Anesthetic Management for Transcatheter Aortic Valve Implantation

Essay

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Anesthesiology

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Abstract

Background: Aortic valve diseases are the most common debilitating valvular heart lesions in adults. Surgical aortic valve replacement is the treatment of choice for the vast majority of patients, but up to 30–40% of the patients are considered as having too high risk for surgery and, hence, remain unreferred and untreated. Prognosis with medical management is poor, and effects of percutaneous balloon aortic valvuloplasty are modest and short lived.

Aims: The aim of this work is to focus the light on the anesthetic techniques used for Transcatheter Aortic Valve Implantation, to illustrate some of the surgical approaches and techniques that are commonly used, and to discuss the choice of general anesthesia versus conscious sedation, also to discuss the role of transesophageal echocardiography during the procedure.

Conclusion: The main issue regarding anesthetic management during TAVI is hemodynamic stability. Anesthesiologists should provide less-invasive anesthesia/analgesia without compromising the safety or comfort of the patient. Local anesthesia plus sedation is a reliable alternative to general anesthesia. Goals of hemodynamic management are those typical of aortic stenosis.

TEE has an important role during TAVI procedure , which includes assessment of the anatomy of the aortic annulus and ascending aorta, sizing the aortic annulus, and identification of the intracardiac catheters, the valvuloplasty balloon, the valve, and the catheter tip. Also post deployment, TEE helps in detection of aortic valve regurgitation, valve embolization, valve malposition and mitral valve regurgitation.

Keywords: Anesthetic Managemen, Transcatheter Aortic, approaches and techniques

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Contents

- List of Abbreviations
- List of figures
- List of tables
- Introduction (1)
- Aim of the work (3)
- Chapter 1: Anatomy of the Aortic valve. (4)
- Chapter 2: Pathophysiology of Aortic Valve diseases. (16)
- Chapter 3: Different Approaches and Techniques of TAVI (28)
- Chapter 4: Anesthetic Management of TAVI. (58)
- Chapter 5: Role Of Transesophageal Echocardiography 'TEE' during the procedure. (78)
- English Summary (88)
- References. (91)
- Arabic Summary.

List of Abbreviations

ACT : Activated Clotting Time.
ALCAPA : Anomalous Left Coronary Artery from The Pulmonary Artery.
AR : Aortic Regurgitation.
AS : Aortic Stenosis.
AVN : Atrioventricular node.
AVR : Aortic Valve Replacement.
BAV : Balloon Aortic Valvuplasty.
CAD : Coronary Artery Disease.
CHF : Congestive Heart Failure.
COP : Cardiac Output.
CPB : Cardioulmonary Bypass.
CTA : Computed Tomography Angiography.
EACTS : European Association for Cardiothoracic Surgery.
ESC : European Society of Cardiology.
EUROSCORE : European System for Cardiac Operative Risk Evaluation.
GA : General anesthesia.

List of Abbreviations (Cont.)

LV	:	Left Ventricle.
LVH	:	Left Ventricular Hypertrophy.
LVOT	:	Left Ventricular Outflow Tract
MAC	:	Monitored Anesthesia Care.
MAP	:	Mean Arterial Pressure.
MDCT	:	Multidetector Computed Tomography Angiogram.
MR	:	Mitral Regurgitation.
PVR	:	Paravalvular Regurgitation.
RHD	:	Rheumatic Heart Disease.
RVP	:	Rapid Ventricular Pacing.
SOV	:	Sinuses Of Valsalva.
STJ	:	Sinotubular Junction.
STS	:	The Sosciety of Thoracic Surgeons.
Tao-TAVI	:	Transaortic-TAVI.
TA-TAVI	:	Transapical-TAVI.
TAVI	:	Transcatheter Aortic Valve Implantation.
Tax-TAVI	:	Transaxillary-TAVI.
TEE	:	TransEsophageal Echocardiography.
TF-TAVI	:	Transfemoral-TAVI.
THV	:	Transcatheter Heart Valve.
VHD	:	Valvular Heart Disease.

