RELIABLE DETECTION OF ATRIAL FIBRILLATION IN HORSES WITH THE AID OF DEEP LEARNING

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Introduction: Atrial fibrillation (AF) is the most important arrhythmia in horses. Diagnosing AF before and after treatment is important, but can be difficult for the owner. Current human AF detection devices are not reliable for horses. Aims: The goal of this study was to determine if it is possible to reliably distinguish AF from sinus rhythm (SR) in horses using deep learning and heart rate data. Methods: Ten-minute ECG recordings of 25 horses in AF and 25 horses in SR were collected from our database. For every rhythm, 15 random ECGs were selected for training of the deep learning algorithm and 10 ECGs were used as a separate validation of the algorithm. Every ECG was subdivided in non-superposing parts of 30s, 60s and 120s. Heart rate data was automatically extracted from the ECG sequences. The deep learning algorithm was separately trained on every sequence length. For the sequences of 120s, the root mean square of successive differences (RMSSD) value was also calculated in order to use a pre-defined cut off value of 302ms to distinguish AF from SR. Results: The RMSSD value had an accuracy of 83%, a sensitivity of 100% and a specificity of 61%. At every sequence length of 30s (accuracy 98%; sensitivity 97%; specificity 98%), 60s (99%; 99%; 99%) and 120s (99%; 99%; 98%), the deep learning has surpassed the RMSSD value. Discussion: The proposed solution has proven to be more precise then the currently used RMSSD value for AF detection. In a next step, this algorithm can be implemented in a smart phone app in combination with a heart rate monitor for AF detection in horses. Conclusion: Deep learning in combination with heart rate data can be used for reliable AF detection in horses.