



Lipid Emulsion Reverses Ventricular Repolarization Disturbances More Effectively After Ropivacaine than Levobupivacaine Toxicity

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INTRODUCTION

Local anesthetics (LA) such as levobupivacaine and ropivacaine are widely used in clinical practice because of their countless advantages. Their accidental intravascular administration may cause electrophysiological alterations due to alteration of ventricular repolarization (VR). Ventricular repolarization markers (corrected QT, QT-dispersion, Tpeak-Tend and Tpeak-Tend dispersion) are useful to predict cardiac arrhythmias. The administration of intravenous lipid emulsions (ILE) such as intralipid (IL) has been proposed as an antidote for LA intoxication. Our aim was to compare the efficacy of ILE in the reversal of levobupivacaine versus ropivacaine-induced VR disturbances.

MATERIALS AND METHODS

Premedication, anaesthesia, intubation, and instrumentation of 16 pigs were performed, then, the animals were randomized into two groups which were administered a non-lethal toxic dose of levobupivacaine or ropivacaine. Within 3 minutes of LA administration, ILE was infused: 1.5 mg/kg bolus + 0.25 mL/kg/min (over 30 minutes). VR parameters as corrected QT, QT-dispersion, Tpeak-Tend and Tpeak-Tend dispersion, were recorded at baseline, after LA and at different intervals after ILE. Statistics: area under the curve (AUC), Mann-Whitney and Wilcoxon test.



Figure 1: Panoramic image of the instrumentalized animal.

RESULTS

Changes in VR were observed after administration of both LAs. The effects on VR were more pronounced with levobupivacaine vs. ropivacaine: QT (Δ :21% vs. 8% $p=0.01$; Tpeak-Tend (Δ :161% vs.48% $p=0.01$), corrected Tpeak-Tend (Δ :118% vs. 56%; $p=0.05$), and Tpeak-Tend dispersion (Δ :272% vs. 67%; $p=0.02$). ILE administration facilitated the recovery of VR parameters in both groups, however after 30 min of its administration VR in ropivacaine group were restored in higher proportion in comparison with levobupivacaine group.

