J R Coll Physicians Edinb 2017; 47: 135–7 | doi: 10.4997/JRCPE.2017.205 **PAPER**

Unilateral atrial fibrillation – how common is atrial divorce?

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Abstract

Atrial fibrillation is the most common pathologic supraventricular tachycardia. It has many causes, is an expensive disease, impairs quality of life and leads to an increased risk of death. Atrial dissociation is characterised by the presence of two independent sets of P-waves. This peculiar abnormality may give rise to the scenario where one atrium is in atrial fibrillation while the other is in sinus rhythm. This is the first published case of atrial dissociation where the phenomenon is demonstrated by transmitral and transtricuspid pulsed wave Doppler.

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Keywords: atrial, dissociation, fibrillation, unilateral

Declaration of interests: No conflict of interests declared

Atrial fibrillation (AF) is the most common pathologic supraventricular tachycardia, affecting 3 million people in the USA alone.[1,2] AF is caused by multiple electrical wavelets, appearing in the atria simultaneously, resembling the wavelets that would be produced if one dropped several pebbles in a bucket of water at the same time.[1]

AF is usually a progressive disease;[3] it often begins with infrequent episodes of limited duration which is termed paroxysmal AF (often defined as episodes of AF that terminate spontaneously within 1 week).[3] Such episodes tend to become more frequent and longer in duration, progressing to persistent AF (persistent AF fails to terminate spontaneously within 7 days and may require cardioversion) or permanent AF (permanent if the AF lasts for more than 1 year and cardioversion either has not been attempted or has failed).[3]

The electrophysiological basis of AF requires both a trigger that initiates the dysrhythmia and a substrate that can sustain it.[3,4] The most common trigger of AF is ectopic atrial beats that arise from the muscle sleeves around the pulmonary veins.[3,5] These triggers (ectopic beats) may be provoked by the intrinsic activity of cardiac ganglionic plexuses which are clustered in the vicinity of the pulmonary vein-left atrial junction.[3,5] The pulmonary vein-left atrial junction together with an enlarged atrium, harbouring fibrosis and inflammation, then serve as the substrate for sustaining wavelets of atrial fibrillation.[3]

With persistence of AF, further electrophysiological changes occur in the atria, which include shortening of the refractory period of the atrial muscle and this in turn predisposes to the development of other triggers and wavelets.[3] Consequently, this process results in a greater predisposition to AF, as well as the perpetuation of existing AF.[3] Maintenance of sinus rhythm can reverse these changes;[3] hence the saying 'AF begets AF and sinus rhythm begets sinus rhythm'.[3]

AF is an important disease as the rate of death is about double when compared to patients in sinus rhythm; it has an adverse effect on the quality of life and is expensive to treat (more than $6.5 billion per year in the USA alone).[3]

Atrial dissociation which presents as unilateral AF has been described previously.[6,7] Doubted by some, further evidence supporting the existence of atrial dissociation was presented by Chung in 1971.[8]

Figure 1 is the electrocardiogram of a 60-year-old Caucasian male with pulmonary hypertension and an enlarged right atrium due to idiopathic pulmonary fibrosis. The rhythm strip (lead II) reveals atrial flutter-fibrillation. However, if one looks at lead V1, two distinct sets of P-waves are seen. Figure 2 is the transtricuspid pulsed wave Doppler appearance. This clearly reflects AF. However, the transmitral pulsed wave Doppler (Figure 3) reflects sinus rhythm with E-A waves. There are two filling phases during ventricular filling: early and late. These two phases are represented by the E and A waves, respectively. These two waves represent the velocity of flow through the atrioventricular valve during early (E wave) and late (A wave) ventricular filling respectively. Late ventricular filling is caused by atrial contraction. Thus, when AF is present, no A wave will be seen. If one looks closely at Figures 2 and 3 this difference is striking: there is only an E wave in Figure 2 but E and A waves in Figure 3.

Atrial dissociation is characterised by the presence of two independent sets of P-waves.5 In extremely rare instances

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Figure 1 Electrocardiogram depicting atrial flutter-fibrillation. Note the distinct two sets of P waves in lead V1

