CASE REPORT

Recurrent ventricular tachycardia managed with balloon aortic valvuloplasty: an unusual presentation of severe aortic stenosis

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SUMMARY

A 68-year-old woman was transferred from a regional hospital with recurrent polymorphic ventricular tachycardia associated with haemodynamic instability. A diagnosis of severe aortic stenosis (AS) with normal left ventricular systolic function had recently been established on echocardiography. Correction of hypokalaemia and intravenous amiodarone infusion were ineffective. On transfer, ongoing ventricular arrhythmias requiring repeat defibrillation occurred. Urgent coronary angiography was unremarkable. Following consultation with the cardiosurgical team, emergency bridging balloon aortic valvuloplasty (BAV) was performed. Two weeks later the patient proceeded to an uneventful inpatient surgical aortic valve replacement (AVR). This case highlights an unusual presentation of severe AS, and describes the use of emergency BAV to correct arrhythmia-induced haemodynamic instability prior to surgical AVR.

malignant ventricular arrhythmia is one proposed mechanism. Balloon aortic valvuloplasty (BAV) is an established treatment modality for high-risk surgical patients with severe AS, either as a bridge to conventional surgical aortic valve replacement (AVR) or for symptom palliation. We report the case of a 68-year-old woman with recurrent ventricular tachycardia (VT) in the setting of newly diagnosed severe AS who was treated with emergency BAV.

CASE PRESENTATION

A 68-year-old woman presented to the local hospital with 1-month history of recurrent palpitations, dizziness and heart failure symptoms. She did not have any significant medical or family history of note.

Initial physical examination demonstrated a systolic heart murmur, irregular pulse and signs of left ventricular failure. Routine blood tests including cardiac markers were unremarkable. Resting ECG confirmed atrial fibrillation. The patient's treatment included diuretics for heart failure, incremental doses of metoprolol for rate control and aspirin. She was discharged home to be followed up in clinic with an echocardiogram. She presented to

BACKGROUND

Clinical presentations of severe aortic stenosis (AS) typically include exercise-induced angina, dyspnoea and syncope. Symptomatic patients are considered at increased risk of sudden cardiac death, of which

Figure 1 The 12-lead ECG on admission to tertiary cardiac care unit (CCU).

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hospital twice again over the same week with ongoing palpitations and breathlessness. Telemetry strips showed runs of non-sustained VT. Serum electrolytes were corrected with intravenous potassium and magnesium supplements. Despite this, the patient deteriorated clinically with recurrent pulseless VT requiring defibrillation. An infusion of amiodarone was started.

INVESTIGATIONS

An urgent transthoracic echocardiography revealed severe calcific AS (mean gradient of 69 mm Hg, maximum jet velocity of 5.5 m/s, calculated valve area of 0.26 cm²), moderate mitral regurgitation, left ventricular hypertrophy with preserved systolic function (ejection fraction 69% by Simpson's Biplane). There was no aortic regurgitation present.

TREATMENT

The patient was transferred to our centre for on-going management. Her ECG on transfer demonstrated sinus rhythm (figure 1).

On arrival at our hospital serum electrolytes were normal. However, the patient continued to have recurrent ventricular ectopics and non-sustained VT that degenerated into polymorphic VT requiring further defibrillation (figure 2).

An urgent coronary angiography demonstrated normal coronary anatomy with no significant coronary artery disease. It was concluded that the patient's recurrent VT and haemodynamic instability were secondary to critical AS. Following discussions with the cardiac surgeons, bridging BAV with a view to surgical AVR was considered the safest management strategy. Vascular access was gained using bilateral common femoral artery puncture. A right femoral vein access was used to advance a 5F temporary pacing wire into the right ventricular apex. The aortic valve was crossed with some difficulty using an AL1 diagnostic catheter and a 0.34 inch straight tip wire. BAV was performed using a 23×45 mm Cristal balloon. A 25 mL diluted contrast was used for balloon inflation under rapid right ventricular pacing at 180 bpm (figure 3). The mean aortic valve gradient dropped from 68 to 42 mm Hg post-BAV (figure 4). The procedure was well tolerated haemodynamically with no arrhythmias.

