Acta Clin Croat (Suppl. 1) 2024; 63:111-115
doi: 10.20471/acc.2024.63.s1.21

Case Report

TAVI PATIENT WITH RCA DISSECTION, POST-TAVR HIGH DEGREE AV BLOCK AND ACUTE NEUROLOGICAL INJURY

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ABSTRACT – TAVI (Transcatheter Aortic Valve Implantation) is a minimally invasive procedure for the treatment of severe aortic stenosis (AS) in elderly and comorbid patients. Following the guidelines of eminent cardiac societies, a decision on the treatment modality is made by the so-called "heart team". Despite being less invasive, the procedure is related to some complications, among which the most common ones are stroke, life-threatening bleeding, vascular injury, kidney injury, conduction disturbances demanding permanent pacemaker (PPM) implantation, and perivalvular leak (PVL). Here we present a case report of multiple periprocedural complications in the same patient, related to TAVI, such as right coronary artery (RCA) dissection on preoperative coronary angiography (CA), postprocedural acute neurologic injury and high grade atrioventricular (AV) block followed by PPM implantation.

Key words: *TAVI, heart team, pacemaker implantation, paravalvular leak, coronary artery dissection, high grade AV block.*

Introduction

TAVI has given a great impulse to less invasive percutaneous interventions for structural heart disease. TAVI technology has seen an impressive uptake, evolving from a challenging intervention to a standardized procedure. Since the first case was performed in humans in 2002, the procedure has undergone rapid development, becoming a reasonable alternative to conventional surgical treatment in elderly patients at increased surgical risk. Since its inception, more than 250,000 TAVI procedures have been performed worldwide, of which 70,000 were performed last year.

Case report

A 71-years old male, with symptomatic sever AS (PPG 93 mmHg, MPG 58 mmHg, AVA 0.7 cm2), and concomitant comorbidities (arterial hypertension, paroxysmal atrial fibrillation, 50% stenoses of both internal carotid arteries), is accepted for TAVI on heart team discussion. CA, which excluded coronary artery disease (CAD), was performed 2 months before TAVI, but also was complicated with RCA dissection (Figure 1). Complication was solved with percutaneous coronary intervention (PCI) and implantation of 3 drug eluting stents (Supraflex Star 3.0x28 mm, 3.0x24 mm, 3.0x16 mm – SMT) (Figure 2). The patient was discharged with dual antithrombotic ther-

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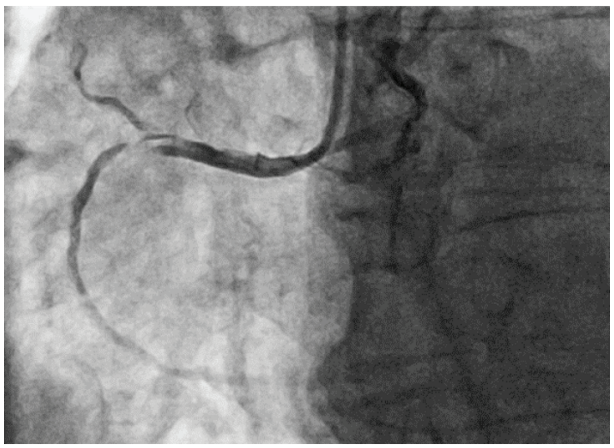

Figure 1. Iatrogenic RCA dissection

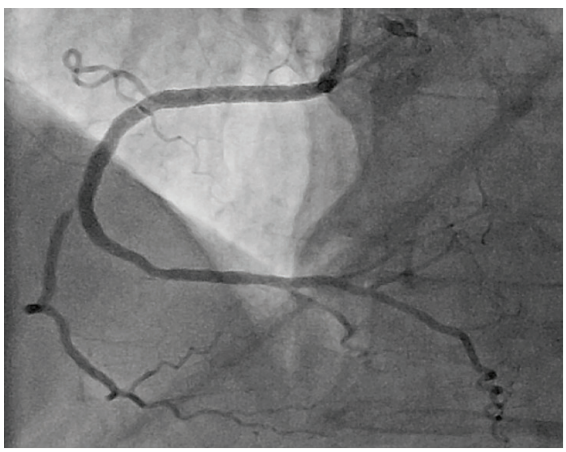

Figure 2. PCI RCA with implantation of 3 DES (Supraflex Star 3.0x28 mm, 3.0x24 mm, 3.0x16 mm – SMT)

