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ANESTHESIOLOGY CHALLENGES DURING TAVI PROCEDURE

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Abstract

Transfemoral transcatheter aortic valve implantation (TAVI) is nowadays a routine procedure for elderly patients with severe aortic stenosis and high perioperative risk. With growing experience, further device development, and the expansion of "intermediate risk" patients, there is increasing interest in performing this procedure under conscious sedation (TAVI-S) instead of the previously favored general anesthesia approach (TAVI-GA). The benefits of TAVI-S include reduced procedure time, shorter length of stay in the intensive care unit (ICU), reduced need for intraprocedural vasopressor support, and the potential to perform the procedure without the direct presence of an anesthesiologist for cost savings. To date, there are no data from randomized trials. Only non-randomized studies were reviewed. Patients' selection, study methods and endpoints varied significantly between published studies. Factors related to the procedure, including hypotension, may add to existing age-specific renal impairment, and increase the risk of acute kidney injury. Hypotonia of the hypopharyngeal muscles in elderly patients, intraprocedural hypercarbia and certain anesthetic drugs may increase the risk of aspiration in sedated patients. General anesthesia and conscious sedation have been successfully used to treat patients with severe AS undergoing TAVI with similar reported short-term and long-term mortality outcomes. It is believed that the significant incidence of complications and unplanned conversion to general anesthesia during TAVI-S mandates the presence from start to finish of an experienced cardiologist and anesthesiologist in order to optimize patients' outcomes. Good quality randomized data are needed to determine the optimal anesthetic regimen for patients undergoing TAVI.

Key words: *Anesthesia, aortic stenosis, transfemoral transcatheter aortic valve implantation.*

Introduction

Aortic stenosis, a progressive narrowing of the aortic valve, is one of the most common valve problems in developed countries. In developing countries, the main cause is attributed to rheumatic heart disease. It can be asymptomatic for a long time, and it is present in 25% of adults over the age of 61.
Transfemoral aortic valve implantation (TAVI) and balloon aortic valvuloplasty (BAV) are less invasive techniques for the treatment of severe aortic stenosis with long-term and short-term benefits respectively.

The first BAV was produced in 1983. Unfortunately, registries have shown high rates of restenosis. In 2002, at the University of Rouen in France, Dr. Alain Cribier performed the first case of percutaneous aortic valve replacement on a 57-years-old patient with inoperable aortic stenosis.
Patients are selected for TAVI based on clinical judgment and risk assessed by a multidisciplinary team of cardiologists, cardiothoracic surgeons and anesthesiologists. Statements by the European Association for Cardiothoracic Surgery (EACTS) and the European Society of Cardiology (ESC) currently limit TAVI to high-risk patients or those with contraindications to surgery.
European Society of Anesthesiology (ESA) and ESC guidelines state that TAVI can be considered in patients with severe aortic stenosis, unsuitable for open surgery, but requiring an emergency life-sustaining valve.

Material and Method

As person ages, calcium can build up on the valve, making it harder and thicker. As a result, the aortic valve cannot open properly, forcing the heart to work harder to pump blood through the narrowed valve. This is a condition called aortic stenosis. The gold standard in the diagnosis of aortic stenosis, as well as all valvular heart diseases, is echocardiography, i.e. ultrasound of the heart. Modern echocardiographic devices allow excellent visualization of the heart, its cavities and valves provide the opportunity for dynamic measurements and assessment of the parameters that indicate the degree of valvular dysfunction. Aortic stenosis can lead to shortness of breath, chest pain, fatigue and dizziness. Aortic stenosis is a disease that gradually develops over a long period of time, progressing from mild to severe form. It often does not give warning symptoms and is therefore more difficult to diagnose. Aortic stenosis is often detected during a routine examination when a murmur is heard on auscultation. Usually, this noise appears long before other symptoms appear. Aortic stenosis can cause electrocardiogram (ECG) changes as well as low blood pressure. Due to the gradual development and compensatory ability of the heart, patients with aortic stenosis are usually asymptomatic for a long period, while the appearance of symptoms usually reflects an advanced stage of the disease. The causes of this disease can be rheumatic fever, calcific degeneration and bicuspid valve. About 45 TAVI procedures have been performed at the University Clinic of Cardiology in the last two years, and it can boast of a small number of complications and good outcome for patients who were followed up in the intensive care unit.

