

# Acute on Chronic Liver failure is associated with prolonged clot initiation in Rotational Thromboelastometry as compared to Acute Decompensation, but clot formation time and firmness are similar.

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## Introduction

- Conventional coagulation tests (CCT) does not directly predict bleeding risk. Viscoelastic Test (VET) eg Rotational Thromboelastometry (ROTEM) is increasingly used in patients with cirrhosis to guide blood product transfusion which has reduced transfusion requirements.
- Lack of data on how ROTEM parameters differs in terms of severity of presentation i.e. Acute Decompensation (AD) or Acute on Chronic Liver Failure (ACLF)

## Aim

- To compare coagulation panel amongst AD and ACLF population using ROTEM

## Method

- This is a single-center observational study conducted from August 2021 to December 2022
- Inclusion criteria: >21 years old, has underlying liver cirrhosis with acute decompensation or ACLF (defined based on EASL-CLIF classification).
- Exclusion criteria: has a life threatening bleed, known coagulation disorder, has active malignancy, pregnant, or received blood product 7 days prior to admission
- ROTEM, CCT and severity of liver disease (Child-Pugh score and MELD score) of both groups were compared.
- Data was analyzed using standard statistical tests in SPSS.

## Results

- 54 participants in total (38 in AD and 16 in ACLF group).
- Mean age was 60.3 ± 10.5 years and 77.8% were males.
- Child-Pugh score and MELD scores among AD vs ACLF were (10.0 vs 10.5; p = 0.227) and (15.82 vs 23.25; p = <0.001) respectively.
- Comparison of CCT between AD vs ACLF
  - ✧ Prothrombin Time (PT): 15.05 s vs 18.20 s; p = 0.012
  - ✧ Activated Partial Thrombin Time (APTT): 35.29 s vs 51.12 s; p = <0.001
  - ✧ Platelet and Fibrinogen levels: similar between both (p=NS).
- Comparison of ROTEM parameters between AD vs ACLF
  - ✧ Initiation of clot formation was delayed in ACLF patients as evidenced by statistically significant prolongation of clotting time (CT) in INTEM (205.86 s vs 258.13 s; p = <0.001), EXTEM (73.39 s vs 91.06 s; p = 0.022) and FIBTEM (78.00 s vs 139.13 s; p = 0.013).
  - ✧ Clot Formation Time (CFT) in INTEM (132.83 s vs 165.44 s) and EXTEM (121.36 s vs 156.63 s) were similar (p=NS)
  - ✧ Maximal clot firmness (MCF) in INTEM (48.75 mm vs 48.31 mm), EXTEM (50.25 mm vs 49.75 mm) and FIBTEM (11.69 mm vs 12.44 mm) were similar (p=NS).

## Figure

Table 1: Comparison of baseline characteristics, CCT and ROTEM parameters between AD and ACLF patients

