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Vincenzo G. Menditto

Rotational thromboelastometry (ROTEM) profiling of early stage COVID-19 patients and its prognostic value: a prospective observational study

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ROTATIONAL THROMBOELASTOMETRY (ROTEM) PROFILING OF EARLY STAGE COVID-19 PATIENTS AND ITS PROGNOSTIC VALUE: A PROSPECTIVE OBSERVATIONAL STUDY

Vincenzo G Menditto[1]

Lara Montillo[1], Marta Buzzo[1], Luisita Marinelli[2], Marco Moretti[2]
[1]Medicina D'Urgenza e Medicina Interna, Azienda Ospedaliero-Universitaria "Ospedali Riuniti di Ancona", Ancona
[2]Medicina di laboratorio, Azienda Ospedaliero-Universitaria "Ospedali Riuniti di Ancona", Ancona

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Background

- *There is emerging evidence for hypercoagulability and thrombosis in coronavirus disease 2019 (COVID-19) patients, contributing to mortality*

- *The mechanisms underlying this pro-thrombotic state is still uncompletely understood, and optimal criteria for early identification of patients at high risk for thrombosis and death remain unclear*

Almskog LM, Wikman A, Svensson J, et al. Rotational thromboelastometry results are associated with care level in COVID-19. J Thromb Thrombolysis. 2021;51(2):437-45.
Kong R, Hutchinson N, Görlinger K. Hyper- and hypocoagulability in COVID-19 as assessed by thromboelastometry. Two case reports. Korean J Anesthesiol 2020. Published online on Aug 10, 2020. doi: 10.4097/kja.20327.

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Scope

The aim of this study was to assess:

- *whether rotational thromboelastometry (ROTEM) would indicate hypercoagulability and fibrinolysis shutdown in an early stage of severe COVID-19 patients*

- *if ROTEM variables in combination with D-dimer would predict mortality*

Kruse JM, Magomedov A, Kurreck A, et al. Thromboembolic complications in critically ill COVID-19 patients are associated with impaired fibrinolysis. Crit Care. 2020;24(1):676.
Schenk B, Görlinger K, Treml B, et al. A comparison of the new ROTEM sigma with its predecessor, the ROTEM delta. Anaesthesia. 2019;74(3):348-356.

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Methods

- ✓ *The study was designed as a prospective, observational study*
- ✓ *We used ROTEM in a cohort of 35 adult critically ill COVID-19 patients admitted to an intermediate ward*
- ✓ *Conventional coagulation assays and D-dimer levels were also analyzed*

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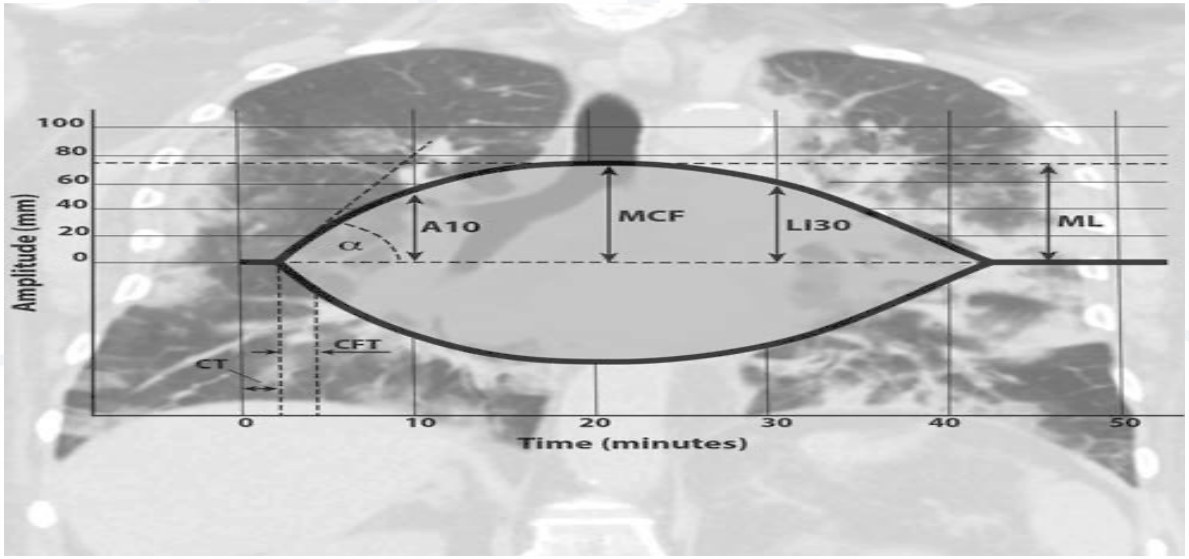
Rotational thromboelastometry (ROTEM)



