

## **Atrial remodelling in obesity and hypertension – what can we learn from the ECG?**

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The electrocardiogram (ECG) remains a vital and widely used clinical investigation, more than 100 years following Einthoven's invention. Given its low cost and ease of measurement, it provides an unparalleled price-to-performance ratio in terms of the yield of clinically useful information and is well established in clinical guidelines as an initial screening tool in suspected cardiovascular disease(1,2). In this issue of *Obesity*, a study by Vaidean, Manczuk and Magnani investigates the single and joint effects of obesity and hypertension on two ECG parameters that may correspond to atrial remodelling (P-wave duration and PR-interval)(3).

The study utilised baseline electrocardiographic and clinical data from a large community-based cohort study conducted in Poland, with over 11,000 participants included in the analysis. All study ECGs underwent automated digital analysis of P-wave duration and PR-interval. Study participants were middle-aged with a preponderance of females, and a typically high prevalence of hypertension, metabolic syndrome, and elevated BMI.

Both P-wave duration and PR-interval increased progressively with BMI and waist circumference, independently of other measured clinical variables. These indices were also increased in central obesity, even among individuals without obesity based on BMI alone. However, absolute increases were expectedly small, with each five-unit increase in BMI corresponding to a 1.9 ms increase in P-wave duration and a 2.4 ms increase in PR-duration. Similar trends were seen for increases in systolic (but not diastolic) blood pressure, which persisted after adjusting for BMI and other clinical variables. Interestingly, hypertension did not additionally increase P-wave duration or PR-interval among individuals with obesity.

Although obesity is linked to both atrial fibrillation and heart failure, not all obese individuals develop these conditions, suggesting that additional factors (beyond BMI alone) are important in susceptibility. It is currently difficult to identify specific obese individuals that are more or less at risk of these cardiovascular complications, and improved risk stratification is clinically attractive.

The increase in P-wave duration and PR-interval noted in this study with obesity metrics, are associated with increased risk of atrial fibrillation (AF) and heart failure respectively. This provides a potential non-invasive and widely available aid to identifying those obese patients who may be at higher risk. These results further suggest that atrial remodelling (such as atrial fibrosis or autonomic remodelling(4)), may occur in obesity independently of the presence of hypertension. This is relevant, as our current understanding of the relationship between AF and systemic disease (including obesity) remains incompletely understood(5).

Inevitably, there are some important limitations of the present work. The most significant of these is that no imaging data are available in the context of this large cross-sectional observational study design. Information on atrial size (from echocardiography or cardiac magnetic resonance) is vital to answer the question regarding whether the relationships between obesity/hypertension and P-wave duration/PR-interval might be explained partially or entirely by increasing atrial size.

Obesity and AF exert a massive combined toll on worldwide morbidity, mortality and healthcare costs(6,7). An improved understanding of the relationships between these conditions would help to identify those at risk, and could generate better treatments and improve outcomes. Future studies that include atrial imaging are needed to prospectively evaluate the independent value of P-wave duration and PR interval as markers of future AF risk in obese patients.

## References

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