Management options for severe aortic stenosis in non-surgical candidate patients

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CASE REPORT

Mrs JH is a 90 year old NZ European female with severe aortic stenosis (AS), who has had eight admissions in the previous twelve months with cardiogenic syncope, preceded by dyspnoea and palpitations on mild exertion. During this admission, she complained of dyspnoea on minimal exertion, but denied any chest pain. She was previously declined aortic valve replacement given her high surgical risk with a EuroSCORE II of 14, putting her estimated surgical mortality at 41.69%.

Other significant medical history includes three non-ST-elevation myocardial infarctions in the last twelve months; paroxysmal atrial fibrillation (warfarin was discontinued recently following frequent falls), hypothyroidism, type II diabetes, stage III chronic kidney disease secondary to diabetes and multiple transient ischaemic attacks. Her regular medications include aspirin 100mg, omeprazole 20mg, levothyroxine 50mcg and frusemide 60mg.

Mrs JH was independent until recently, and has moved in with her son due to increasing difficulty with daily activities of living. She is a non-smoker and does not drink alcohol.

Her physical examination was normal apart from a slow-rising carotid pulse and 4/6 ejection systolic murmur accentuated on expiration, loudest at the left sternal edge and radiating up to the carotids. There was no paradoxical splitting of the second heart sound. Sitting and standing blood pressure (BP) showed a small systolic drop of 10mmHg (from 130 to 120mmHg).

Her blood tests were all unremarkable apart from raised creatinine of 136µmol/L, which was reflective of her chronic renal impairment. An echocardiogram in July 2012 showed severe calcific AS with mean gradient of 75mmHg and aortic valve area of 0.5cm^2; there was also moderate concentric left ventricular (LV) hypertrophy. She had normal LV size and function and an LV ejection fraction (LVEF) of 50-55%.

DISCUSSION: NON-SURGICAL MANAGEMENT OF CRITICAL AS

Calcific aortic stenosis typically occurs in the elderly, and is predominantly characterised by calcification of the valve, causing a reduction in leaflet motion and effective valve area.[1] Recent understanding of the underlying pathophysiology suggests that calcification is driven by active inflammation similar to that of atherosclerosis.[2] Although AS is usually silent with a long latent period, when symptoms of angina, syncope, or heart failure develop, its prognosis changes dramatically. The average survival of symptomatic AS is two to three years. Severity of AS is defined by valve anatomy and haemodynamics found on echocardiographic studies. The American College of Cardiology and the American Heart Association joint guidelines in 2014 state that the prognosis is poor once a peak aortic valve velocity of >4 m per second, corresponding to a mean aortic valve gradient >40 mm Hg or an aortic valve area of <1.0 cm^2 is reached.

In these patients, aortic valve replacement (AVR) has well-documented symptomatic and survival benefits.[1] However, despite this clear evidence, many patients being elderly, either refuse surgery for various reasons or are declined surgery due to multiple co-morbidities.[3] For these patients, the overarching principle of treatment should be enhancing quality of life rather than prolonging life span. Therefore, long-term palliative medical management should be put in place to address their significant debilitation.

There are a number of medical management options available for inoperable AS, ranging from medication therapy, balloon aortic valvuloplasty, and most recently introduced transcatheter aortic valve replacement.

MEDICATIONS

Although there is no effective medical treatment available for calcific AS, the recent advancements in the understanding of its aetiology has allowed researchers to explore the potential benefits of lipid lowering therapy in slowing down the progression of disease. Despite early promising results from retrospective studies, a randomised controlled trial studying the efficacy of Atorvastatin 80mg in moderate to severe AS (with average AVA of 1.01cm^2) showed no significant reduction in disease progression.[4] A major trial looking at combined Simvastatin and Ezetimibe also did not demonstrate much difference in outcome.[5] Conversely, Moura and co-workers found that patients with mild to moderate AS (with average AVA of 1.23cm^2) treated with Rosuvastatin 20mg had significantly reduced rate of disease progression.[6] Following on from these conflicting studies, Carabello and Paulous concluded that if statins were to be considered at all, they must be given early for mild AS.[2] Also, a recent meta-analysis concluded that currently available data does not support the use of statins to improve outcomes and to reduce disease progression in non-rheumatic calcific aortic valve stenosis.[7] This means that Mrs JH is unlikely to benefit from statins, especially in her advanced disease state.

