Revista Colombiana de Anestesiología
Colombian Journal of Anesthesiology
www.revcolanest.com.co

Review

An overview of thrombelastography research☆

Othman M. Sulaiman[a], Germán A. Pabón[a], Cristian C. Cortés[a], Luis A. Muñoz[b], Luis E. Reyes[c], Jimmy J. Arevalo[d,*]

[a] Resident, Department of Anesthesiology, Fundación Universitaria de Ciencias de la Salud, Hospital de San José, Bogotá, Colombia
[b] Associate Instructor, Department of Anesthesiology, Fundación Universitaria de Ciencias de la Salud, Hospital de San José, Bogotá, Colombia
[c] Professor, Department of Anesthesiology, Fundación Universitaria de Ciencias de la Salud, Hospital de San José, Bogotá, Colombia
[d] Research Division, Fundación Universitaria de Ciencias de la Salud, Department of Anesthesiology, Hospital de San José, Bogotá, Colombia

ARTICLE INFO

Article history:
Received 9 October 2013
Accepted 27 May 2014
Available online 22 July 2014

Keywords:
Thrombelastography
General Surgery
Diagnosis
Blood Coagulation
Hemostasis

ABSTRACT

Introduction: Thrombelastography (TEG) is a method to assess clot formation and destruction. Various applications have been suggested in the literature.
Objective: To provide an overview of the current knowledge about TEG applications.
Methods: A database search in PubMed was performed up to July 2012 using the term "Thrombelastography [MeSH Terms]". We analysed retrospective and prospective studies, reviews and guidelines with information about the applications of TEG written in English and Spanish.
Results: The search resulted in 3139 papers since 1962. These were classified in 8 categories: 862 (27.6%) in non-surgical diseases, 294 (9.4%) in liver transplant, 711 (22.6%) in basic research, 174 (5.5%) in obstetrics, 228 (7.3%) in cardiovascular surgery, 177 (5.6%) in other types of surgery, 234 (7.4%) in anaesthetic techniques, and 459 (14.6%) in relation with medications.
Conclusion: The application of TEG as a diagnostic tool and as a guide in transfusion therapy is increasing. Its use is still in development in different clinical fields and the advantages and limitations of this technique still have to be defined. It is evident that thrombelastography should be used with caution, and its strengths and weaknesses as well as new applications must continue to be explored.

☆ Please cite this article as: Sulaiman OM, Pabón GA, Cortés CC, Muñoz LA, Reyes LE, Arevalo JJ. Un resumen de la investigación en tromboelastografía. Rev Colomb Anestesiol. 2014;42:302–308.

* *Corresponding author at*: División de Investigaciones, Fundación Universitaria de Ciencias de la Salud, Carrera 19 No. 8a – 32, Bogotá DC, Colombia.
E-mail address: jarevalo@fucsalud.edu.co (J.J. Arevalo).

Un resumen de la investigación en tromboelastografía

Palabras clave:
Tromboelastografía
Cirugía General
Diagnóstico
Coagulación Sanguínea
Hemostasis

RESUMEN

Introducción: La tromboelastografía (TEG) es un método para valorar las características de la formación y destrucción del coágulo. Una variedad de aplicaciones han sido sugeridas en la literatura.

Objetivo: Proporcionar un resumen acerca del conocimiento actual de las aplicaciones de la TEG.

Métodos: Se realizó una búsqueda en la base de datos PubMed hasta julio de 2012 con el término «Thrombelastography [MeSH Terms]». Se analizaron artículos de estudios retrospectivos y prospectivos, revisiones y guías conteniendo información acerca de las aplicaciones de la TEG escritos en inglés y español.

Resultados: La búsqueda arrojó 3.139 artículos desde 1962. Se clasificaron en 8 categorías: 862 (27,6%) asociados a enfermedades no quirúrgicas, 294 (9,4%) a trasplante hepático, 711(22,6%) a investigación básica, 174 (5,5%) a obstetricia, 228 (7,3%) a cirugía cardiovascular,177 (5,6%) a otras cirugías, 234 (7,4%) a técnicas anestésicas y 459 (14,6%) a fármacos.

Conclusión: La TEG como herramienta diagnóstica y para guiar terapia transfusional está en aumento. La TEG aún continúa en estudio en diferentes áreas del conocimiento clínico y aún falta definir adecuadamente los alcances de esta técnica diagnóstica. Es evidente que se debe hacer un uso racional de la TEG, conocer a fondo sus fortalezas y debilidades y continuar explorando nuevas aplicaciones.

Introduction

Thrombelastography (TEG) provides a graphic representation of blood clot formation and destruction, as well as of clot viscosity and elasticity.[1] It has been used in clinical practice to detect and quantify hypercoagulability, hypocoagulability, fibrinolysis, clot strength, and anticoagulant therapy effects.[2] Recently, this diagnostic method has also been used in cardiovascular surgery with bypass circulation, in neurosurgery, trauma and other surgical interventions involving the haematological system.[3] There are several methods available in the market for assessing the viscoelastic properties of blood, besides conventional TEG (Haemoscope Corporation, Niles, Illinois E.U.) which is the most widely referenced method in national publications[1,4–6] and is the subject of this paper. The other systems available include ROTEM (Pentapharm GmBH, Munich, Germany) and Sonoclot Analyser (Sienco Inc., Arvada, Colorado, USA). In the first system, fibrin polymerization is detected by the restricted oscillation of the cup where the sample is placed; in the second, by the restricted oscillation of a pin submerged inside the sample; and in the third, by the restricted vertical oscillation of a probe.[7]

In our setting, the clinical and surgical uses of TEG are growing, as evidenced by the publications in Colombian Journal of Anesthesiology[1,4,5] related to the understanding of the physiology of coagulation and the principles of TEG.

Despite increasing access to publications describing new implementations of TEG, there is no review in our literature that encompasses them from the beginning to the present. The objective of this article is to provide a summary of the current knowledge on the clinical applications of TEG.

Methods

An electronic search was conducted in the PubMed database on all studies published on the subject between January 1962 and July 2012. In order to increase the sensitivity of the search as much as possible, the Medical Subject Heading (MeSH term) "Thrombelastography" was used. No language restriction was applied. The references included in the articles that were downloaded were all reviewed by three researchers (OMS, CCC and GAP) in order to identify additional articles. Titles, abstracts and/or full texts of the articles in English or Spanish ($n = 3139$) were read in order to classify them according to the type of use suggested by the study (Fig. 1).

The classification categories emerged as the review proceeded, in accordance with the main study objective in each article. For the purpose of this study, the description of one use for TEG was accepted when the authors of the article described it as such, in relation to medical disease, a surgical disease, a diagnostic procedure or a therapeutic procedure. One category emerged in the classification that did not correspond to the use of TEG in human beings, mainly comprising articles that reported basic science research[8,9]; these were excluded from the analysis.

The most relevant publications ($n = 44$) were selected for the analysis of each category, in accordance with the following criteria: systematic reviews and meta-analyses, original papers (experimental or descriptive), and reviews of the literature. Conclusions related to thrombelastography use and areas of research were derived from this selection; these conclusions are summarized by category. Trends were analysed based on the number of publications per year.