Transmembranal Potentials from the Human Heart

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Intracellular action potentials from human ventricular muscle have been recorded with the flexibly mounted ultramicroelectrode. The complete record, correlated with the lead I electrocardiogram, is presented. The size, duration and shape of the human potentials closely resemble those previously recorded from lower animals.

This note is to report the successful recording of transmembrane potentials from human ventricular muscle exposed during cardiac surgery. The development of the flexible mounting for the Ling-Gerard ultramicroelectrode has eliminated most of the rather serious technical difficulties encountered in attempting to make intracellular records from human tissues. This flexible mounting removes the necessity for immobilizing the heart and using a micromanipulator to advance the microelectrode. Instead, a sterilizable input probe held in the hand provides sufficient control of the microelectrode tip, which is supported by a 1-mil tungsten wire.

The figure shows the entire sequence of five intracellular action potentials. The upper tracing is the lead I electrocardiogram, and the lower tracing is the potential recorded by the ultramicroelectrode with respect to a towel clip. The amplitude of the lower right-hand action potential is 95 mV., and the resting potential is about 0.5 mV. The small pip at the start of the plateau phase is pen "overshoot." Note the correspondence in time between the depolarization of the intracellular action potential and the QRS complex, and between the fast repolarization phase and the T wave. The duration of the action potential is 0.2 sec, and the pulse rate is 110/min. These values and the shape of the action potential are closely similar to records obtained on other mammals. This near identity of the ventricular action potentials in man and in other mammals is a strong indication that the fundamental mechanisms are the same and that findings from animal experiments are applicable to the human heart.

REFERENCES