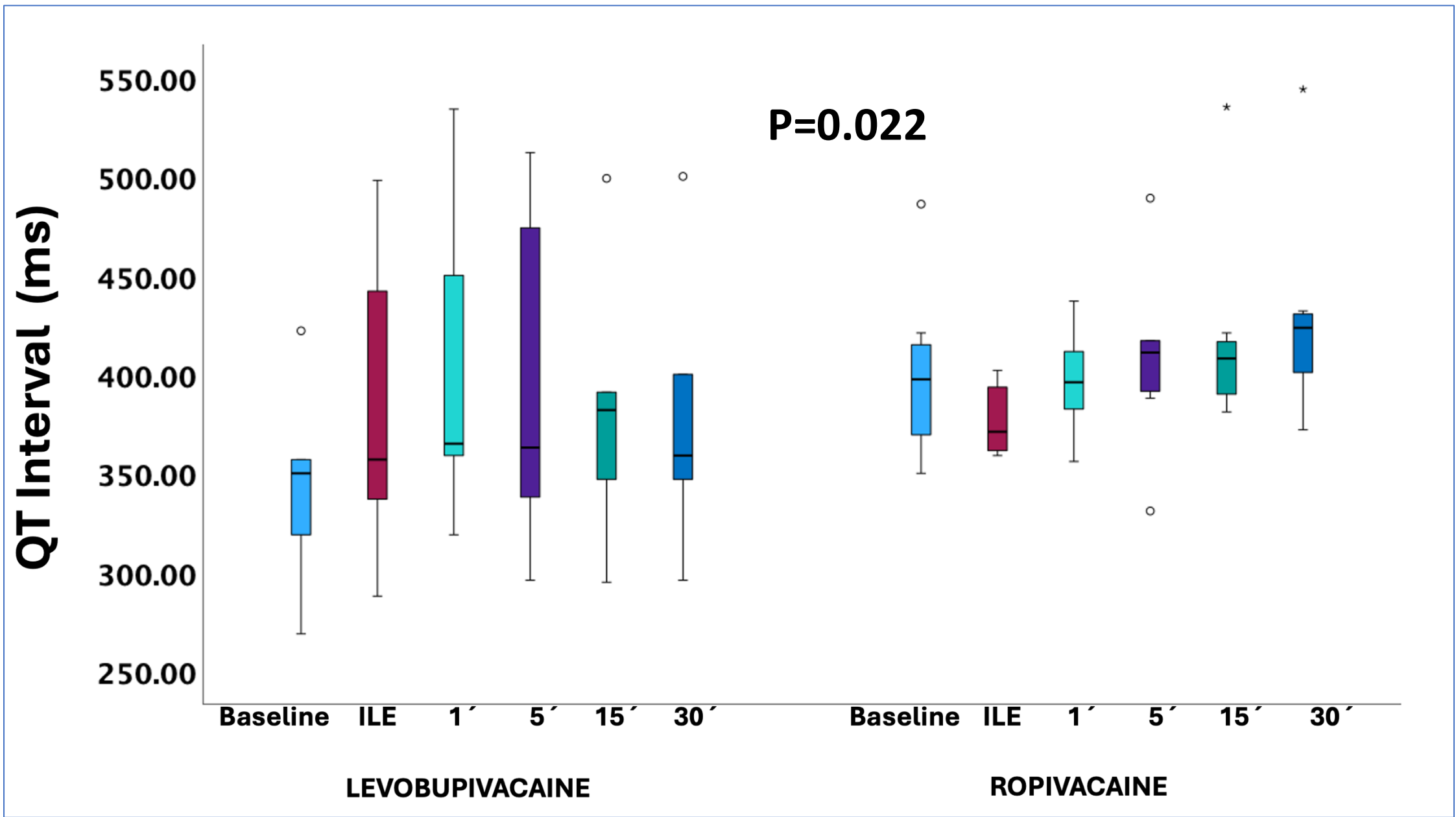


Figure 2: Temporal evolution of the QT interval after ILE administration in both groups