List of Tables

Table	*Title*	*Page*
1	Balloon expandable transcatheter heart valves.	30
2	Complications associated with balloon expandable TAVI	35

List of Figures

Fig.	*Title*	*Page*
1	Anatomic relationship of the cardiac valves	4
2	Sinotubular junction	5
3	Coronary sinuses	5
4	Aortic valve leaflet	7
5	Histologic structure of the valve leaflet	8
6	Valve leaflet structure	9
7	Interleaflet triangles	11
8	Types of the bicuspid aortic valve	12
9	Coronary arteries with aberrant origins	14
10	Natural history in untreated severe AS	20
11	Aortic va;ve vegetations with leaflet prolapsed	25
12	Edward Balloon expandable valve	31
13	Edward transfemoral sheath	31
14	Deployment of Sapien valve via transfemoral approach	34
15	Corevalve prosthesis and delivery catheter	37
16	MDCT of the aortic root	39
17	MDCT detection of the aortic root angulation	40
18	Iliofemoral artery evaluation	41
19	The deployment projection	43
20	Adjustments in the corevalve position	44
21	corevalve deployment process	45
22	Postdeployment aortography	45
23	Mechanism of paravalvular regurgitation	46
24	CT arteriogram reconstruction showing porcelaine aorta	47
25	The apex of the heart fluoroscopically	48
26	Placement of retractors	49
27	Placement of purse string stitches	49
28	Placement of valve sheath through the apical string	50
29	Flouroscopic imaging of a pigtail in aortic annulus	50

30	Flouroscopic imaging of valve being deployed	51
31	The purse string sutures have been tied	51
32	Drains placement	52
33	Approaches of Tao-TAVI	53
34	Minimum aortic puncture to annulus	54
35	Optimal implant angle	55
36	Stiff wire used for implant	56
37	TEE view of an implanted corevalve prosthesis	62
38	TEE view of a calcific aortic valve	63
39	TEE prope inserted through a face mask	64
40	Modified Wilson sedation score	67
41	TEE image of right coronary ostia	79
42	TEE view showing calcific unicuspid aortic valve	80
43	TEE long axis view of the aorta	81
44	Valve positioning under TEE guidance	82
45	TEE imaging during balloon valvuloplasty	83
46	TEE view of an implanted Sapien XT valve	83
47	TEE view of an implanted corevalve prosthesis	84
48	TEE view showing alignment of the ventricular edge of the valve	84
49	TEE view showing paravalvular regurgitation	85
50	Severe mitral regurgitation	86

Introduction

Aortic valve diseases are the most common debilitating valvular heart lesions in adults. Surgical aortic valve replacement is the treatment of choice for the vast majority of patients, but up to 30–40% of the patients are considered as having too high risk for surgery and, hence, remain unreferred and untreated.

Prognosis with medical management is poor, and effects of percutaneous balloon aortic valvuloplasty are modest and short lived.

The catheter procedure was developed in France, initially performed in 2002 on April 16 by Prof Alain Cribier at Charles Nicolle Hospital, at the University of Rouen. It is now approved in more than 50 countries. It is effective in improving function in the patients with severe aortic stenosis. In the US, it received FDA approval in November 2011 for use in inoperable patients and in October 2012 for use in patients at high surgical risk **(Cribier, 2014).**

Transcatheter aortic valve implantation (TAVI), a minimally invasive transcatheter technique, has been recently developed. The rationale is that of minimizing the overall surgical trauma by avoiding sternotomy, aortotomy, use of cardiopulmonary bypass (CPB) and by implanting the prosthesis on the beating heart, thereby avoiding cardiac arrest in order to improve postoperative patient outcome (**Leon *et al,* 2010).**

TAVI has become a rapidly evolving technique with a potential to create a paradigm shift similar to the introduction of percutaneous transluminal coronary angioplasty in the early 1980s. Nevertheless, according to the European Society of

Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS) position statement, TAVI should be restricted only to high-risk patients or those with contraindications for surgery.

