A case report of arrhythmogenic mitral valve disease: still a long way to go

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Background
Mitral valve prolapse (MVP) is a common valvular heart disease and has often been associated with an increased risk of sudden cardiac death (SCD). This underlines the pressing need for the establishment of consistent tools for arrhythmic risk prediction.

Case summary
A 73-year-old man with previous diagnosis of MVP was referred to the cardiology outpatient consult for a 1-month history of near-syncope and light-headedness. He had no family history of SCD. Physical examination was unremarkable. Holter monitoring recorded frequent and multiple long episodes of non-sustained ventricular tachycardia (VT) and paroxysmal atrial fibrillation with controlled ventricular response. Echocardiogram revealed mitral bileaflet billowing, systolic curling, and annular disjunction, as well as increased peak systolic strain dispersion with two-dimensional speckle tracking. Cardiac magnetic resonance disclosed additional tricuspid annular dilatation and disjunction, as non-ischaemic late gadolinium enhancement on the left ventricular basal inferolateral wall. The Heart Team decided to implant a defibrillator as primary prevention for SCD due to arrhythmogenic mitral valve disease (AMVD) with high-risk features. The patient remained asymptomatic over the next 2 years, when he suffered an appropriate shock due to VT at 200 b.p.m.

Discussion
Here, we present a case of a patient with AMVD with classic features of high arrhythmic risk but also with some unusual characteristics such as older age, male gender, and only little pronounced mitral valve billowing, emphasizing the wide heterogeneity and lack of knowledge surrounding this entity.

Keywords
Mitral valve prolapse • Mitral annular disjunction • Tricuspid annular disjunction • Arrhythmic prolapse

Learning points
• Identification and risk stratification of arrhythmogenic mitral valve disease is still a major clinical challenge and should be regarded as a priority.
• In patients with arrhythmogenic mitral valve disease, the presence of mitral annular disjunction, curling, Pickelhaube sign, and increased mechanical dispersion by strain should be systematically sought and reported.

Introduction
Mitral valve prolapse (MVP) is a frequent finding in echocardiography and carries a risk of sudden cardiac death (SCD) of 0.2–0.4% per year, underlining the pressing need for new risk stratification tools.

In this report, we describe a patient with arrhythmogenic mitral valve disease (AMVD) and review the features suggestive of increased arrhythmic risk.
Timeline

Case presentation

A 73-year-old man was referred to cardiology consultation for a 1-month complaint of near-syncope and light-headedness during exercise and at rest, with associated diaphoresis. His cardiac history was remarkable for arterial hypertension treated with ramipril and hydrochlorothiazide and a previous diagnosis of MVP. There was no family history of heart disease or SCD.

Physical examination was unremarkable, and a 24 h Holter monitoring, echocardiogram, and blood tests were requested.

Electrocardiogram (ECG) showed sinus rhythm 77 b.p.m. and one ventricular extrasystole but otherwise unremarkable. Laboratory evaluation revealed creatinine 1.02 mg/dL, sodium 139 mmol/L, potassium 3.85 mmol/L, magnesium 2.1 mg/dL, thyroid-stimulating hormone 1.01 μIU/mL, hs-cTnT 8 ng/L, and NT-proBNP 88 pg/mL.

A 24 h Holter monitoring showed multiple episodes of non-sustained ventricular tachycardia (VT), the longest with 15 s at 220 b.p.m. (Figure 1) with associated light-headedness and paroxysmal atrial fibrillation.

Due to symptomatic VT, the patient was admitted to the Cardiology ward for additional workup.

Echocardiogram showed moderate left ventricular (LV) hypertrophy with preserved LV function and increased peak systolic strain dispersion (PSD; 61 ms). It was most notable for mitral valve disease such as bileaflet billowing with trace mitral regurgitation, annular disjunction (MAD), and systolic curling (Figure 2 and Supplementary material image 01 and 02).