Although the evidence is scarce, there is general consensus among clinicians to optimise loading conditions. This includes antihypertensive treatment and maintenance of euvolaemic status with the aim of reducing the afterload by vasodilatation and thereby reducing the workload on the ventricle. However, this should be closely monitored to prevent systemic hypotension by excessive vasodilation.[2] In the presence of fixed cardiac output due to AS, reduced afterload may well cause significant hypotension

such that organ perfusion is compromised.[2] Therefore, angiotensin-converting enzyme (ACE) inhibitors are often avoided in patients with severe AS,[8] which should only be introduced under careful supervision of selected inpatients.[9] Furthermore, the use of beta-blockers is also avoided as this could potentially pose the danger of reducing transaortic gradient by its negative inotropic effect.[2] After carefully selecting pharmacological therapies for these patients, they should also be advised to watch for any signs of decompensation by fluid restriction, reduction of sodium intake, and daily weighs.

BALLOON AORTIC VALVULOPLASTY (BAV)

BAV is a non-surgical invasive procedure performed in order to improve left ventricular outflow. It involves passing a catheter balloon percutaneously through a narrow diseased valve to dilate and break the leaflet calcifications. Although it does not have an associated survival benefit, it serves a palliative role with symptomatic improvement and lower rates of hospitalisation.[10] Furthermore, a subsequent BAV procedure (often performed six to twelve months post initial procedure) has been described to prolong symptom-free survival.[10] Therefore, in patients who have a prohibitive surgical risk, BAV can still be performed as a short-term palliative procedure to improve their quality of life.

In the majority of patients, recurrent hospitalisation is one of the major issues which has a significantly negative impact on their quality of life, let alone a huge burden on limited hospital resources. A study conducted in Auckland City Hospital demonstrated a statistically significant reduction in the number of cardiac-related hospital admissions six months after BAV.[10] This study showed that over three-quarters of the participants had no hospital admission in the six months following BAV. Therefore, Mrs JH could be considered as a suitable candidate for BAV which may improve her symptoms and potentially reduce the likelihood of future hospitalisations.

When making an informed decision, it is important that Mrs JH is aware of potential risks and benefits of any intervention. When Sack and colleagues assessed the efficacy of BAV in the elderly, they suggested that LV dysfunction was the strongest predictor of post-procedure mortality.[3] Mean survival was significantly lower for patients with a LVEF of less than 35%. High serum creatinine level (greater than 200μmol/L) was also an independent predictor of mortality. Given that her LVEF is 50-55% and her creatinine level is below the 'unfavourable' range, one could argue that she has a relatively low risk of complications from BAV. Therefore, as the benefit of BAV outweighs its risk, this could be recommended as palliative treatment for Mrs JH.

TRANSCATHETER AORTIC VALVE REPLACEMENT (TAVR)

TAVR is a new procedure first introduced in 2002. It involves inserting a bioprosthetic valve percutaneously through a catheter and implanting it within the diseased native aortic valve.[11] Many studies show a mortality as well as morbidity benefit demonstrated by TAVR compared to standard medical therapy, including BAV. Of these, the PARTNER trial is considered a pioneer study which has shown significant benefit in the group that was not fit to undergo major open cardiac surgery.

In this multi-centre randomised controlled trial, 358 participants of a mean age of 83 years were randomised into TAVR and standard therapy group which consisted of maximisation of medications and BAV.[11] The study demonstrated that TAVR markedly reduced both the rate of death from any cause and from cardiovascular causes, as well as reducing the rate of repeat hospitalisations. It was also associated with a significant reduction of breathlessness on minimal exertion and at rest. This would mean that Mrs JH is likely to benefit from the procedure. However, she had previously refused AVR with the view that she does not want any major procedures or operations given her old age. Despite her family willing to consider TAVR (even as a private procedure should she be declined for one), she refused TAVR as she considered this as a major procedure with significant risk and potential adverse events.

CONCLUSION

After exploring various management options for inoperable AS, it was concluded that Mrs JH would benefit from maximisation of standard medical therapy, BAV and TAVR. For her, it is most realistic that she would consider BAV as a next step of treatment which has a relatively low risk profile.

It is interesting to note that a recent study looking at the short-term efficacy of BAV in inoperable patients suggested that BAV has the potential to facilitate progress to TAVR in those who are technically suitable.[12] Therefore, it may serve as a bridge to TAVR which has a survival and symptomatic benefit, with decreased hospitalisations. However, before deciding on any treatment option, it is important that the potential risks and benefits of such an intervention are explained in detail to the patient to ensure that we are responding to the patient's expectations and goals.

The findings of this case history were discussed with the consultant physician and the medical team, and were then further discussed with the patient and her son. She was referred to outpatient cardiology for consideration of palliative BAV.

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