Görlinger K, Almutawah H, Almutawaa F, et al. The Role of Rotational Thromboelastometry during the COVID-19 Pandemic: A Narrative Review. Korean J Anesthesiol. 2021;74(2):91-102

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Results (1)

- ✓ *The median age of the study population was 74 years and 74% were males; the median number of comorbidities and SOFA score were 3 and 3, respectively; the median duration of symptoms before admission was 5 days*
- ✓ *The median D-dimer value was 1.08 mg/L*
- ✓ *The median EXTEM Maximum Clot Firmness (MCF) was 71.0mm and the median maximum lysis (ML) value was 3%*

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Results (2)

The overall 30 day-mortality was 40% (14/35)

Predicting factors	N (%)	Mortality	p*	VTE	p*
None	8 (23)	0 (0)	/	0 (0)	/
Fibrinolysis shutdown					
ML < 3.5%	18 (51)	9 (50)	0.01	5 (28)	0.06
D—ML > 3.7	7 (39)	4 (57)	0.01	2 (29)	0.1
D-dimer > 1 mg/L	19 (54)	11 (58)	0.005	6 (32)	0.07
CT > 79 sec	5 (14)	4 (75)	0.002	2 (40)	0.05

Relation between presence of predicting factors, 30-day mortality and thromboembolic events.
***vs group without risk factors. VTE: venous-thromboembolism**
ML: Maximum Lysis
D - ML: maximum D-dimer — EXTEM ML
CT: Clotting Time

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Results (3)

- ✓ *5 patients with a specific profile characterized by a high D-Dimer value, ROTEM signs of fibrinolysis shutdown and high EXTEM clotting time (CT) presented an early death after admission (n=4) and one patient an hemodinamically unstable PE at admission*

	Outcomes		
ROTEM characteristics	Early death or TVE events N=5	No early death or TVE events N=30	p
D-Dimer median mg/dl	15.04 (12.52-33.35)	0.78 (0.24-17.97)	<0.0001
CT mean sec.	87.5 (71.5-147.5)	63.5 (58.3-73.5)	0.001
MCF mean mm	63.0 (50.0-65.0)	71.5 (68.0-73.0)	0.001
ML %	0 (0-2.0)	3.5 (1.0-5.0)	0.15

CT: Clotting Time
MCF: Maximum Clot Firmness
ML: Maximum Lysis

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Discussion

- ✓ *Our results suggest that the altered ROTEM values in combination with D-dimer could be used to better identify the presence of fibrinolysis shutdown in those patients*
- ✓ *Our findings highlight that the mechanisms to explain the coagulability state of patients infected with SARS-CoV-2 is very complex: for example, the significance of high value of EXTEM clotting time (CT) is not yet known since now*

Ibanez C, Perdomo J, Calvo A, et al. High D dimers and low global fibrinolysis coexist in COVID19 patients: what is going on in there? J Thromb Thrombolysis. 2020;15:1-5.
Iba T, Connors JM, Levy JH. The coagulopathy, endotheliopathy, and vasculitis of COVID-19. Inflamm Res 2020; 69:1181-9.

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Conclusions

- ✓ *Our results confirm altered ROTEM values in early stage of patients with severe COVID-19*
- ✓ *The combination of D-dimer concentrations, fibrinolysis shutdown and ROTEM CT prolongation may provide valuable in identifying patients at high risk of early onset of thrombosis and death which potentially requiring specific therapies*

Moore HB, Barrett CD, Moore EE, Jhunjhnuwala R, McIntyre RC, Moore PK, et al. STudy of Alteplase for Respiratory failure in SARS-Cov2/COVID-19: Study Design of the Phase IIa STARS Trial. Res Pract Thromb Haemost 2020; 4: 984-96.

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