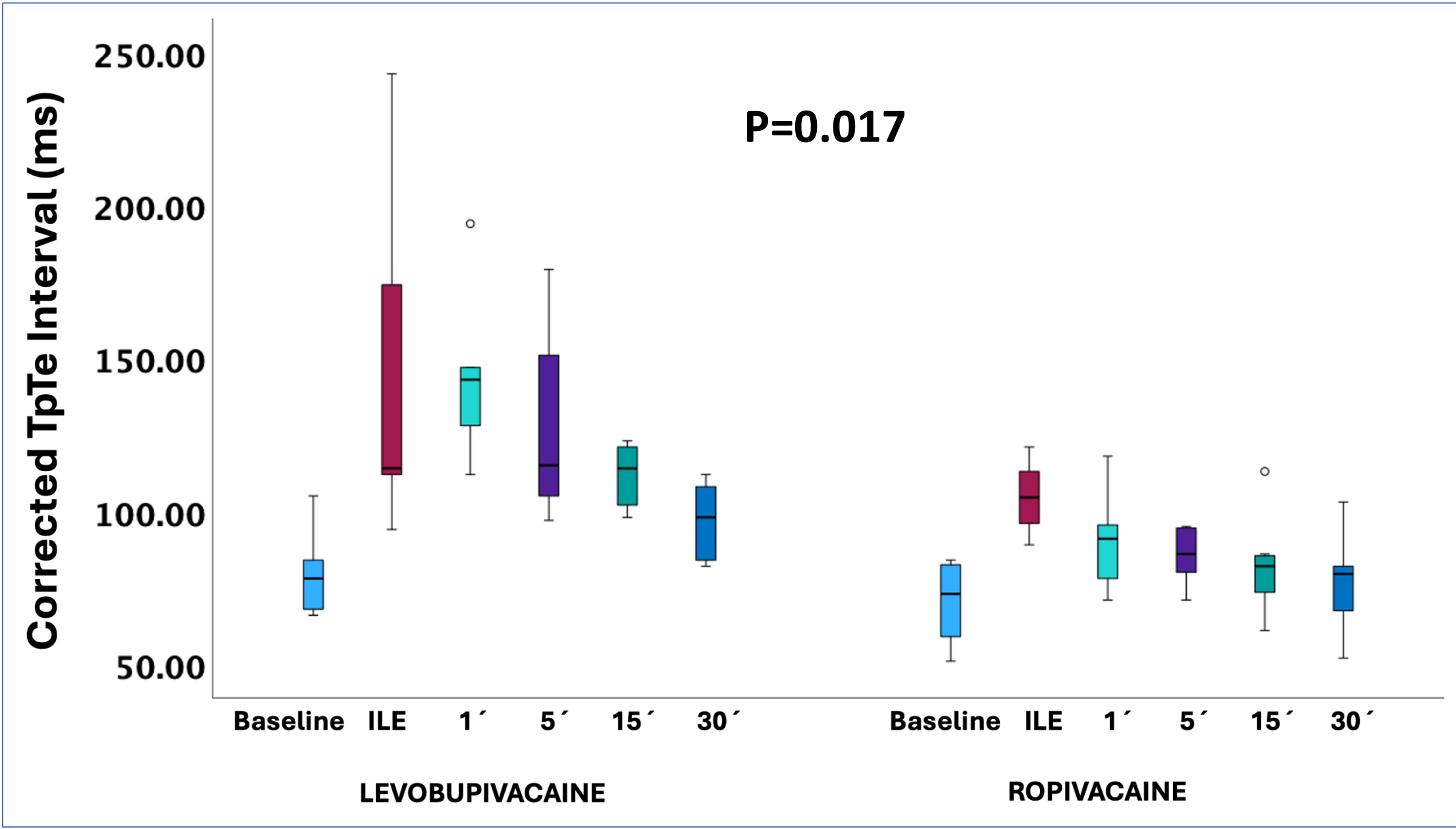


Figure 3: Temporal evolution of the corrected TpTe interval after ILE administration in both groups

CONCLUSIONS

In this porcine model, ILE administration was more effective in reversing the pro-arrhythmic effects on ventricular repolarization caused by ropivacaine toxicity compared to levobupivacaine. The greater cardiotoxicity associated with levobupivacaine persists even after the application of lipid emulsion rescue therapy.

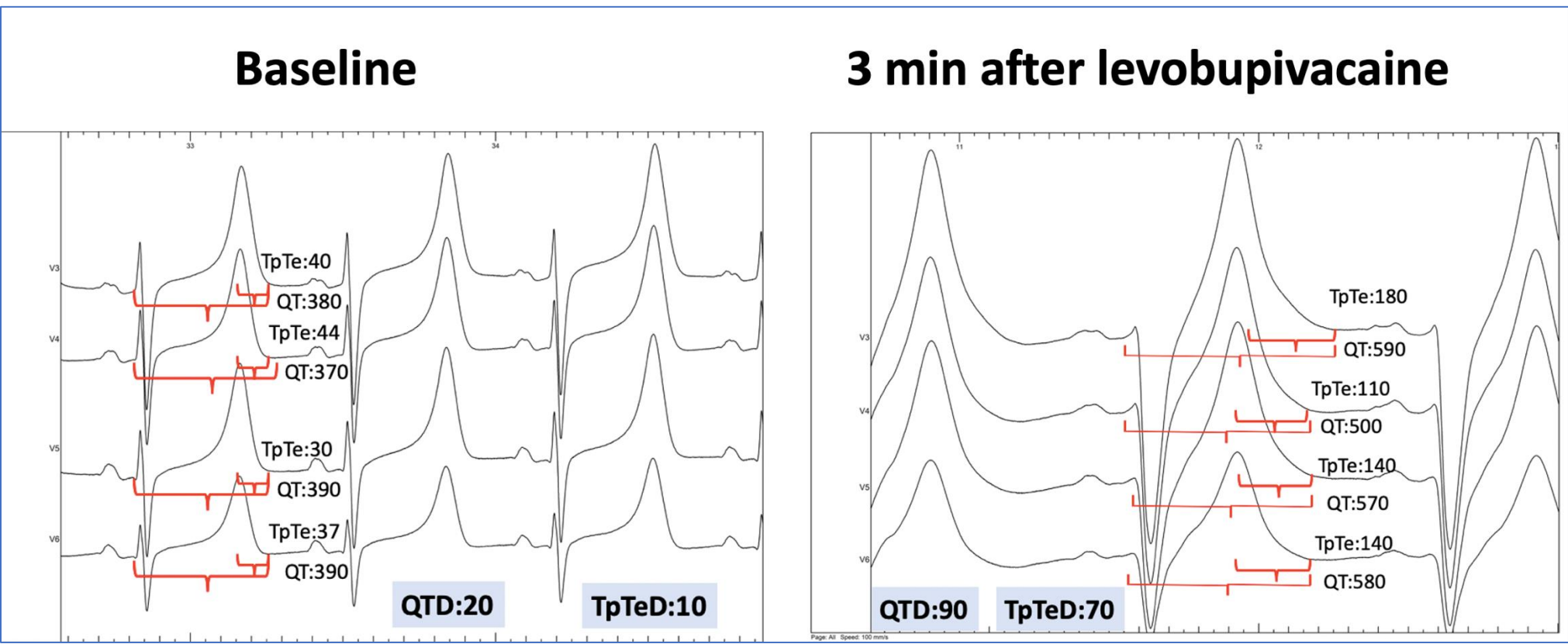


Figure 4: Example of changes in TpTe interval in a specimen after levobupivacaine administration