P-wave visibility in ECGs of the Biotronik BioMonitor III Implantable Loop Recorder

Sam Lovibond  
Justin Mariani  
Paul Gould  
Rukshen Weerasooriya  
Rajeev Pathak  
Tina Lin  
Ian Matthews  
Kushwin Rajamani  
Dennis Lau

Introduction: Implantable loop recorders (ILRs) are standard of care in the investigation of some patients with presyncope, syncope or cryptogenic stroke. Through electrocardiogram (ECG) generation, ILRs provide detailed rhythm analysis to enable diagnosis of specific arrhythmias. Basic rhythm analysis can occur with an ECG that shows only QRS complexes. However, the addition of reliable P-waves to the ECG enables better rhythm evaluation, especially during arrhythmia. The BioMonitor III (Biotronik, Berlin, Germany) is the new, smaller version of its predecessor the BioMonitor 2. It seeks to have all the diagnostic capabilities of the previous version with improved patient comfort through miniaturization as well as improved quality of the stored ECG. The BIOCONCEPT.BIOMONITOR III (BC.BM III) trial is currently underway within Australia. Through analysis of ECGs collected during the BC.BM III study, we aim to assess the quality of the BioMonitor III ECG and whether visible p-waves support the arrhythmia recognition.

Methods: Patients in the BC.BM III trial who underwent successful ILR implant were eligible. Patient consent was provided by the BC.BM III investigators and additional ethical clearance for the substudy was gained. Deidentified ECGs were collated from the BC.BM III database following remote monitoring download. ECGs with device-detected arrhythmias (Atrial Fibrillation, High Ventricular Rate, Sudden Rate Drop, Asystole or Bradycardia) were included in the study. Specific ECGs were then marked for selective review; with the 1st, 2nd, 3rd, 10th, 20th, 30th etc. ECG identified for each device-detected arrhythmia, for each patient. ECGs were then reviewed by a Cardiologist (the reviewer) for: predominant rhythm, evident p-waves (yes/no), the presence of atrial fibrillation (yes/no) and whether the presence of p-waves was deemed very helpful in rhythm diagnosis (yes/no). ECGs in the non-AF group were then compared (p-waves vs no p-waves). ECGs with p-waves were then assessed for whether the presence of the p-waves considerably aided arrhythmia diagnosis.

Result: 1739 ECGs with device-detected arrhythmias from 44 patients were included in the study. 298 ECGs were then designated for selective review. 52 (17.4%) of reviewed ECGs demonstrated AF and 246 (82.6%) demonstrated non-AF. Of the 246 ECGs not in AF, 180 (73.2%) had visible p-waves. Of the 66 ECGs without p-waves in the non-AF group, 37 (15%) were unclear or uninterpretable due to artifact and/or noise, 22 (8.9%) were regular narrow complex rhythms and 7 (2.9%) were narrow complex tachycardias. Of the 180 ECGs with p-waves, the presence of p-waves was deemed very helpful in correct rhythm diagnosis in 62 (34.4%).
Conclusion: This study suggests the BioMonitor III produces ECGs with reliably visible p-waves during device-detected arrhythmia. In a relevant number of cases, the visibility of P-waves contributes to reliable rhythm identification.