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Balloon Aortic Valvuloplasty as a Bridge to Planned Surgical Treatment of Lung Adenocarcinoma

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ABSTRACT

Introduction: Balloon aortic valvuloplasty (BAV) can temporarily relieve left ventricular outflow obstruction in selected patients with severe aortic stenosis who require time-sensitive noncardiac treatment. We describe its use in preparation for planned surgical treatment of lung cancer.

Case presentation: In a 66-year-old man, chest CT revealed a peripheral mass in the left upper lung lobe measuring 30 × 33 × 31 mm and extensive aortic valve calcification. Cytology was consistent with adenocarcinoma, and a multidisciplinary team recommended surgical treatment. Transthoracic echocardiography demonstrated severe aortic stenosis (valve area 0.7 cm^2; mean gradient 45 mmHg), prompting postponement of thoracic surgery. Transfemoral BAV was performed using an 18 × 50 mm balloon with rapid ventricular pacing. Follow-up aortography showed no significant aortic regurgitation. Postprocedural echocardiography showed a valve area of 1.2 cm^2 and a mean gradient of 36 mmHg, interpreted in the report as moderate residual stenosis. Digital subtraction angiography demonstrated subtotal occlusion of the right common femoral artery; following CT angiography and conservative vascular management, no progression of ischemia was observed. On follow-up, the oncologic workup was continued.

Conclusion: In this case, BAV achieved short-term hemodynamic improvement and served as an interim step in preparation for reassessing the operability of the lung tumor. The procedure itself carries cardiovascular risks, and the decision regarding thoracic surgery requires renewed multidisciplinary assessment.

Keywords: balloon aortic valvuloplasty; aortic stenosis; lung adenocarcinoma; noncardiac surgery; CT angiography; case report.

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INTRODUCTION

Severe aortic stenosis complicates planning for major noncardiac surgery, particularly when postponement of oncologic treatment may affect prognosis. Surgical or transcatheter aortic valve replacement is the definitive treatment in suitable patients. According to contemporary European guidelines, BAV may be considered in carefully selected cases as a temporary bridge in patients with severe stenosis requiring urgent high-risk noncardiac surgery; the decision should be made by a multidisciplinary team [1]. Its effect is not durable, and the procedure itself may cause vascular and valvular complications [2,3].

Imaging assessment in such cases has a dual role: it delineates the tumor and its relationship to surrounding structures while also demonstrating valve calcification, the condition of arterial access vessels, and potential postprocedural complications. The aim of this case report is to describe the clinical course, imaging findings, performance of BAV, and limitations of conclusions regarding its role as a bridge to planned treatment of pulmonary malignancy.

CASE PRESENTATION

A 66-year-old man with arterial hypertension, dyslipidemia, and a previous transient ischemic attack underwent evaluation of a lesion in the left lung. Contrast-enhanced chest CT demonstrated a peripheral soft-tissue mass in the dorsal portion of the left upper lobe, measuring 30 × 33 × 31 mm. The lesion was in close contact with the oblique interlobar fissure and parietal pleura, with partial extension toward the apical segment of the lower lobe. No enlarged mediastinal or hilar lymph nodes were reported. Extensive calcification of the aortic valve was noted.

CT-guided aspiration of the left lung lesion yielded cytologic findings of malignancy with adenocarcinoma morphology. Following discussion by the thoracic multidisciplinary team, surgical treatment was indicated, preceded by bronchoscopy. Flexible bronchoscopy did not reveal a visible endobronchial tumor.

During cardiologic evaluation, the patient reported fatigue and exertional dyspnea without typical angina. A previous transthoracic echocardiogram demonstrated an aortic valve area of 0.7 cm^2 and a mean transvalvular gradient of 45 mmHg, consistent with severe aortic stenosis. The planned thoracic procedure was therefore postponed. Coronary angiography before BAV showed normal epicardial coronary arteries. On the day of intervention, the patient was hemodynamically stable without signs of heart failure at rest; creatinine was 89 µmol/L and hemoglobin was 141 g/L.

BALLOON AORTIC VALVULOPLASTY TECHNIQUE

BAV was performed via femoral arterial access under continuous hemodynamic and electrocardiographic monitoring. After puncture of the left common femoral artery, a 6 F introducer sheath was inserted. A 6 F sheath was introduced into the left femoral vein, and a temporary pacing lead was positioned in the right ventricle. An IMA catheter was used to establish crossover access for angiographically guided puncture of the right common femoral artery, initially with a 7 F sheath.