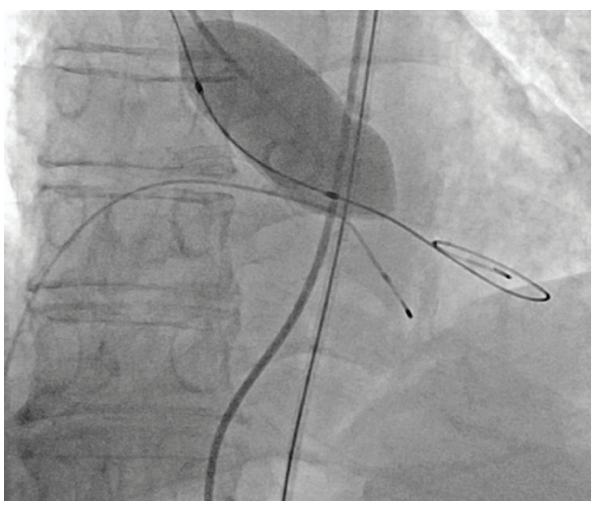

Figure 3. Balloon aortic valvuloplasty (BAV) (Atlas 28 mm – Bard Medical)

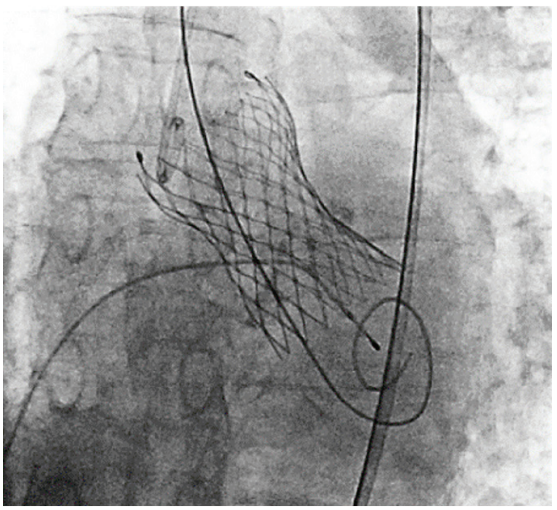

Figure 4. Full-expanded SE valve (Evolute R 34 mm – Medtronic)

Figure 5. Femoral puncture site closed with Manta 18 F Closure device (Teleflex)

Yellow arrow pointing at Manta's plug

apy (DAT) consisting of rivaroxaban 15 mg once daily (OD) and clopidogrel 75 mg OD. TAVI was performed in the second act in general anaesthesia, through right femoral access (20F Sentrant introducer sheath – Medtronic), with balloon pre-dilatation (Atlas 28 mm – Bard medical) (Figure 3) over stiff guide-wire (Confida Brecker-Medtronic), followed by implantation of self-expandable valve (Evolute R 34 mm – Medtronic). Residual PVL demanded balloon post-dilatation with an extra 2 ml of volume and the

final angiographic result was optimal (Figure 4). Puncture site was closed with 18F vascular closure device (Manta – Teleflex) (Figure 5). After valve deployment, an intermittent 3rd degree AV block was observed, and temporary pacemaker electrode was left inside. There was no discontinuation of DAT.

After the procedure, the patient was hemodynamically stable and admitted to Intensive Care Unit for further observation. In the early recovery period (inside 24h hours), the patient become disoriented and uncooperative, but without a clear neurologic deficit. Blood pressure (invasively measured) was normal and non-divergent without inotropic support. Monitoring showed normal sinus rhythm with intermittent conduction disturbances presenting as high degree AV block with pauses up to 8 seconds. Brain computerized tomography (CT) scan was performed, and there were no pathological findings. Symptomatic treatment was continued without discontinuation of DAT. Clinical condition was figured as acute neurocognitive dysfunction, very likely connected to conduction disturbances.

Disturbances sustained longer than 24h hours and dual chamber PPM was implanted (Sensia SEDR01 – Medtronic). Day after, ventricular electrode dysfunction was established (Treshold > 5V@0.4 ms) and urgent repositioning was made.

During further hospital care, neurocognitive dysfunction recovered well and control brain CT was not performed. Echocardiography (ECHO) showed optimal post-TAVI measurements (peak pressure gradient 7.0 mmHg) with a minimal PVL and preserved systolic function (Ejection fraction- EF 55%). The patient was discharged home at 12th postoperative day.

Discussion

According to the European Society of Cardiology (ESC) guidelines, TAVI, as less invasive procedure, is recommended in older patients (>75 years) or in those who are at high risk (STS/EuroSCORE II >8%) or unsuitable for surgery (IA). The „heart team" should make a choice weighing the risks and benefits of each approach for an individual patient (IC). In this case, the patient had a moderate risk for surgery (EuroSCORE II 5.71%, STS 5.0%), and a decision was made after taking into account the patient's preferences and values, which are clearly marked in the American College of Cardiology/American Heart Association (AHA/ACC), but not in the ESC guidelines.

Preoperative CA, which in this case resulted with complication, is not mandatory according to some publications. Also, routine CA is performed in all patients planned for severe AS treatment in our centre, so RCA dissection (most probably related to deep intubation of diagnostic catheter), cannot be strictly related to the TAVI procedure. Few meta-analyses point out that the pre-existing CAD had no impact on mortality.[1 2 3]. Patients with symptomatic (CCS II/III) CAD and AS had no difference in cumulative risk of death or re-hospitalization in 1-year post TAVI period[4]. In case of established obstructive CAD, PCI before TAVI is reserved for proximal lesions and multivessel disease with severe coronary stenosis (>75%, or left main coronary artery >50%)[5].

