Influence of Hydroxychloroquine Dosage on the Occurrence of Arrhythmia in COVID-19 Infected Ventricle

Ponnuraj Kirthi Priya¹, Srinivasan Jayaraman ²

¹ Life Sciences, Tata Consultancy Services Limited, Bangalore, Karnataka, India
² Life Sciences, Tata Consultancy Services Limited, Portland, USA

The interaction mechanisms of Hydroxychloroquine (HCQ) in a COVID-19 infected ventricle and its vulnerability to arrhythmogenesis for different dosage levels is not clearly understood. To address this, a 2D transmural anisotropic ventricular tissue model consisting of endocardial, midmyocardial and epicardial myocytes are configured for mild and severe COVID-19 conditions as well as for three dosage levels of HCQ (1 µM, 10 µM and 100 µM). Results show that under control and mild COVID conditions, increasing the dosage of HCQ prolongs the QT interval as well as QRS duration, although under severe COVID-19 conditions, inverted T-waves are observed. In addition, on pacing with premature beats (PBs), it is observed that under all condition, premature ventricular complexes (PVCs) are created at 1 µM and 10 µM HCQ. However, the PVCs are sustained for a longer duration in presence of 10 µM HCQ. ST elevation is observed under mild COVID-19 conditions and 1 µM HCQ and reentrant arrhythmic activity is generated in severe COVID-19 conditions and 10 µM HCQ dosage. Under all conditions, 100 µM HCQ doesn’t generate arrhythmia or PVCs in presence of PBs. This in-silico ventricular model indicates that the dosage of HCQ as well as pacing sequence influences the appearance of arrhythmic activity and could help in guiding HCQ therapy.

Figure 1. Pseudo ECGs generated on pacing the severe COVID-19 infected ventricle tissue with PBs in presence of HCQ