	Normal values/ranges	All Patients (N=54)	AD (n=38)	ACLF (n=16)	P value
<b>Demographics</b>					
Age, years <sup>SD</sup>	-	60.31 (10.49)	59.03 (10.83)	63.38 (9.24)	0.170
Male <sup>%</sup>	-	42 (77.78)	32 (84.21)	10 (62.50)	0.148
<b>Organ Failures</b>					
Respiratory <sup>%</sup>	-	2 (3.70)	1 (2.63)	1 (6.25)	0.509
Brain <sup>%</sup>	-	2 (3.70)	1 (2.63)	1 (6.25)	0.509
Liver <sup>%</sup>	-	5 (9.26)	2 (5.26)	3 (18.75)	0.148
Cardiovascular <sup>%</sup>	-	4 (7.41)	1 (2.63)	3 (18.75)	0.073
Coagulation <sup>%</sup>	-	2 (3.70)	1 (2.63)	1 (6.25)	0.023
Renal <sup>%</sup>	-	11 (20.37)	0 (0)	11 (68.75)	<0.001
<b>Baseline laboratory results and CCT</b>					
Platelet (x 10 <sup>9</sup> /L) <sup>SD</sup>	150-450	94.70 (52.19)	95.58 (57.42)	92.63 (38.54)	0.851
APTT (sec) <sup>SD</sup>	24-34	39.98 (13.54)	35.29 (7.69)	51.12 (17.73)	<0.001
PT (sec) <sup>SD</sup>	9.5-11.5	15.98 (4.27)	15.05 (2.97)	18.20 (5.93)	0.012
Fibrinogen (g/L)	1.8-4.8	1.75 (0.93)	1.68 (0.726)	1.91 (1.31)	0.455
WBC (x 10 <sup>9</sup> /L) <sup>SD</sup>	4-11	7.68 (5.24)	7.14 (5.25)	8.96 (5.13)	0.246
CRP (mg/L) <sup>SD</sup>	<3.0	28.90 (29.53)	26.94 (29.88)	32.96 (29.48)	0.538
Procalcitonin (ug/L) <sup>SD</sup>	<0.5	0.80 (1.16)	0.51 (0.918)	1.37 (29.48)	0.043
MELD Score <sup>SD</sup>	6-40	18.02 (6.72)	15.82 (5.88)	23.25 (5.75)	<0.001
Child-Pugh Score <sup>IQR</sup>	5-15	10.00 (2.00)	10.00 (4.00)	10.50 (1.75)	0.227
<b>ROTEM parameters</b>					
INTEM CT (sec) <sup>SD</sup>	161-204	221.94 (42.32)	205.86 (27.28)	258.13 (48.34)	<0.001
INTEM CFT (sec) <sup>SD</sup>	62-130	142.87 (83.79)	132.83 (58.98)	165.44 (122.35)	0.198
INTEM A5 (mm) <sup>SD</sup>	33-52	32.92 (8.49)	33.42 (7.93)	31.81 (9.80)	0.535
INTEM A10 (mm) <sup>SD</sup>	43-62	41.62 (9.11)	42.06 (8.41)	40.63 (10.76)	0.606
INTEM MCF (mm) <sup>SD</sup>	51-69	48.62 (8.93)	48.75 (8.36)	48.31 (10.39)	0.678
EXTEM CT (sec) <sup>SD</sup>	50-80	78.83 (25.99)	73.39 (17.19)	91.06 (37.12)	0.022
EXTEM CFT (sec) <sup>SD</sup>	46-149	132.21 (89.73)	121.36 (56.22)	156.63 (138.13)	0.194
EXTEM A5 (mm) <sup>SD</sup>	32-52	34.73 (9.19)	35.08 (8.53)	33.94 (10.78)	0.682
EXTEM A10 (mm) <sup>SD</sup>	43-63	43.25 (9.70)	43.58 (8.94)	42.50 (11.51)	0.714
EXTEM MCF (mm) <sup>SD</sup>	55-72	50.10 (9.37)	50.25 (8.67)	49.75 (11.20)	0.861
FIBTEM CT (sec) <sup>SD</sup>	46-84	96.81 (82.90)	78.00 (34.23)	139.13 (133.69)	0.013
FIBTEM A5 (sec) <sup>SD</sup>	5-20	9.92 (4.79)	9.94 (4.41)	9.88 (5.73)	0.962
FIBTEM A10 (mm) <sup>SD</sup>	6-21	11.08 (5.31)	11.00 (4.81)	11.25 (6.46)	0.877
FIBTEM MCF (mm) <sup>SD</sup>	6-21	11.92 (6.05)	11.69 (5.52)	12.44 (7.26)	0.718

Legend:  
SD = mean (SD)  
IQR = median (IQR)  
% = number (%)

## Conclusion

- Based on ROTEM parameters, although there is a significant delay in clot initiation in ACLF patients, clot formation time is not affected and the clot is as strong as in patients with AD.
- These findings may have practical implications for ACLF patients undergoing either elective procedures or actively bleeding, as they should not be over transfused just to correct the delayed clot initiation.