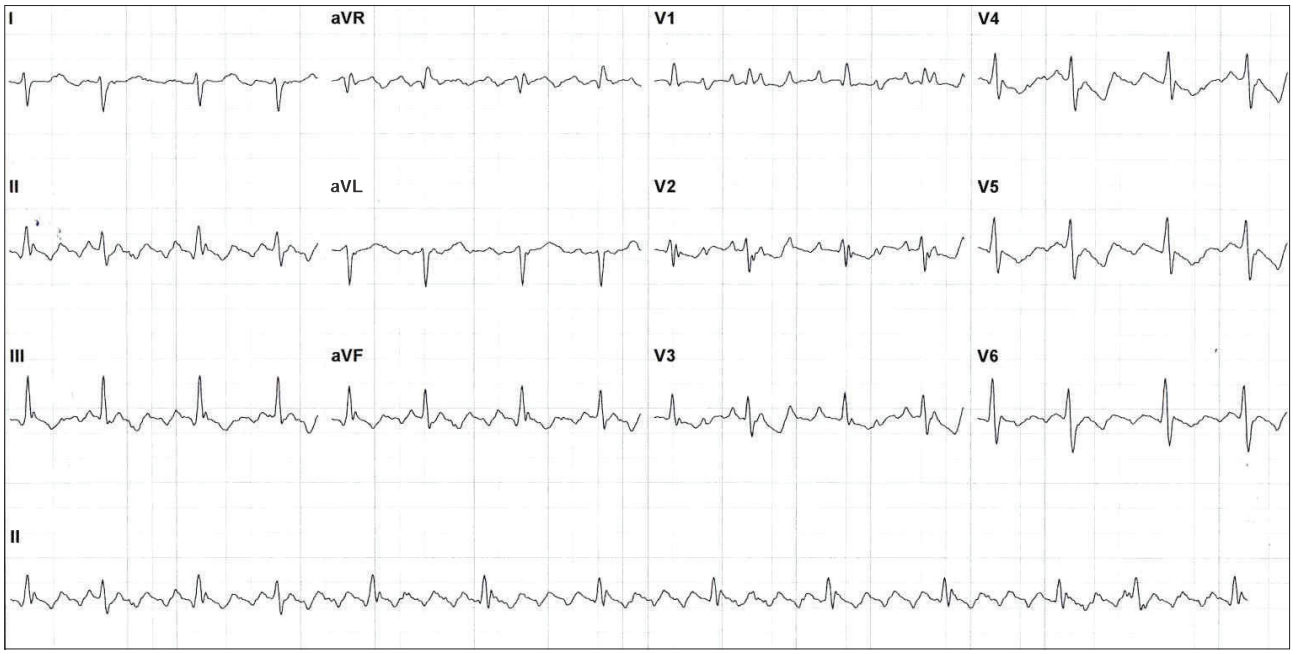


Figure 2 Pulsed wave Doppler over the tricuspid valve. This is the appearance of AF

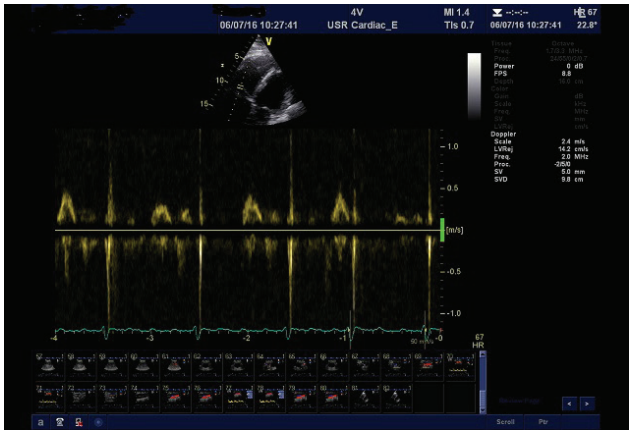
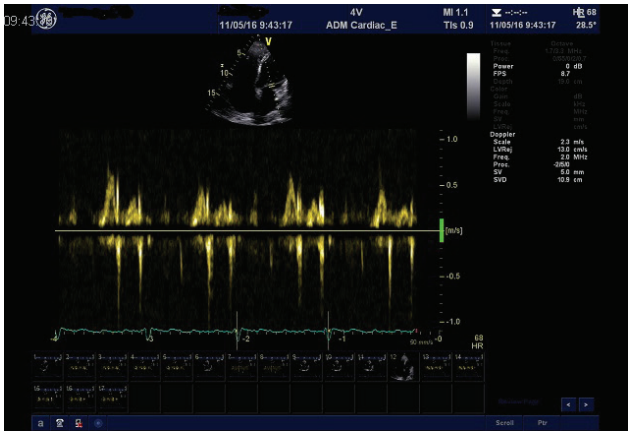


Figure 3 Pulsed wave Doppler over the mitral valve. This demonstrates normal sinus rhythm



of atrial dissociation it has clearly been described that one atrium or only a portion of one may have atrial tachycardia, atrial flutter or AF while the other atrium is still in sinus rhythm.[5,9–12]

The first observation of atrial dissociation was by Hering in an experimental study. Wenckebach was the first to report the phenomenon in a patient in 1906.[6] Since then, atrial dissociation was observed by numerous authors in various clinical settings, such as congestive heart failure, rheumatic heart disease, hypertension, uraemia, pneumonia, glomerulonephritis, myocardial infarction, congenital heart disease, diphtheria and digitalis intoxication.[6]

This is the first published case of atrial dissociation where the phenomenon is demonstrated by transmitral and transtricuspid pulsed wave Doppler demonstrating one atrium in sinus rhythm and one in atrial fibrillation.

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