OUTCOME AND FOLLOW-UP

Following BAV, the patient recovered in the coronary care unit over 2 weeks with no further recurrence of ventricular arrhythmia. Her post-BAV echocardiogram showed severe calcific aortic stenosis with improved parameters (maximum gradient

Figure 2 Telemetry tracings showing ventricular ectopic beats degenerating into sustained polymorphic ventricular tachycardia requiring defibrillator therapy.

Figure 3 Balloon aortic valvuloplasty with Cristal balloon inflation under rapid ventricular pacing.

82 mm Hg, mean gradient 49 mm Hg, maximum jet velocity 4.5 m/s, valve area 0.74 cm²). There was mild aortic regurgitation with preserved left ventricular systolic function. She

Figure 4 Left ventricular and aortic pressure tracings at cardiac catheterisation pre-balloon aortic valvuloplasty (BAV) and post-BAV. The mean gradient pre-BAV (top) was 68 mm Hg, dropping down to 42 mm Hg (bottom) postprocedure.

therefore underwent uncomplicated surgical AVR as an inpatient, in accordance with current international guidelines. She was discharged well, 5 days post-AVR.

DISCUSSION

Calcific AS is the most common valvular heart disease of the elderly. Typically, patients present with exertional dyspnoea, angina, syncope, or a combination of these symptoms. The presence of symptoms in a patient with severe AS constitutes a class I indication for aortic valve surgery according to current international guidelines.¹ Patients with severe symptomatic AS have a higher incidence of sudden cardiac death,^{2–4} and ventricular tachycardia is one proposed mechanism. The prevalence of ventricular tachycardia in AS is uncertain. In a study of 52 patients with severe symptomatic AS, 3 had symptomatic VT documented on 24 h ambulatory ECG monitoring.⁵ Research data suggest left ventricular hypertrophy and systolic dysfunction confer a higher risk for the development of ventricular arrhythmias in these patients.² The presence of acute pulmonary oedema, recurrent ventricular tachyarrhythmia and cardiac arrest, as seen in our case, increases the risks of emergency surgical AVR.

BAV was first introduced by Cribier *et al*⁶ more than 25 years ago for the management of high risk surgical patients with severe symptomatic AS. Although it provides symptomatic relief, it does not alter the natural history of AS.^{7,8} With the advent of

semicompliant balloons, use of rapid pacing and vascular closure devices, the peri-procedural complication rates of BAV have markedly reduced in recent years. Current guidelines recommend BAV as a bridge to definitive surgery in haemodynamically unstable patients who are at high risk for surgery.¹ Having ruled out reversible causes of VT in our case, and in consultation with cardiac surgeons, we successfully undertook emergency BAV. This was a bridging procedure that stabilised the patient prior to definitive valve surgery.

This case highlights an unusual clinical presentation of severe AS and further adds to the available evidence base on the use of emergency BAV in haemodynamically unstable patients⁹ prior to surgical AVR.

Learning points

- ▶ Ventricular tachyarrhythmias are an uncommon but important clinical presentation in patients with severe aortic stenosis (AS).
- ▶ Ventricular arrhythmias in aortic stenosis may be resistant to antiarrhythmic therapy.
- ▶ Balloon aortic valvuloplasty (BAV) may be useful in patients with severe AS who present with haemodynamic instability associated with ventricular arrhythmias prior to definitive aortic valve replacement (AVR).

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Contributors RN performed the Balloon aortic valvuloplasty (BAV) and revised the draft paper. CN performed and reported the coronary angiography of the patient, and revised the draft paper. GD performed the BAV, revised the draft paper and was the lead clinician for the patient. PT is the advanced trainee registrar to GD. He managed the patient until she was transferred to the cardiac surgeons, and performed the literature search, wrote the original draft paper and submitted the final version.

Competing interests None.

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