After PCI, dual antithrombotic therapy with direct oral anticoagulant (DOAC) (rivaroxaban 15 mg OD) and P2Y12 inhibitor (clopidogrel 75 mg OD) was continued during 6 months, and afterwards DOAC monotherapy with rivaroxaban 20 mg OD. There was no periprocedural discontinuation during TAVI procedure, as pointed in some publications[12] .

Balloon pre-dilatation (BAV) is marked as the dominant cause of acute neurological injury, but in this case, it was partial and combined with conduction disturbances. According to recent publications, BAV does not improve the rate of device success at 30-day follow-up in both self-expandable (SE) and balloon-expandable (BE) valves. Also, it has no benefit on early all-cause mortality and appearance of 30-day moderate/severe aortic regurgitation (AR), stroke, PPM implantation and acute kidney injury[9].

Routine use of cerebral protection devices (CEPD) also has no significant result in reducing the risk of stroke within 72 hours[7]. Otherwise, some authors observed worsening of neurocognitive function ranged in patients with no CEPD. [8]

Because of anatomical proximity between the aortic ring and conduction pathway, conduction disturbances have close connection with aortic valve calcifications[6]. In patients with AS, the prevalence of ventricular conduction abnormalities increases with AS severity, with a reported frequency of left bundle branch block (LBBB) in 2.1%, 4.6% and 8.1% of patients with mild, moderate and severe AS. In the PARTNER 1 and CoreValve US Pivotal trials that enrolled patients with high or prohibitive surgical risk, the prevalence of pre-existing PPM was 21% to 22%. The requirement for PPM was lower (6%) with the BE and substantial-

ly higher (25–28%) with the SE valves. Recent publications are pointing to the tendency toward equalization in PPM requirement in SE and BE valves, which is explained as technological improvement[10].

In this case, Evolute R 34 mm SE valve was used according to electrocardiography (ECG) gated CT measurements. 26% oversize was optimal according to the manufacturer's recommendations. There were no predictors (RBBB, LVOT calcifications and diameter) to possible conduction disturbances, and considering that coronary arteries are free of atherosclerosis and we did not expect further interventions (including RCA with the optimal stents apposition), we presumed the choice of SE valve reasonable. Otherwise some experts observed that 34 mm Evolute valve may increase the overall oversize rate within the native aortic annulus and the left ventricle output tract (LVOT) because it has a wider range of the annular diameter applicability. Excessive valve oversize may eventually increase the possibility of AV node trauma and raise requirement of PPM in patients with smaller LVOT diameters[11].

Conclusion

This case represents three complications associated with TAVI (preoperative RCA dissection, acute neurologic injury and conduction disturbances requiring PPM implantation). RCA dissection could be avoided if CA was not performed in (for coronary disease) asymptomatic patient, or if less invasive imaging was done (CT coronary angiography). Acute neurologic injury is a statistically inevitable complication, but less likely to happen without BAV, which is also not preferred in recent publications. Conduction disturbances are also statistically inevitable, and PPM implantation after TAVI will always be required in some cases. Depending on the type and size of a valve, we can be more precise in screening those patients.

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Sažetak

TAVI BOLESNIK SA DISEKCIJOM RCA, POST-TAVI AV BLOKOM VISOKOG STUPNJA I AKUTNOM NEUROLOŠKOM OZLJEDOM

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TAVI (transkateterska implantacija aortalne valvule) manje je invazivna metoda liječenja teške aortalne stenoze u komorbiditetnih bolesnika starije životne dobi. Prema važećim preporukama vodećih društava definitivnu odluku oko modaliteta liječenja donosi kardiokirurški konzilij. Premda manje invazivna, procedura ima određeni stupanj komplikacija od kojih su najčešće moždani udar, po život opasno krvarenje, vaskularna ozljeda, bubrežno oštećenje, poremećaji kondukcije koji zahtijevaju implantaciju trajnog elektrostimulatora srca, te paravalvularna insuficijencija. Ovdje prikazujemo slučaj bolesnika sa višestrukim periproceduralnim komplikacijama TAVI zahvata u vidu preoprativne disekcije desne koronarne arterije na dijagnostičkoj koronarografiji, postproceduralnom akutnom neurološkom ozljedom i poremećajem kondukcije u vidu atrioventrikularnog bloka visokog stupnja, što je zahtjevalo implantaciju trajnog elektrostimulatora srca.

Ključne riječi: *TAVI, kardiokirurški konzilij, implantacija elektrostimulatora srca, paravalvularna insuficijencija, disekcija koronarne arterije, AV blok visokog stupnja*