Comparison of the Smartphone Electrocardiogram Device With a Reference Standard Base Apex Electrocardiogram in Horses

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Our data suggest that the smartphone-acquired electrocardiogram (SAE) accurately identifies cardiac rhythms and heart rate in horses. Authors’ address: Department of Clinical Sciences, College of Veterinary Medicine, Cornell University, Ithaca, NY 14853; e-mail: msk16@cornell.edu. © 2013 AAEP.

1. Introduction
The smartphone-acquired electrocardiogram (SAE) device incorporates electrodes into a smartphone hand-held case, allowing wireless recordings of electrocardiograms. We hypothesized that the SAE would permit immediate and accurate heart rate and rhythm identification in horses with normal sinus rhythm and spontaneous arrhythmias when compared with a reference electrocardiogram (ECG).

2. Materials and Methods
A standardized base apex ECG and SAE recordings were acquired simultaneously from 20 horses (with spontaneous arrhythmias). Instantaneous heart rates were obtained from identical QRS complexes in which these were identified; 15-second average heart rates were obtained in which identical QRS complexes were not identified. Three observers independently evaluated the rhythm and the polarity of QRS depolarization for each recording. The results were compared within-observer and between observers.

3. Results
Instantaneous and average heart rates were identical in all cases in which exact matches could be made for comparison between the smartphone and reference ECG and were within 1 beat when average heart rates were calculated. Intra-observer agreement for rhythm assessment was very high, with no disagreement for equine ECGs. The polarity of depolarization revealed minimal disagreement between the SAE and reference ECG in horses. Inter-observer agreement for SAE ECGs was similar to that for reference ECGs, with all observers agreeing on the rhythm analysis, with minimal disagreement on polarity.
4. Conclusions

With this new hand-held device, ECGs can be observed immediately, and, when necessary, e-mailed to a consulting veterinarian or cardiologist for advice on diagnosis and treatment.

The authors thank AliveCor for providing the equipment (iPhone ECG case).

Footnotes

*a* iPhone ECG, AliveCor, San Francisco, CA 94108.

*b* 4GS iPhone, Apple, Cupertino, CA 95014.