Comparison of Hand-Held and Conventional ECG Units for Measuring Rate and Rhythm

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Electrocardiograms can be obtained in the horse by using current hand-held technology. The rate and rhythm observed with the hand-held ECG unit is comparable with electrocardiograms obtained with a conventional ECG unit. Authors’ address: Dept. of Large Animal Clinical Sciences, College of Veterinary Medicine, The University of Tennessee, P.O. Box 1071, Knoxville, TN 37901. © 1997 AAEP.

1. Introduction
Electrocardiographs (ECG’s) are useful in evaluating exercise intolerance, characterizing arrhythmias, and monitoring antiarrhythmic therapy in horses. However, conventional ECG units are expensive, can be difficult to use on refractory patients, and are cumbersome pieces of equipment, especially in an ambulatory practice. In contrast, hand-held technology has recently become available to record ECG’s in a variety of species, including the horse. However, these hand-held instruments have not been validated for use in horses, in comparison with conventional ECG units. The purpose of this study was to compare a new hand-held ECG unit with a conventional ECG unit in order to evaluate its accuracy and practicality in measuring heart rate and examining rhythm.

2. Materials and Methods
Electrocardiograms were performed on 62 horses admitted to the veterinary teaching hospital over a 4-month period. In each horse, an ECG was recorded by using a hand-held unit on the left side of the thorax just caudal to the olecranon, followed immediately by an ECG obtained with a conventional ECG unit, which utilized lead II. The settings on each unit were standardized to a paper speed of 25 mm/s and amplitude of 1 cm/mV. The ECG recorded with the hand-held unit was transmitted by phone to the sponsor’s company. After phone transmission, the ECG was recorded by using a printer and faxed back to the principal investigators. At least five complexes of each electrocardiogram from the horses were evaluated for heart rate, presence of arrhythmias, P interval, P-R interval, Q-R-S interval, and Q-T interval length. Parameters from each unit were then compared by using student t tests. The significant difference was determined at p < 0.05.

3. Results
One hundred twenty-four ECG tracings were collected from 62 horses. Of the 62 tracings obtained with the hand-held unit, four tracings did not have adequate amplitude to allow measurement of the intervals. Two horses displayed inadequate ampli-
tude of the P wave for measurement with the hand-held unit. Heart rate was significantly higher with the use of the conventional ECG unit. P and P-R intervals were significantly longer with the use of the conventional ECG unit. There was no significant difference between the two ECG units with respect to the Q-R-S and Q-T intervals. All of the measured parameters were within accepted normal values for the horse.2

Second degree atrioventricular block was detected in five horses with both units. Two horses displayed second degree atrioventricular block with the hand-held ECG unit that was absent from the conventional ECG unit tracings. Two horses with second degree atrioventricular block in the conventional ECG unit tracing displayed sinoatrial block or sinus arrest in the hand-held ECG unit tracing.

4. Discussion
Parameters recorded from both ECG units from each horse were similar to values previously reported.2 Results of this study show that there was a significant difference detected in the parameters for heart rate, P interval, and P-R interval between the hand-held ECG unit and the conventional ECG unit that used a lead II tracing. However, the measured parameters from both units were within the normal accepted values.2 An increased heart rate in the conventional ECG unit may be due to the placement of the alligator clips on the skin.

ECG’s for heavy animals were difficult to obtain with the conventional ECG unit and the hand-held ECG unit. ECG’s for horses with excessively long hair coats were difficult to obtain with the hand-held unit. Electrical impulses may be impeded in heavy horses and horses with excessively long hair coats.

This study indicated that the hand-held unit produces similar tracings to that of a lead II from a conventional ECG unit. The tracings obtained from the hand-held unit are comparable with that of a lead II from the conventional ECG unit; however, heart rate was increased with the conventional ECG unit as a result of the placement of the clip-on leads.

References and Footnotes

aCardiomemo, Instrumedix Inc., Hillsborough, OR 97123.
bModel 4755A, Hewlett-Packard, Boise, ID 83704.
cCardiotech Services, Inc., Louisville, KY 40542.