Specific perioperative management issues should be considered for the safe implementation into routine clinical practice, and by using different approaches, transapical, transfemoral or transaxillary.
Many studies conducted to compare the benefits and risks of each approach (**Taramasso et al, 2011).**

We will discuss the usefulness of TEE as the primary imaging technique to guide transcatheter transapical aortic valve implantation (**Bagur *et al, 2011*).**

General anesthesia (GA) and monitored anesthesia care (MAC) can both be used in transfemoral TAVI, depending on the individual patient and procedural details. Adequate airway evaluation and experienced anesthesiologists are also needed **(Park et al, 2014).**

Aim of the Work

The aim of this work is to focus the light on the anesthetic techniques used for Transcatheter Aortic Valve Implantation, to illustrate some of the surgical approaches and techniques that are commonly used, and to discuss the choice of general anesthesia versus conscious sedation, also to discuss the role of transesophageal echocardiography during the procedure.

Chapter One
Anatomy of the Aortic Valve

The aortic valve is the most centrally located cardiac valve, sitting just posterior and medial to the pulmonary valve and anterior to the tricuspid and mitral valves (Fig. 1).

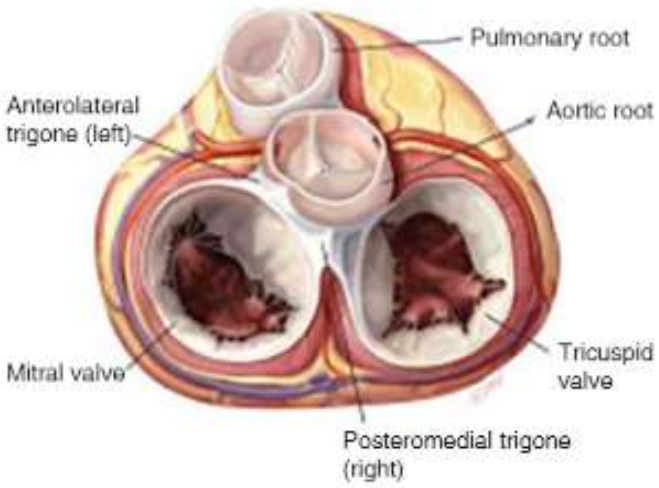

Fig. (1). Anatomic relationship of the cardiac valves. ***(Crawford and Roldan, 2001).***

Aortic valve structure and function is intimately related to the surrounding aortic root —a structure that extends from basal attachments of the aortic valve leaflets in the LV to the superior attachment at the Sino tubular junction (STJ).

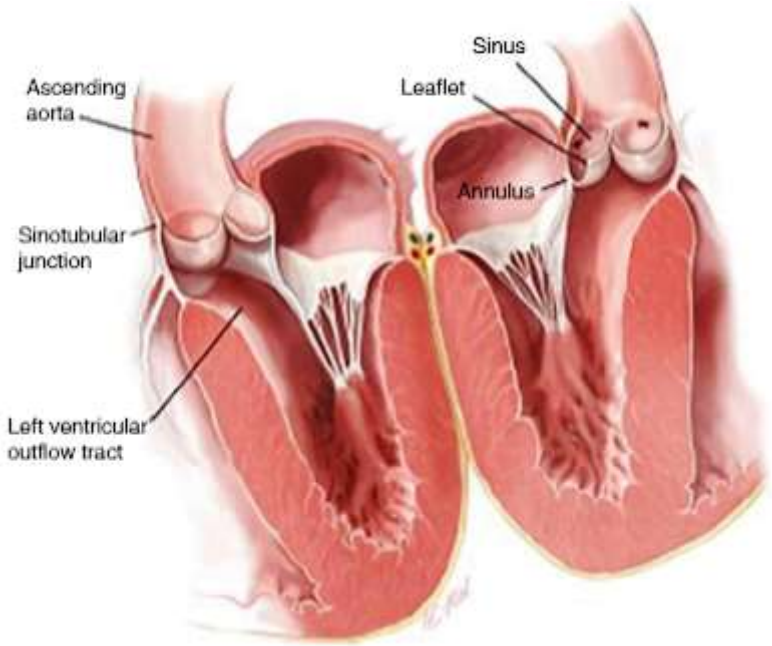

Fig. (2). Sinotubular junction. ***(Crawford and Roldan, 2001).***

Two thirds of the aortic root is attached to the muscular ventricular septum, while one third is attached to the fibrous aorto-mitral continuity and fibrous trigons. Important structures contained within the aortic root include the sinuses of Valsalva, the coronary ostia, the aortic valve leaflets, and the interleaflet triangles.