

# **The Relationship between the Occurrence of the U Wave and both the Electrical and Mechanical Timing Sequence**

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The U wave on the ECG was identified more than a hundred years ago, however, its genesis is still in debate. Various hypotheses have been offered, but none of them is universally accepted. This work aimed to investigate the relationship between the occurrence of the U wave and both the electrical and mechanical timing sequence during heart beats. The 12-lead ECG and M-mode echocardiography were simultaneously recorded from 4 healthy subjects aged from 22 to 45 years. In each subject, there were four repeat measurements, with the recording length of 15s each. The ECG was recorded on all four and the mitral and aortic valves (AV and MV) movements from echocardiography were recorded alternately. The timings of QQ interval, the peak and end of the T wave, the peak and end of the U wave, and the AV and MV opening and closing were measured. Overall mean and SD of all the above timings were calculated. Linear regression analysis was then performed to investigate the relationship between the QQ interval and the other timing sequences. The peak of the U wave localized at  $523 \pm 44\text{ms}$  and the end of the U wave occurred at  $657 \pm 60\text{ms}$ . The MV opening preceded the end of the T wave (also considered as the start of the U wave for healthy subjects) by  $9 \pm 11\text{ms}$ , while the AV closed earlier than the start of U wave by  $47 \pm 15\text{ms}$ . When compared with the mechanical timings, the timing of the U wave had better correlation with the QQ, with the R square value changed from 0.95 to 0.76. Our findings suggest that the characteristics of the U wave may be more related to electrical activity than the mechanical events.