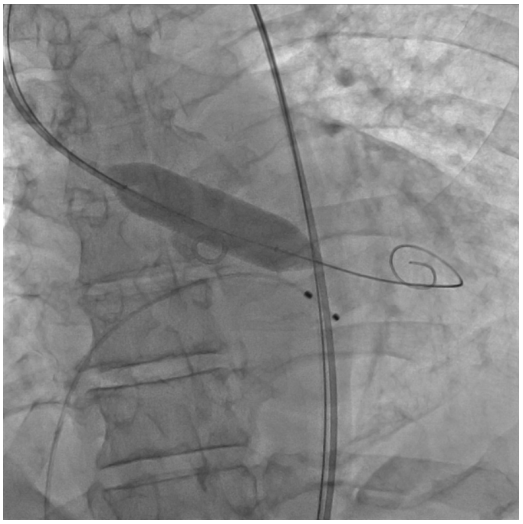
A pigtail catheter introduced through the left femoral artery was positioned in the noncoronary sinus of the aortic root for baseline aortography and angiographic guidance (Fig1.).



Figure 1.

A single suture was predeployed on the right side using the ProGlide percutaneous closure system. Following placement of an 8 F sheath, a long 12 F sheath was advanced over a stiff guidewire. The native aortic valve was crossed with a straight guidewire supported by an AL1 catheter; the wire was then exchanged for a stiff transcatheter aortic intervention guidewire positioned in the left ventricle. The balloon was centered across the calcified valve orifice; rapid ventricular pacing was applied during inflation to reduce systolic ejection and balloon displacement. According to the detailed procedure record, an 18 × 50 mm NuMED balloon was used (Fig: 2a, 2b).

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2a.



2b.

Completion aortography showed no significant new aortic regurgitation. After closure of the right arterial access site with a single ProGlide suture, digital subtraction angiography revealed subtotal occlusion of the right common femoral artery. Attempts to cross the lesion with 0.035-inch and 0.018-inch guidewires supported by a microcatheter were unsuccessful. At that time, the patient had no clinical signs of ischemia; after measurement of activated clotting time, an additional 5,000 IU of unfractionated heparin was administered, and a vascular surgeon was consulted.

Subsequent CT angiography of the abdominal aorta and lower-extremity arteries demonstrated diffuse stenotic and subtotal occlusive arterial disease; the cardiology discharge summary described recanalization of the right common femoral artery lesion. During vascular surveillance, there was no progression of clinical ischemia, and limb coldness and pallor subsided with heparin therapy.

OUTCOME AND FOLLOW-UP

Echocardiography after BAV demonstrated a bicuspid, heavily calcified aortic valve with a raphe between the right and left coronary cusps. The planimetrically estimated valve area was 1.2 cm^2, with a peak gradient of 63 mmHg and a mean gradient of 36 mmHg; the findings were interpreted as moderate aortic stenosis. Aortic regurgitation was not reported, and the left ventricular ejection fraction was 55%. Compared with the previous study, the valve area had increased by 0.5 cm^2 and the mean gradient had decreased by 9 mmHg. At outpatient follow-up, the patient denied chest pain, edema, and orthopnea but reported occasional exertional fatigue. Repeat echocardiography and continuation of evaluation by the oncology multidisciplinary team were recommended.

DISCUSSION

This case illustrates a clinical situation in which two time-sensitive conditions require a coordinated decision: a potentially resectable lung neoplasm and severe calcific aortic stenosis. CT characterized the peripheral pulmonary lesion and simultaneously drew attention to marked aortic valve calcification. Echocardiography confirmed hemodynamically severe stenosis. In this context, BAV was selected as a temporary intervention in preparation for planned thoracic surgery rather than as definitive treatment of valvular disease.

Post-BAV findings demonstrated favorable short-term changes in valve area and gradient without significant aortic regurgitation. Nevertheless, stating that the procedure had “removed an absolute contraindication” would be an overstatement: operability depends on symptoms, ventricular function, the urgency and extent of the planned resection, anesthetic assessment, tumor stage, and other comorbidities. A residual mean gradient of 36 mmHg and a planimetric valve area of 1.2 cm^2 are consistent with moderate stenosis according to the postprocedural report; they do not, in isolation, guarantee a safe operative course. Contemporary guidelines emphasize team-based assessment and consideration of definitive valve intervention in patients who meet the relevant criteria [1,4].

A published small case series of patients with cancer described successful BAV before major noncardiac surgery [2]. By contrast, an observational comparison of patients with severe stenosis before urgent noncardiac surgery found no clear benefit of a routine invasive strategy for the composite outcome at one month, limiting the generalizability of success in an individual case [3].

Subtotal occlusion of the femoral artery is an important component of the outcome, particularly for a radiology readership. The combination of completion angiography and CT angiography enabled assessment of the access site, the extent of atherosclerotic disease, and subsequent vascular management. This complication underscores that BAV, although less extensive than valve replacement, is not risk-free. Access-site selection, peripheral arterial assessment, hemostasis, and monitoring of limb perfusion are integral to procedural planning.

CONCLUSION

In a patient with lung adenocarcinoma and severe aortic stenosis, transfemoral BAV produced documented short-term improvement in echocardiographic parameters, with preserved left ventricular function and no significant aortic regurgitation. The intervention served as a temporary bridge while preparing for reconsideration of planned thoracic surgery. A concomitant femoral arterial complication required angiographic and CT evaluation and vascular monitoring.

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