



Case of Right Anterior Minithoracotomy to Treat Subaortic Membrane

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Abstract

The subaortic membrane is a rare pathological entity, with a 1% to 2% occurrence in young adults. Typically it consists of a thin fibrous membrane in the left outflow tract leading to symptoms such as dyspnea. Transesophageal echocardiography is the gold standard imaging for diagnosis and detection of associated cardiac defects. The classic approach consists of median sternotomy to proceed to membrane resection and septal myectomy. We present 2 case of resection by right anterior minithoracotomy.

Keywords: Subaortic stenosis; Left ventricular outflow tract obstruction; Membrane; Minimally invasive surgery; Right thoracotomy

Introduction

The subaortic membrane is a rare pathological entity, parts of subaortic stenosis, first described in 1884 by Cheevers [1]. It is usually present in young adults, with a 1% to 2% occurrence [2], and until 6.5% when associated with another cardiac malformation, such as ventricular septal defect [1].

In most cases, it consists of a thin fibrous membrane below the aortic valve. Still, sometimes it can be a larger fibrous diaphragm inducing a Left Ventricular Outflow Tract (LVOT) obstruction [2,3].

Concerning the physiopathology, an abnormal aorto-septal geometry causes shear stress with endothelium damaging and then, cell proliferation that may lead to membrane formation, and LVOT obstruction [2]. In major cases, it is an acquired disease, but some familial forms exist, such as Shone Syndrome.

Symptoms are variables, and transesophageal echocardiography remains the gold standard imaging [3], even if cardiac CT angiography provides valuable preoperative information in patients with LVOT disorders [2].

Even with additional cardiac defects, surgical correction is generally a successful approach consisting of membrane resection and septal myectomy underneath the right coronary sinus [2]. Median sternotomy is the most common approach.

There is no guideline for surgery, but as known, subaortic membrane natural history leads to left ventricular hypertrophy, aortic regurgitation and can result in endocarditis. So it is commonly approved that symptoms, aortic regurgitation, or gradient should lead to surgery.

In recent years, there has been an increased interest in less invasive surgical approaches to the heart. Recent evidence suggests that the Right Anterior Minithoracotomy (RAM) is associated with several clinical benefits in patients undergoing aortic valve replacement [4].

We report our experience with a minimally invasive approach by RAM for surgical management of subaortic stenosis.

Case Presentation

A 45-year-old man Preoperative symptomatology was spontaneous syncope and dyspnea. Preoperative Transthoracic Echocardiography (TTE) showed subaortic stenosis with a transmembranous peak pressure gradient around 76 mmHg and a tricuspid aortic valve with grade 1 regurgitation. There was a slightly concentric hypertrophic left ventricle, septum hypertrophy, no systolic anterior motion, and a conserved ejection fraction.

There was no abnormality on the preoperative coronary CT angiography, and Euroscore II

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Figure 1: Aortic valve retractors, Delacroix chevalier.



Figure 2: Subaortic membrane exposed with our aortic valve retractor and the resected subaortic membrane.

was 0.6%. Symptoms' severity and risk of progressive valve damage enforced us to operate. So we decided to carry out a minimally invasive septal myectomy and membrane resection performed through a RAM.

The intervention was achieved under mild hypothermia (34°C) using femorofemoral cardiopulmonary bypass through a surgical exposure, and myocardial protection was made of antegrade cold blood cardioplegia.

Minimally invasive septal myectomy was performed through a 41 mm RAM in the second intercostal space. The right internal thoracic artery and vein were ligated.

Aortic cross-clamping was performed with a transthoracic cross-clamp inserted through the second intercostal space. An aortic valve retractor has been used to expose the subvalvular membrane (Figure 1) valve distractor (Delacroix Chevalier, Paris, France).

We found a fibrous almost circular subvalvular membrane (Figure 2) with septal hypertrophy and a fibroelastoma tumor on the right leaflet confirmed by anatomopathological analysis.

We first resected the membrane on its $\frac{3}{4}$ circumference, and then we removed right cusp calcification and practiced the septal myectomy through a trans-aortic approach.

Finally, aortotomy was closed using a running suture. CPB times and aortic cross-clamp time were respectively 77 and 64 min.

There were no perioperative complications.

Follow-up

Our patient stayed one day in intensive care hospitalization, and its total hospitalization duration was ten days. TTE at discharge showed no LVOT obstruction but a persistent grade 1 aortic regurgitation without an intraventricular gradient.

Three months control transthoracic echography showed that the membrane was successfully resected, with no evidence of LVOT obstruction and no SAM phenomenon. There was an average ejection fraction, and clinically, no recurrent symptoms were described.

A few months later, we realize the same surgery on a 41-year-old woman with this technique by RAM, complaining about dyspnea and faintness, with similar results.

Preoperative TTE showed subaortic stenosis with a transmembranous peak pressure gradient around 80 mmHg with neo-aortic valve regurgitation but a concentric hypertrophic left ventricle with a conserved ejection fraction. Femoral CPB times and aortic cross-clamp time were respectively 61 and 41 min. In postoperative, the evolution is favorable with TTE control with mean gradient.

Discussion

Benefits of minimally invasive surgery include a decreased atrial fibrillation incidence, less blood transfusion, a shorter duration of mechanical ventilation, and hospital stay [4]. So it seems logical to try to treat the most significant number of patient eligible, and subaortic stenosis seems a good indication by this approach to avoid the full sternotomy.

Indeed, the standard approach is median sternotomy; Khalpey et al. describe a successful surgery with robotic septal myectomy [5].

But there are some limits to the robot, compared to the open technique, with higher cross-clamping time, lower accessibility, and a higher cost [6].

In this hand, the minimally invasive technique appears to be a good alternative. Moreover, as seen in our case, patients are usually young adults, so at risk of further redo cardiac surgery. After RAM, there will be less surgical adherence, permitting a safer future sternotomy. Regarding the age, a smaller scare is another argument without compromising the surgical exposure thanks to an adapted retractor.

For single septal myectomy, Mazine et al. report a mean aortic cross-clamp time of 57 min for mini-thoracotomy vs. 43 min for sternotomy, which is comparable to our average of 53 min [7]. Transaortic septal myectomy is feasible through a RAM, but it's a technical challenge, made easier with our aortic valve retractor. Its strongest advantage is its discretion in the operative field, and it is economical because it is repeatedly sterilizable.

Regular follow up is indicated; the recurrence rate is well known, up to 28% [8]. But the reasons behind the high recurrence rate are not well understood, probably due to abnormal aorto-septal geometry persistence. Currently, there is no medical way to prevent recurrence, which justifies annual transthoracic echography to manage new growth if necessary.

Conclusion

Minimally invasive by right anterior minithoracotomy appears

to be an excellent alternative to sternotomy in surgery of subaortic stenosis, and our valvular retractor is a helpful device for a more comfortable exposition.

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