Is there a need for a novel algorithm for accessory pathways localization?

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Wolff Parkinson White Syndrome (WPW) affects between 0.1% and 0.2% of the population, causes morbidity due to supraventricular tachycardia (SVT) and can lead to sudden cardiac arrest [1-3]. The management involves localizing the accessory pathway, and then ablating it, by using either radiofrequency (RF) ablation or cryoablation. The electrocardiogram has been useful over the last decades in the localization of accessory pathways, premature ventricular contractions site of origin and pacing sites [4]. Regarding localization of the pathway, following a large study of RF ablation, Fitzpatrick et al described eight anatomical locations of different pathways using fluoroscopic landmarks: Right anteroseptal (RAS), right midseptal (RMS), right posteroseptal (RPS), right anterolateral (RAL), right posterolateral (RPL), left anterolateral (LAL), left
posterolateral (LPL) and left posteroseptal (LPS) [5]. Other algorithms such as the Arruda algorithm or the D’Avila algorithm are also used by clinicians [6, 7]. Most of the accessory pathways’ localization algorithms involve assessment of the delta wave vector (Figure 1), some focus more on QRS morphology (Figure 2), and others combine both methods (Figure 3) [8-12]. By using these algorithms, differentiating between right sided and left sided accessory pathways does not generally pose a problem. However, determining the exact location of right and left sided pathways appears to be more challenging.

The study of Bera et al. is a retrospective cohort. Twenty-two patients met the inclusion criteria. The aim was to assess the value of inferior lead discordance (meaning a positive QRS in lead II and a negative QRS in lead III) as a predictor of right anterior (RA) and RAL pathway. The authors included participants who had undergone RF ablation and were found to have right sided pathways. They then separated them in two groups based on if they had RA and RAL pathway (group 1) vs other pathways (group 2). The study found that all patients who had RA and RAL pathway had an ECG showing ILD, while 17 out of 18 patients who were in the other locations did not have an ECG with ILD. The sensitivity and specificity of ILD for predicting RAL location are 100% and 95% respectively.

The findings in this study are highly relevant because they represent a clear and simple way of localizing RA/RAL pathways. Other algorithms are also extremely helpful but have their limitations especially if they rely on the delta wave polarity and the electrocardiogram is not fully pre-excited. Another advantage to the algorithm used in this study is that it focuses on limb leads, instead of pericardial leads, which are highly susceptible to variability due to possible displacement.

This was a well conducted study, but has some limitations, most notably the small sample size of 22, with only 4 being RA and RAL pathways. There are many algorithms that help cardiologists and cardiac electrophysiologists in localizing accessory pathways before ablation, however, none has specifically focused on RA and RAL pathways. With the advances in artificial intelligence and machine learning, more algorithms using them might be developed in the future.

Figure Legends

Figure 1: Examples of algorithms that rely on delta wave polarity such as Fitzpatrick (top) [5], Chiang (bottom left) [8] and Arruda (bottom right) [6]

Figure 2: Example of algorithms that rely on QRS morphology such as D’Avilla (top left) [7], Taguchi (top right) [9] and St George’s (bottom) [10].

Figure 3: Examples of algorithms that rely both on delta waves and QRS morphology, such as Pambrun (top) [11] and Baek (bottom) [12].

References:


