

# Perkutana balonska aortna valvuloplastika kot možnost paliativnega zdravljenja za inoperabilne bolnike?

## Percutaneous balloon aortic valvuloplasty: palliative treatment for inoperable patients?

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### Izvleček

**Namen:** V razvitih državah se zaradi staranja prebivalstva povečuje število starostnikov s hudo aortno stenozo. Tveganje za zaplete je pri kirurški zamenjavi aortne zaklopke, ki je standarden način zdravljenja, pri tej skupini bolnikov visoko. Za zdravljenje omenjene skupine starostnikov razvijajo perkutane načine zdravljenja, kot sta perkutana balonska aortna valvuloplastika in perkutana vstavitev aortne zaklopke.

**Prikaz primera:** V prispevku je opisan primer 84-letne bolnice z levostransko hemiparezo po možganski kapi in generalizirano aterosklerozo. Sprejeta je bila zaradi pljučnega edema, zdravljenje z neinvazivno ventilacijo in inotropi pa ni bilo uspešno. Perkutana balonska aortna valvuloplastika je bila opravljena 6 ur po sprejemu. Takoj po posegu se je bolnično stanje izboljšalo. Po 25 dneh bol-

### Abstract

**Purpose:** The number of elderly patients with severe aortic stenosis and comorbidities is increasing in the aging populations of “developed” countries. Unacceptably high perioperative mortality and morbidity makes the decision to undertake surgical aortic valve replacement in this group of patients difficult and unlikely. Development of less invasive procedures such as balloon aortic valvuloplasty and transcatheter aortic valve replacement is emerging as another treatment option.

**Case report:** A 84-year-old female with previous left-sided hemiparesis after stroke and severe aortic stenosis presented with pulmonary edema to our institution. Non-invasive ventilation and inotropic support were unsuccessful. Balloon aortic valvuloplasty was done as an emergency procedure and she improved immediately. She

nišničnega zdravljenja smo jo odpustili v domsko varstvo.

**Zaključek:** Perkutana balonska aortna valvuloplastika je dodatna možnost zdravljenja bolnikov z aortno stenozo in visokim tveganjem za zaplete ob kirurškem zdravljenju. Balonska dilatacija aortne zaklopke ima lahko vlogo paliativnega posega ali premostitvenega posega do kirurške ali perkutane zamenjave aortne zaklopke.

was discharged after 25 days of in-hospital treatment. She died 8 weeks later of unrelated reasons (infected decubitus and sepsis).

**Conclusion:** Balloon aortic valvuloplasty might be used as temporary and interim therapeutical options for patients with severe aortic stenosis and acute left ventricular failure who have unacceptably high risks when aortic valve replacement or emergency transcatheter aortic valve implantation is considered. Balloon aortic valvuloplasty may be used as a bridge to both procedures.

## INTRODUCTION

Aortic stenosis (AS) is the most common valvular disease in “developed” countries. Once patients develop symptoms, life expectancy without surgery is <3 years (1, 2). The “gold standard” treatment is surgical aortic valve replacement (AVR). Surgery in elderly, comorbid patients often carries unacceptable risks of surgical morbidity and mortality (2–4). In these patients, transcatheter aortic valve implantation (TAVI) is emerging as another option (5).

We report a case of a 84-year-old female with generalized atherosclerosis and severe AS who presented with acute pulmonary edema. Conservative therapy was unsuccessful. We undertook emergency balloon aortic valvuloplasty (BAV), after which the patient improved and was discharged after 25 days of in-hospital treatment.

## CASE REPORT

An 84-year-old female with known severe AS (transvalvular gradient, 81 mmHg; aortic-valve area, 0.6 cm<sup>2</sup>) was admitted to hospital because of pulmonary edema. She had known three-vessel coronary artery disease, peripheral arterial disease, an abdominal aortic aneurism, and had suffered ischaemic stroke with subsequent left-sided hemiparesis in the week before hospital admission. In the previous year she had been admitted to our institution thrice because of left ventricular failure. She had been referred to a cardiosurgery team in s previous hospitalization but

was classified “inoperable” because of high surgical risk (at that time: Euroscore calculated risk was 15; logistic, 55.45%). BAV was not considered in previous hospitalizations because of appropriate response to medical therapy.

Upon hospital admission she was dyspneic with respiratory rate of 25/min and peripheral oxygen saturation of 92% upon 100% oxygen and non-invasive ventilation. Widespread inspiratory crackles were present over the lungs. Laboratory tests revealed elevated levels of brain natriuretic peptide (1,201 µg/L) as well as mildly elevated creatinine (156 µmol/L) and troponin I levels (0.08 µg/L). These were, in the absence of angina and ischemic changes on electrocardiography, attributed to acute heart failure. Signs of congestive heart failure were also visible on chest radiography. Non-invasive ventilation, which was initiated in the pre-hospital setting, was continued. Inotropic support (dobutamine) was instituted. However, all attempts to stabilize the patient failed. Six hours after hospital admission we undertook emergency rescue BAV.

Both femoral arteries and right femoral vein were cannulated. First, coronary angiography was done and revealed three-vessel disease. We decided against percutaneous revascularization in the acute setting. The aortic valve was crossed with a guidewire and a temporary pacing lead positioned in the right ventricle via the right femoral vein. Three dilations of the aortic valve were undertaken with a 20 × 4 mm balloon under rapid ventricular pacing (200/min). The transvalvular gradient was reduced to 33 mmHg

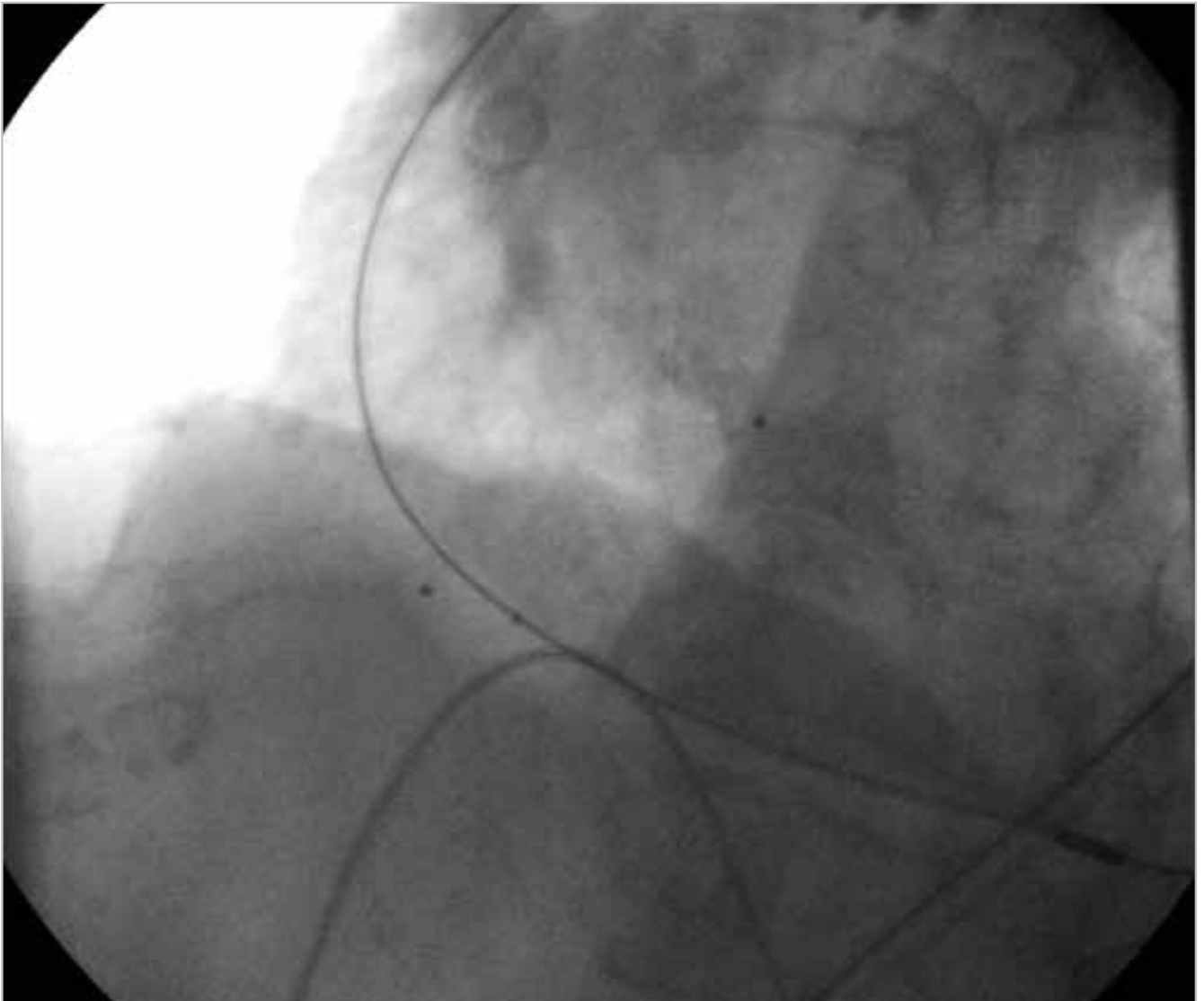
as measured invasively (Figure 1). One hour after the procedure we weaned the patient off non-invasive ventilation; dobutamine was discontinued the next day. She was discharged after 25 days of hospital treatment. TAVI and percutaneous revascularization were being considered as delayed procedures, but she died 8 weeks later of unrelated reasons (infected decubitus and sepsis).

## DISCUSSION

BAV was first described in 1986 (1). In the short-term, good hemodynamic and clinical responses were

observed. A high prevalence of restenosis, high risk of procedural mortality and morbidity, and a poor prevalence of survival have contributed to a decline in the use of BAV. AVR remains to this day the gold-standard treatment of AS (1-3). In some cases, however, AVR is not appropriate for patients who decline surgery or in cases where predicted surgical mortality and morbidity is too high (4).

BAV can be employed as a palliative procedure in elderly, highly comorbid patients (5, 6). However, BAV itself is not without risk. Intra-procedural death can be expected in 2% of patients, stroke in 2-5%;



**Figure 1.** *Dilation of the aortic valve.*

occlusion of coronary arteries in 2%; and procedure-related severe aortic regurgitation, tamponade and need for permanent pacemaker implantation in 1% each. Vascular complications occur in 7–10% of patients (6, 7, 8). The most common complication is post-procedural rise in creatinine levels (10–15%), whereas the requirement for hemodialysis is rare (1%). Serious procedure-related adverse events can be expected in 15–30% of patients (6, 7). In spite of the risk of complications, good short-term hemodynamic responses can be expected, with an increase in aortic valve area (AVA) of  $\approx 0.3 \text{ cm}^2$  and a fall in the mean and peak gradient of  $\approx 30 \text{ mmHg}$ . An increase in cardiac output and decline in pulmonary artery and left-ventricular end-diastolic pressure can also be expected. The prognosis remains poor after BAV alone, with 6-month mortality reaching 50% (6, 7, 8). Risk scores are being developed that identify patients at high risk of BAV-related mortality (9). In our case, concomitant acute heart failure and generalized atherosclerosis (three-vessel coronary artery disease, carotid atherosclerosis, abdominal

aortic aneurism and peripheral arterial disease) made the procedure extremely risky (upon admission: the Euroscore-calculated risk was 17; logistic 71.74%) (5). There were no procedure-related complications. The patient improved immediately after the procedure. Weaning from non-invasive ventilation was possible within 1 h; dobutamine infusion was discontinued the next day. Echocardiography upon hospital discharge revealed AVA  $1.0 \text{ cm}^2$  (improvement of  $0.4 \text{ cm}^2$ ) and a gradient of  $42 \text{ mmHg}$  (improvement of  $50 \text{ mmHg}$ ).

## CONCLUSION

The number of elderly patients with AS will continue to increase in the future. Concomitant cardiac and non-cardiac diseases make AVR inappropriate for some patients because of high surgical risks. Medical therapy is not successful. BAV can be used in these patients as a bridge to AVR or TAVI. In the emergency setting, BAV might also be used as paliative treatment for selected patients.

## REFERENCES

1. Yamen E, Fearon WF. Balloon aortic valvuloplasty: modern indications and techniques for a niche therapy. *Expert Review of Cardiovascular Therapy* 2010; 8(7): 885–7.
2. Maganti K, Rigolin VH, Sarano ME, Bonow RO. Valvular Heart Disease: Diagnosis and Management. *Mayo Clinic Proceedings* 2010; 85(5): 483–500.
3. Ambrozic J, Zorman D, Azman Juvan K, Music S, Kozelj M, Bunc M. Percutaneous balloon aortic valvuloplasty. *Zdrav Vestn* 2010; 79: 48–54.
4. Vahanian A, Otto CM. Risk stratification of patients with aortic stenosis. *Eur Heart J* 2010; 31(4): 416–23.
5. Spaccarotella C, Mongiardo A, Indolfi C. Pathophysiology of aortic stenosis and approach to treatment with percutaneous valve implantation. *Circ J* 2010; 75(1): 11–9.
6. Ben-Dor I, Pichard AD, Satler LF, Goldstein SA, Syed AI, Gaglia MA Jr et al. Complications and outcome of balloon aortic valvuloplasty in high-risk or inoperable patients. *JACC Cardiovasc Interv* 2010; 3(11): 1150–6.
7. NHLBI Balloon Valvuloplasty Registry Participants. Percutaneous balloon aortic valvuloplasty. Acute and 30-day follow-up results in 674 patients from the NHLBI Balloon Valvuloplasty Registry. *Circulation* 1991; 84(6): 2383–97.
8. Kapadia SR, Goel SS, Yuksel U, Agarwal S, Pettersson G, Svensson LG et al. Lessons learned from balloon aortic valvuloplasty experience from the pre-transcatheter aortic valve implantation era. *J Interv Cardiol*. 2010; 23(5): 499–508.
9. Elmariah S, Lubitz SA, Shah AM, Miller MA, Kaplish D, Kothari S et al. A novel clinical prediction rule for 30-day mortality following balloon aortic valvuloplasty: the CRRAC the AVscore. *Catheter Cardiovasc Interv* 2011; 78(1): 112–8.