Chapter 18: Post-procedure management: complications; anticoagulation, standard pathways, discharge instructions and follow-up

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Anticoagulation

Anti-platelet therapy consisting of lifelong aspirin at a dose of 75-100 mg and six months of clopidogrel at a dose of 75 mg is recommended after TAVR based on the 2017 AHA/ACC Valve Guidelines (Class IIb, LOE C)[1]. These recommendations were unchanged from the 2014 AHA/ACC Valve Guidelines. Updated for 2017, ACC guidelines now recommend anticoagulation with a VKA (vitamin K antagonist) to achieve an INR of 2.5 for at least 3 months after TAVR for patients at low risk of bleeding due to growing concerns over valve leaflet thrombosis (Class IIb, LOE B). However, no formal guidelines are provided regarding the optimal anticoagulation strategy for patients who are already on full anticoagulation for atrial fibrillation or another indication. In many institutions, however, patients who are already on a VKA will be continued on aspirin plus a VKA after TAVR, but the management of patients who are already on pre-existing novel oral anticoagulants is an area of ongoing investigation.

Fortunately, multiple randomized trials are currently underway to study optimal anticoagulation after TAVR and will likely provide further clarity on the subject over the next several years that will influence future valve guidelines and recommendations.

The ARTE trial evaluated aspirin monotherapy versus aspirin plus clopidogrel for patients undergoing TAVR[2]. The duration of clopidogrel was 3 months and a loading dose of 300mg was used followed by 75mg. Clopidogrel was started within 24 hours preoperatively for cases that were intended as transfemoral and within 24 hours postoperatively for transapical cases. The trial showed an increased risk of major bleeding events with dual antiplatelet therapy (10.8% vs. 3.6% in the single antiplatelet therapy group, $p = 0.038$) with no difference in rates of death, myocardial infarction, or stroke/TIA. However, a possible limitation of this trial is that the endpoints were measured at three months which may be too short a timeframe to see an effect of reduced anticoagulation on issues such as leaflet thrombosis.

The POPular-TAVI trial is investigating whether the addition of clopidogrel to either aspirin or VKA is beneficial[3]. The trial will have two cohorts: Cohort A will randomize patients to either aspirin or aspirin plus clopidogrel and Cohort B will randomize patients to VKA or VKA plus clopidogrel. The final data collection date for the primary outcome measure will occur in August 2018.

There is also increasing interest in the use of oral direct thrombin inhibitors after TAVR. One study investigating patients with atrial fibrillation after TAVR showed a lower risk of stroke with apixaban at 3 months although results at one year were similar[4].

The GALILEO study is an ongoing trial to assess use of rivaroxaban and aspirin versus clopidogrel and aspirin[5]. Patients in the experimental arm will receive rivaroxaban plus aspirin for 90days

followed by rivaroxaban alone. In the control arm, patients receive clopidogrel plus ASA for 90days followed by ASA alone. In case new-onset atrial fibrillation occurs after randomization, full oral anticoagulation will be implemented with maintenance of the original treatment assignment.

The AVATAR study (Anticoagulation Alone Versus Anticoagulation and Aspirin Following Transcatheter Aortic Valve Interventions) will examine patients already on VKA prior to TAVR and randomize them to either receive VKA alone or VKA plus aspirin after TAVR[6].

The ADAPT-TAVR (Anticoagulant Versus Dual Antiplatelet Therapy for Preventing Leaflet Thrombosis and Cerebral Embolization After Transcatheter Aortic Valve Replacement) trial will examine the effects of Edoxaban versus DAPT on the occurrence of leaflet thrombosis and cerebral emboli using MRI[7].

The ATLANTIS trial (Anti-Thrombotic Strategy After Trans-Aortic Valve Implantation for Aortic Stenosis) will compare Apixaban to VKA in patients who have an indication for VKA and it will also compare Apixaban to DAPT for patients who do not have an indication for VKA[8].

There have been some retrospective studies analyzing optimal anticoagulation management after TAVR. One meta-analysis of four studies comparing aspirin monotherapy to dual antiplatelet therapy found no benefit to dual therapy with an increased trend towards bleeding complications[9]. In another study, authors found that if patients are already receiving a VKA for other indications then this anticoagulation regimen should be sufficient without the addition of antiplatelet agents[10].

To further complicate the issue of anticoagulation after TAVR, there have recently been reports of subclinical thrombosis of biological valve leaflets[11-13]. This subclinical thrombosis has been reported in both SAVR and TAVR valves and the clinical meaning of how this observation should influence anticoagulation decisions has not yet been studied, but is an area of active investigation. Current, limited data suggest that subclinical leaflet thrombosis appears less frequently in patients on VKA and that when leaflet thrombosis does appear it can be resolved by a VKA in up to 88% of patients[14].

Pacemakers

The need for permanent pacemaker (PPM) is one of the most discussed complications of TAVR that influences post-operative care. Depending on the publication, valve type, and generation of valve, the risk of PPM after TAVR has ranged from the lower single digits to almost one third of patients[15-17]. Rates of PPM implantation have been noted to be higher for self-expanding compared to balloon-expandable valves. A variety of other factors has been associated with need for PPM with the most commonly associated variables being: larger valve size, pre-existing conduction abnormalities such as bundle branch block, and deeper implantation into the left ventricle[18-21]. Left bundle branch block is the most common conduction abnormality after TAVR. While there is some limited evidence that conduction abnormalities may improve with time, this issue often conflicts with the expected short length of stay for TAVR[22]. Most patients at our center will receive a PPM within a few days of demonstrating a clinical need. According to the 2013 European Society of Cardiology guidelines: “For high degree or complete AV block after cardiac surgery and TAVI, a period of clinical observation up to 7 days is indicated in order to assess

whether the rhythm disturbance is transient and resolves. However, in case of complete AV block with low rate of escape rhythm, this observation period can be shortened since resolution is unlikely."[23] These recommendations concur with the 2012 ACCF/AHA/HRS Guidelines for device-based therapy of cardiac rhythm abnormalities; however these guidelines do not specifically address rhythm abnormalities after TAVR[24].

While some studies have found no connection between PPM implantation and survival, there is now a growing body of literature demonstrating an association between the need for PPM and decreased long term survival[25, 26]. Besides the type of valve selected, another physician-controlled variable affecting the need for PPM is the depth of implantation[27]. One study looking at the Sapien S3 showed that decreasing the depth of implantation in the left ventricle significantly reduced the need for PPM from 25.9% to 12.3%[28].

Follow-up

According to the 2012 Expert Consensus Guidelines on TAVR, follow-up care after TAVR should consist of clinical evaluation, echocardiography and ECG at 30 days, six months (without echo), 1 year and annually thereafter[29]. Some hypothesize that with increasing experience, long-term follow-up may eventually be spaced to every 3 years.

Discharge Instructions

Patients are instructed on maintenance of a heart-healthy low-fat, low-salt diet with any additional necessary restrictions as dictated by comorbid conditions (diabetes, renal failure etc). In general, patients are restarted on the majority of their pre-operative medications, with adjustments in beta blockade and diuretics dictated by their clinical status. The minority of patients who are on opioid pain medications after discharge should be instructed to avoid driving while on these medications. Any surgical wounds or incision sites should be kept clean and dry without bandages. Patients are instructed to seek immediate medical care for chest pain, shortness of breath, severe persistent abdominal pain, nausea, vomiting, fever, and for redness, swelling, or drainage from the wound. At our institution, patients are scheduled for follow-up with any of their heart-team physicians within the first few days after discharge and then per the follow-up schedule listed above.

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