The role of renal impairment on rotational thromboelastometry (ROTEM) parameters in hospitalised patients with cirrhosis – a prospective cohort study

134

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Introduction

The use of ROTEM has allowed for better understanding of complex haemostatic processes involved in patients with cirrhosis compared to conventional clotting tests (CCT). Renal dysfunction (RD) is a common comorbidity in patients with cirrhosis, but its effect on ROTEM parameters in cirrhosis remains unknown. We conducted a novel study on how ROTEM parameters may be altered by the presence of RD among patients with cirrhosis.

Methodology

A total of 76 consecutively admitted patients with cirrhosis were prospectively recruited in this study. Patients were classified into 2 groups based on their estimated glomerular filtration rate (eGFR) by the CKD-EPI equation; no-RD (eGFR ≥ 90, n = 36) and RD (eGFR < 90, n = 40). ROTEM parameters (INTEM, EXTEM, FIBTEM and APTEM), CCT (prothrombin time (PT), activated partial thromboplastin time (aPTT), fibrinogen, platelet) and Child- Pugh score were compared between the groups. Standard statistical tools were applied for group comparisons using Student's t-test and Mann-Whitney U test for parametric and non-parametric data, respectively.

Results

The mean age was 60.6 ± 10.0 years and 77.6% were male patients. For severity of liver cirrhosis, MELD scores were significantly higher in the RD group (RD 17.7 ± 7.2 vs non-RD 14.3 ± 6.7, p = 0.04) likely owing to higher serum creatinine levels, while Child-Pugh score were similar (RD 9.4 ± 2.2 vs non-RD 9.0 ± 2.4, p = 0.4). In figure 1, ROTEM parameters in the RD-group showed significantly higher clot amplitudes at A5, A10, A20 and A30 and lower clot formation time (CFT) across INTEM, EXTEM and APTEM analyses (p < 0.05). The RD-group also had a significantly higher maximal clot firmness (MCF) for INTEM, EXTEM, APTEM and FIBTEM (p < 0.05). Difference in clotting time (CT) was not statistically significant between the groups. CCT showed significant differences in platelet (RD 95.9 ± 49.3 vs non-RD 73.2 ± 46.1, p = 0.04) and aPTT (RD 41.1 ± 14.5 vs non-RD 34.7 ± 9.7, p = 0.03), but no difference in PT (RD 15.6 ± 4.7 vs non-RD 14.5 ± 3.2, p = 0.22) and fibrinogen (RD 2.0 ± 1.0 vs non-RD 1.6 ± 0.6, p = 0.07).

Figure

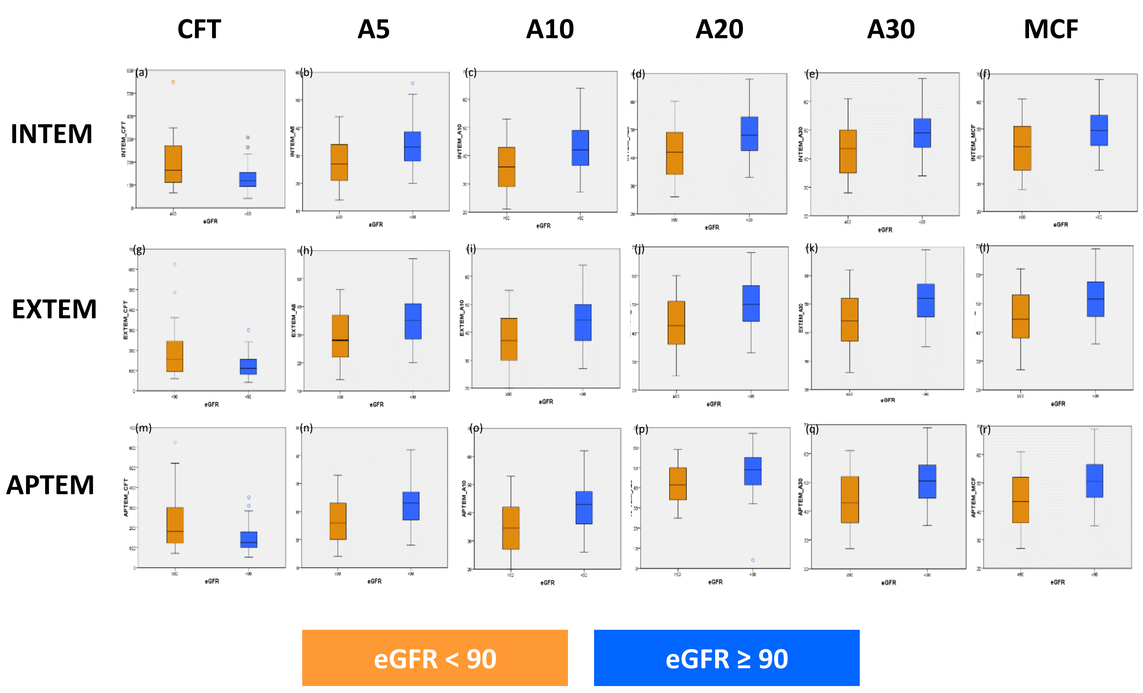

Figure: ROTEM parameters were significantly different between cirrhotic patients with or without renal dysfunction (p < 0.05)

(a) INTEM CFT, (b) INTEM A5, (c) INTEM A10, (d) INTEM A20, (e) INTEM A30, (f) INTEM MCF, (g) EXTEM CFT, (h) EXTEM A5, (i) EXTEM A10, (j) EXTEM A20, (k) EXTEM A30, (l) EXTEM MCF, (m) APTEM CFT, (n) APTEM A5, (o) APTEM A10, (p) APTEM A20, (q) APTEM A30, (r) APTEM MCF.

Conclusion

The analysis of our data shows that kidney impairment is an important contributor towards the haemostatic processes in cirrhosis and results in an overall hypercoagulable state, as measured using ROTEM parameters. This was not apparent based on traditional clotting tests alone. This is a novel finding as there may be direct implications for patients undergoing procedures where decisions for prophylactic blood product transfusions were previously based on only traditional clotting parameters. By being in a more hypercoagulable state, patients with cirrhosis and renal dysfunction may require less transfusions and experience fewer transfusion-related complications. Further research is needed to elucidate the effect of platelet dysfunction from renal impairment on ROTEM parameters in cirrhosis, and how it contributes towards the complex interplay of various haemostatic mechanisms.

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