Results

Although there are no randomized data on this type of procedure, the European PARTNER trial in 2011/12 showed that TAVI is at least as good as SAVR (surgical aortic valve replacement) for high-risk patients, perhaps better, and should be the standard for care of an inoperable patient. Over the last few years, trans-thoracic catheter techniques have emerged as the primary treatment options for aortic stenosis for the inoperable and high-risk patient. Over 200,000 aortic implants

have been performed worldwide with good results compared to SAVR. Procedural results report success rates of 98%, with a 30-day mortality of less than 5%. Improvement in symptoms and reduction in hospitalization also occur in the immediate future.

Discussion

TAVI is aortic valve implantation without removal of the diseased valve, performed under local anesthesia and general anesthesia. The TAVI approach is X-ray guided and provides full expansion of the replacement valve to the valve site via a catheter. After the new valve expands, it pushes the old valve leaflets out of the way, and the tissue in the replacement valve takes over the valve's normal function. All this is performed under conscious sedation and local anesthesia. TAVI is usually completed within 1 to 2 hours. The groin and wrist will be cleaned with an antiseptic solution, and then the patient will be covered with a large sterile compress. The groin (and sometimes the wrist) will be completely numb from the local anesthetic and may sting for about 30 seconds. Pressure may be felt, but no pain should be felt during the procedure. If at any time the patient feels pain or discomfort, the doctor should be notified, and more local anesthetic or pain relief may be given. At least three small hollow tubes (introducers) will be inserted into the groin vein and arteries, and sometimes into the wrist artery. These are places for access to the valve and for catheters (thin flexible long tubes) that are used to take pictures or make aortograms and measure the pressure of the heart.
In preparation for the new valve, balloon aortic valvuloplasty (BAV) may be performed to stretch and widen the aortic valve and make room for the new one. The heart will be stimulated to beat very fast during each balloon inflation with the help of the pacing cable, i.e. with a temporary pacemaker (PPM) which will be previously inserted through the groin, i.e. through the v.femoralis. Pressure measurements with the new valve operating will be recorded. Another BAV can be performed to ensure that the new valve is seated properly and there are no leaks. Final x-rays and safety checks will be done before the catheters and sheaths are removed. At this stage, the sedation will begin to wear off and the patient will feel more alert.

Conclusion

Nowadays, the most preferred treatment is the minimally invasive approach, which is the TAVI procedure. The length of time, the advancement of technology, as well as the recovery in intensive care makes this procedure advisable in the elderly population. Clinical and echocardiographic follow-up of the valves over 5 years would be well documented. Only time will tell if the valve's durability matches that of surgical prostheses. This is especially important if TAVI is offered to younger patients' groups in the future. Transthoracic aortic valve implantation is now a well-established technique for the treatment of aortic stenosis in high-risk patients. Experiences in TAVI and valve technology are advancing rapidly.
When it comes to general anesthesia and conscious sedation, they are successfully used to treat patients with severe aortic stenosis undergoing TAVI. However, the anesthetic regimen itself remains only one part of a complex procedure for complex patients and the lack of randomized

data to guide practice has resulted in wide variation in the management of patients undergoing TAVI. Experienced high-volume TAVI centers continue to report very positive outcomes for patients treated with both sedation and general anesthesia. Complications and unplanned conversion to general anesthesia during TAVI, mandate the presence from start to finish of the procedure with an experienced anesthesiologist and cardiologist in order to optimize patients' outcomes.

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