



Original article

Comparison Between Thromboelastography and Conventional Coagulation Test: Should We Abandon Conventional Coagulation Tests in Polytrauma Patients?☆☆

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Introduction: Thromboelastography (TEG) provides an in vivo assessment of viscoelastic clot strength in whole blood compared with a conventional coagulation test (CCT), which may not reflect the influence of platelets. The aim of this study was to compare TEG vs CCT in trauma patients stratified by mechanism of injury (MOI) and pre-existing coagulation status. **Methods:** A retrospective, observational study of 230 polytrauma patients admitted to a University Hospital Level 1 Trauma Center, with TEG and CCT on admission stratified by MOI: multiple trauma (MT), isolated traumatic brain injury (TBI) or MT + TBI. Statistical analysis included correlation between TEG and CCT in all groups and a subgroup analysis of anticoagulated patients. Data were analyzed with ANOVA, Spearman and lineal regression when appropriate. Statistical significance was accepted at $P < .05$.

Results: TEG was normal in 28.7%, hypercoagulable in 68.3% and hypocoagulable in 7%. There was no difference in TEG status among the groups. The coagulation status was not affected by age, ISS or shock. The CCT was abnormal in 63.6% of patients with normal TEG. Normal or hypercoagulable-TEG was found in 21 of 23 patients on Coumadin who had elevated international normalized ratio (INR) and in 10 of 11 patients on NOAC. An analysis of the 23 patients on Coumadin stratified by INR showed a normal or hypercoagulable-TEG in 21 of 23 patients. Only two patients had a hypocoagulable-TEG. Mortality was 5.2% (58.3% severe TBI).

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Conclusions: TEG is more useful than CCT in polytrauma patients, including patients on anticoagulants. TBI could increase the incidence of hypercoagulability in trauma. CCT are not useful from the standpoint of treatment.

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Comparación entre tromboelastografía y test de coagulación convencionales: ¿deberíamos abandonar los test de coagulación convencional en el paciente politraumatizado?

R E S U M E N

Palabras clave:

Tromboelastografía
Test coagulación convencional
Traumatismo

Introducción: TEG mide in vivo la potencia viscoelástica de la coagulación en sangre total; comparado con los TCC, estos no reflejan la influencia plaquetaria. Nuestro objetivo fue comparar TEG vs TCC en pacientes politraumáticos estratificados por mecanismo lesional (ML) y estado previo de coagulación.

Métodos: Estudio retrospectivo y observacional de 230 pacientes politraumáticos, en un Hospital Universitario Nivel 1 de Trauma, realizándose TEG y TCC a su llegada. Los pacientes se dividieron según ML: multitraumatismo (MT), traumatismo craneoencefálico (TCE) aislado y MT + TCE. Se analizó la correlación entre TEG-TCC en todos los grupos y un análisis de subgrupo de los pacientes anticoagulados, utilizándose ANOVA, Spearman y regresión lineal según correspondía. Se definió la significación estadística como $p < 0,05$.

Resultados: Coagulación según TEG: normal (28,7%), hipercoagulación (68,3%) e hipocoagulación (3%). No hubo diferencias en parámetros de coagulación por TEG entre grupos. La coagulación no estaba afectada por edad, ISS o presencia de shock. Los TCC estaban alterados en 63,6% pacientes con TEG normal. La TEG fue normal o hipercoagulación en 21/23 pacientes anticoagulados con warfarina e INR elevado, y en 10/11 pacientes anticoagulados con NAO. TEG fue normal o hipercoagulación en 21/23 pacientes anticoagulados con warfarina, estratificado por INR (2 pacientes), y 2 pacientes presentaron TEG con hipocoagulación. La mortalidad fue del 5,2% (58,3% TCE severo).

Conclusiones: TEG es más útil que los TCC en pacientes politraumáticos, incluyendo a pacientes anticoagulados. El TCE podría aumentar la incidencia de hipercoagulabilidad en traumatismos. Los TCC no son útiles desde el punto de vista terapéutico.

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Introduction

Thromboelastography (TEG) was first described by Hartert¹ in Germany in 1948, as a way to assess alterations in coagulation factors. It was introduced in the United States in the 1980s for its usefulness in liver transplantation² and progressively began to be used in other areas, such as cardiothoracic surgery,³ aortic surgery⁴ and, finally, in surgical patients, in general.⁵

Very shortly after tissue aggression, polytrauma patients are affected by what is called trauma-induced coagulopathy.⁶ This state of hypo- or hypercoagulability cannot be easily detected with a conventional coagulation test (CCT), which include international normalized ratio (INR), prothrombin time (PT) and partial thromboplastin time (PTT). For this reason, TEG began to be used in the management of polytrauma patients, showing results compatible with hypo- or hypercoagulability, while CCT was normal.⁷ Obtaining this type of information is of utmost importance in the management of polytrauma patients, and even more important in

patients under treatment with conventional anticoagulants, such as warfarin or new oral anticoagulants (NOA), as it may allow us to conduct individualized treatments aimed at restoring hemostasis.

On the other hand, with the advent of NAO and antiplatelet agents⁸ (AP), the number of anticoagulant treatments available is increasing, the majority of which are not analytically monitored with CCT. It is in this type of patients where TEG can be of greater help, although there are some studies that speak of limited use in patients with NAO.⁹

Currently, there are two ways to conduct a dynamic study of clot formation: TEG (TEG[®]) and thromboelastometry (ROTEM[®]). Both produce a graphic evaluation of the kinetics of clot formation in all its phases (initiation, propagation, formation and dissolution).¹⁰ A recent meta-analysis¹⁰ on the use of TEG[®] and ROTEM[®] in patients with bleeding has shown a reduction in mortality, need for transfusion of blood products, bleeding and presence of renal failure requiring dialysis. In addition, no differences were found between TEG and ROTEM.

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