![Figure 1](holter-monitoring-showing-sustained-ventricular-tachycardia.png)
Cardiac magnetic resonance (CMR) unveiled concurrent tricuspid annular disjunction. Late gadolinium sequences (LGEs) revealed non-ischaemic LV basal inferolateral enhancement. There were no coronary artery lesions on angiography.

After discussion in the Heart Team, a cardioverter defibrillator (ICD) was implanted for primary prevention of SCD due to AMVD with high-risk features. The patient was discharged medicated with amiodarone 200 mg, bisoprolol 2.5 mg, edoxaban 60 mg, and ramipril plus hydrochlorothiazide.

Two years after ICD, he suffered an appropriate shock due to VT at 200 b.p.m. Follow-up echocardiogram showed similar findings such as mitral valve regurgitation severity, MAD height, and LV ejection fraction.
Discussion

We present a case of AMVD that illustrates some known arrhythmogenic markers, demonstrates the heterogeneity of this entity, and underlines the difficulties and lack of certainty involved in risk stratification.

The ECG is the initial test in risk stratification. T-wave inversion is strongly linked to the development of ventricular arrhythmias (VAs) in MVP, and the presence of VAs on Holter monitoring is an independent predictor of all-cause death in these patients.\(^2\)

Echocardiography is invaluable in the diagnosis of AMVD and may have a role in risk stratification. Bileaflet prolapse is a known marker of increased risk of SCD.\(^3\) Mitral annular disjunction frequently coexists with MVP (40–60%), but it may also present regardless of it,\(^4\) as was the case presented here. Another risk marker is the Pickelhaube sign, characterized by a systolic high-velocity signal on the mitral annulus by tissue Doppler. Both latter parameters showed a strong correlation with VAs on Holter.\(^4-6\) Peak systolic strain dispersion can also be useful as it was found that MVP patients with VAs had a mean PSD of 59 vs. 43 ms in MVP patients without VAs.\(^7\) Tricuspid valve annular disjunction was recently recognized to be associated with MAD, but no association with VAs was found.\(^8\)

In the presence of high-risk features on first-line workup, it is advised to use CMR to further stratify arrhythmic risk prediction. Systolic curving seems to be associated with SCD when evaluated by CMR\(^9\) and could also be appreciated on echocardiogram in our case (Figure 2). Finally, LGE may be present in patients with MVP, usually affecting only one segment, most often LV basal inferolateral, and with a non-ischaemic pattern (most frequently intramural or patchy).\(^10\) This finding is strongly correlated with the development of SCD, aborted SCD, and VAs.\(^10\) Recently, increased extracellular volume, a marker of interstitial fibrosis, was suggested to have a similar ability to predict SCD and greater sensitivity to predict complex VAs when compared with LGE in patients with MVP.\(^11\) A visual summary of the characteristics related to arrhythmic risk can be found in Figure 4.

Figure 4. Summary of the features potentially related to prognosis in patients with arrhythmogenic mitral valve disease. The cited articles can be found in the References section.
This small review is illustrative of the growing interest in the topic of AMVD and of the plethora of techniques and parameters available to assist in risk stratification. However, most of these studies are small, with a retrospective design and lacking in hard endpoints such as SCD.

**Conclusion**

Arrhythmogenic mitral valve disease has been increasingly recognized as a heterogeneous entity and efforts have been made to identify risk markers of malignant arrhythmias in this population. However, because these markers still have limitations and lack consistency, risk stratification is mainly performed in an individual basis. This case reminds us that, although we have come a long way with regard to knowledge on AMVD, there is still a long way to go.

**Lead author biography**

Gonçalo Cunha, Cardiology resident in the Hospital of Santa Cruz, Lisbon, Portugal, with a particular interest in echocardiography and cardiac rehabilitation.

**Supplementary material**

Supplementary material is available at *European Heart Journal – Case Reports* online.

**Consent:** The patient gave consent for using his anonymized data for the purposes of this clinical case report, read the manuscript, and approved its content.

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