in Switzerland with 13,944 injured patients, found a low rate of prehospital TXA use.[2] Another study by Gulickx *et al*. conducted in the Netherlands with 477 patients with severe bleeding, reported that only 124 (26%) received TXA prior to hospital arrival.[1]

There are multiple reasons for the underuse of prehospital TXA, including lack of awareness, concerns about side effects, difficulty identifying patients at risk of bleeding, absence of specific local protocols, and unclear treatment criteria.[2,11]

A recent systematic review identified several factors associated with limited TXA use: patient age, type and severity of injuries (Injury Severity Score), Glasgow Coma Scale score, provider competence, inadequate training, lack of knowledge of TXA's effects or evidence base, restrictive or ambiguous indications depending on provider type (paramedic, physician, air transport), and deprioritization in favor of other interventions (fluid administration or management of distracting injuries)[8].

Author Affiliations:
Unidad de Terapia Intensiva, Hospital Docente Clínico Quirúrgico ¨Dr. Miguel Enríquez¨, La Habana, Cuba.

Corresponding Author:
Hedgar Berty Gutiérrez.
Unidad de Terapia Intensiva del Hospital Docente Clínico Quirúrgico "Dr. Miguel Enríquez"
11200 La Habana, Cuba.

E-mail:
hedgarbg@gmail.com

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Differences also exist between European and U.S. approaches to patient selection for TXA. U.S. guidelines recommend a restrictive approach, limiting TXA use to high-risk trauma patients in the field (systolic blood pressure < 90 mm Hg and heart rate > 120 bpm).[2] In contrast, European guidelines recommend broader use in trauma patients at risk of major bleeding, ideally as early as possible, including administration during transport.[2,12]

There is currently no universally accepted consensus on how paramedics should objectively assess hemorrhage risk. Ageron et al. proposed the use of objective treatment criteria, such as the BATT (Bleeding Audit Triage Trauma) score, which provides clear treatment guidance based on expected patient benefit.[13]

Conversely, researchers from the PATCH-Trauma trial, conducted across 15 emergency medical services (EMS) systems in Australia, New Zealand, and Germany, proposed the COAST (Coagulopathy of Severe Trauma) score as a prehospital tool to assess coagulopathy risk.[14] Recently, TXA administration has also been proposed in specific mass-casualty situations.[15]

We believe it is essential to train health care personnel not only in drug administration but also in identifying patients who require prehospital TXA treatment, managing possible side effects, and regularly reviewing and updating treatment protocols.[16]

Considering that TXA is an inexpensive, generic drug with a long shelf life, easy administration, and cost-effectiveness, it is accessible to almost all countries worldwide.[17]

Its early and timely use could make a significant difference in the prehospital management of patients with severe hemorrhage.[18]

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