



Original article

Thromboelastometric Profile and Acute Coagulopathy of the Polytraumatized Patient: Clinical and Prognostic Implications[☆]



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Introduction: About 25%–35% of polytraumatized patients have a profound alteration of hemostasis on arrival at the hospital (acute traumatic coagulopathy [CAT]). Viscoelastic tests (ROTEM[®]) measure the hemostatic capacity and provide an early detection of CAT. The objectives of this study are to describe the initial thromboelastogram of these patients and to determine the prevalence of CAT according to predefined thromboelastographic profiles.

Methods: Single-center, observational, prospective study in polytraumatic patients. Initial blood and thromboelastographic test (ROTEM[®]) were made, and pre-hospital, hospital, transfusion, initial surgical/angiographic interventions, cardiac arrest and mortality data were collected. ROTEM[®]-based, patients were classified as: normal, hypercoagulable, hypocoagulable, hypocoagulable+hyperfibrinolytic and isolated hyperfibrinolysis.

Results: One hundred and twenty-three patients were analyzed. 32 cases (26%) with CAT: 15 patients with hypocoagulability, 9 with hyperfibrinolysis alone and 8 with hypocoagulability+hyperfibrinolysis. The CAT group, related to the normal group, presented higher ISS (23 vs 16, $P < .01$), higher blood products transfusion (2.5 vs 0; $P = .001$), more cardiac arrest (19 vs 1%, $P < .01$), and higher mortality (34 vs 5%, $P < .01$). The subgroup with hypocoagulability/hyperfibrinolysis, related to the groups with hypocoagulability or hyperfibrinolysis alone, presented a higher ISS (41 vs 25 vs 15, $P < .01$), higher angiographic procedures (62% vs 13% vs 0%, $P < .01$) and higher mortality (75% vs 33% vs 0%, $P = .05$).

Conclusions: Twenty-six percent of the polytrauma patients presented early coagulopathy assessed by thromboelastography. It is associated with higher consumption of blood products and lower survival. The presence of hypocoagulability+hyperfibrinolysis is associated with greater severity and a higher requirement of blood products.

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Perfil tromboelastométrico y coagulopatía aguda del paciente politraumatizado: implicaciones clínicas y pronósticas

RESUMEN

Palabras clave:

Politraumatizado
Coagulopatía
Tromboelastograma

Introducción: El 25-35% de los pacientes politraumatizados presentan profundas alteraciones de la coagulación a su llegada al hospital (coagulopatía aguda traumática [CAT]). Los test viscoelásticos (ROTEM[®]) valoran rápidamente la capacidad hemostática y detectan precozmente la CAT. Los objetivos de este estudio son describir el tromboelastograma inicial de estos enfermos y determinar la prevalencia de CAT según unos perfiles tromboelastográficos predefinidos.

Métodos: Estudio unicéntrico, observacional y prospectivo en pacientes politraumatizados. Se realizó analítica, prueba tromboelastográfica (ROTEM[®]) y se registraron datos prehospitalarios y hospitalarios, transfusiones, intervenciones quirúrgicas/arteriografía iniciales, paradas cardiorrespiratorias y fallecimientos. Los pacientes fueron clasificados en grupos según su ROTEM[®] inicial: «normal», «hipercoagulabilidad», «hipocoagulabilidad», «hipocoagulabilidad+hiperfibrinólisis» e «hiperfibrinólisis aislada».

Resultados: Se analizaron 123 pacientes. En 32 casos (26%) se objetivó CAT: 15 pacientes presentaron hipocoagulabilidad, 9 hiperfibrinólisis aislada y 8 hipocoagulabilidad+hiperfibrinólisis. El grupo con CAT, respecto al grupo «normal», presentó mayor ISS (23 vs 16; $P<0,01$), mayor transfusión de hemoderivados (2.5 vs 0; $P=0,001$), más episodios de PCR (19 vs 1%, $P<0,01$) y mayor mortalidad (34 vs 5%, $P<0,01$). El subgrupo con hipocoagulabilidad+hiperfibrinólisis, respecto a los grupos con hipocoagulabilidad o hiperfibrinólisis aislada, presentó mayor ISS (41 vs 25 vs 15, $P<0,01$), mayor necesidad de arteriografía (62% vs 13% vs 0%, $P<0,01$) y mortalidad superior (75% vs 33% vs 0%, $P=0,05$).

Conclusiones: El 26% de los enfermos politraumatizados presenta coagulopatía precoz evaluada mediante tromboelastografía, asociada a mayor consumo de hemoderivados y menor supervivencia. El perfil combinado de «hipocoagulabilidad+hiperfibrinólisis» se asocia a mayor gravedad y necesidades superiores de hemoderivados y arteriografía.

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Introduction

Trauma hemorrhage is the main cause of preventable mortality in polytrauma patients (PTP).¹ Several studies have shown that 25%–35% of PTP present profound coagulation alterations upon arrival at the admission center²; this phenomenon, intrinsically associated with severe trauma and with a decisive prognostic value, has been termed “acute coagulopathy of trauma” or “acute traumatic coagulopathy” (ATC).³ This entity should be considered an independent factor – but with a synergistic effect – of the altered hemostasis derived from hemodilution (excessive fluid therapy) and the so-called “lethal triad” (hypothermia, metabolic acidosis and coagulopathy).³

Classically, the degree of coagulopathy is monitored by conventional coagulation tests based on plasma reactions (plasma-based tests: TP, INR, aPTT) and on the concentration of platelets and fibrinogen. These parameters only reflect the amount of thrombin generated during the initial phase of coagulation, without providing information on the interaction of platelets with coagulation factors, clot formation-stability-lysis, or the overall state of hyperfibrinolysis (characteristic of severe PTP). Therefore, “viscoelastic tests” (TEG[®] and ROTEM[®]) have recently acquired an increasing role in the assessment of the hemostatic capacity of polytrauma patients and the early detection of ATC.^{4,5} Rotational thromboelastometry (ROTEM[®]) and conventional thromboelastography (TEG[®]) provide quali-

tative and quantitative information on the overall balance between clot formation and destruction, being able to discriminate the pathophysiological mechanism of severe hemorrhage and more precisely guide PTP hemostatic resuscitation in an individualized manner.^{6,7} However, the prototypical thromboelastogram pattern in severe polytrauma patients treated at Spanish reference hospitals has not yet been defined.

The main objectives of our study are to describe the initial thromboelastogram of polytrauma patients treated at our hospital and to determine the prevalence of ATC based on predefined thromboelastometric profiles of normal coagulation, hypocoagulability and/or hyperfibrinolysis. As secondary objectives, we analyzed the clinical, analytical, transfusional, therapeutic and prognostic differences between the groups that present a normal ROTEM[®] pattern versus a coagulopathic pattern (ATC). Finally, we describe the association between the different thromboelastometric profiles and trauma severity (hemodynamic characteristics, Glasgow and Injury Severity Score [ISS]), transfusion and therapeutic needs (surgery, arteriography) and mortality.

Methods

Ours is an observational prospective study conducted at a single hospital between October 2012 and October 2013. The study was approved by the Clinical Research Ethics Committee

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