Volume 2 Issue 1, 2024

NEWSLETTER

Pakistan Association of Cardiothoracic Anaesthesiologists

VIGILANCE ENSURE SAFETY

Inside This Issue:

EDITORIAL

Assalam Alaikum,

Alhamdulillah, By the grace of Allah almighty, we are launching the Second edition of the Newsletter under the banner of the Pakistan Society of Anesthesiologists (PACTA).

Last year was the busiest year for PACTA office bearers and the cardiac anesthesia community.

After the annual conference, a transesophageal symposium and point-of-care workshops were held at Quetta and Peshawar, organized by the PACTA, and participated by the local anesthesia community. Weekly lectures on different cardiothoracic anaesthesia topics are also a constant feature which Dr. Amin Khawaja coordinates. We are also working on the PACTA website, which will be launched very soon.

The theme of this Newsletter is Valvular heart disease and its management. I am grateful to all those who contributed including the writers, reviewers, and editors.

Please provide your feedback and let me know if any changes are needed to improve the quality of this Newsletter.

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Anaesthesia Concerns of Aortic Stenosis for Aortic Valve Replacement

Introduction:

Left ventricular (LV) outflow obstruction due to severe aortic stenosis results in diastolic LV dysfunction with reduced cardiac output and stroke volume, concentric hypertrophy, and LV pressure overload. Preoperative assessments should cover the etiology, pathophysiology, stages of aortic stenosis severity, and indications for aortic valve replacement (AVR) either surgical aortic valve replacement (SAVR) or transcatheter aortic valve implantation (TAVI).

The stage of the disease determines when an intervention should be performed, and it considers both the existence and absence of symptoms as well as the severity as shown by echocardiogram. Patients who are symptomatic should have surgery due to the significant risk of sudden death and short life expectancy. Severe AS patients who don't exhibit any symptoms could be constantly watched and the risk of surgery should be carefully evaluated against the risk of waiting.

Patients with severe AS, surgical aortic valve replacement (SAVR) is the recommended course of treatment; nevertheless, there is a significant risk of serious morbidity or death associated with this procedure for certain patients. Transcatheter aortic valve implantation (TAVI) is an alternative in patients who require AVR but do not qualify for SAVR. TAVI is a less invasive alternative that is performed without cardiopulmonary bypass (CPB), in which a bioprosthetic valve is implanted within the native aortic valve via a catheter introduced through a major artery or the apex.

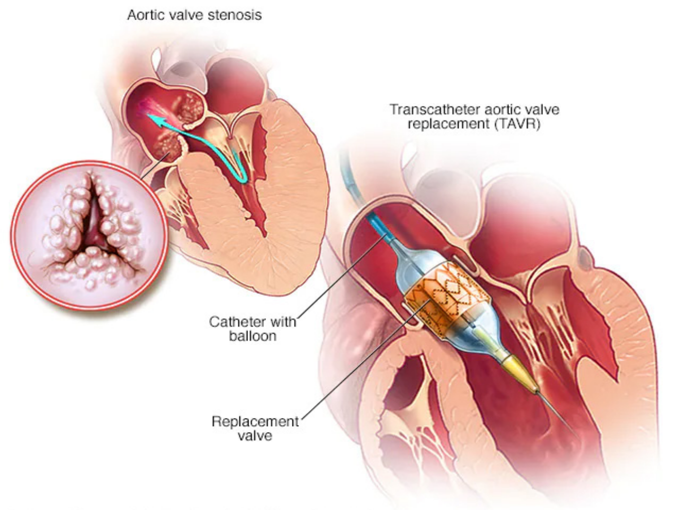
Preoperative considerations

The severity of AS, the existence of concomitant aortic regurgitation (AR), additional cardiac valve pathology, dysfunction of the left and right ventricles, and coexisting coronary artery disease are all carefully considered during the preanesthetic consultation and review of the findings of cardiac diagnostic studies. Perioperative morbidity and mortality are more likely in patients with AS who have a high pulmonary-systemic ratio. Appropriate premedication in individuals in stable condition may lessen the risk of tachycardia, excessive preoperative excitation, and worsening of cardiac ischemia and the transvalvular pressure gradient. Patients who exhibit instability (such as severe aortic stenosis or congestive heart failure) should not be put under anesthesia before they are able to be observed by a caregiver for anesthesia until they go to a preanesthetic holding area.

Small incremental doses of short-acting medications, such as intravenous benzodiazepines (midazolam, 0.5 to 1 mg) and/or opioids (fentanyl, 25 to 50 mcg), may be given in the immediate preoperative period while the patient is under the anesthesiologist's continuous care to help reduce stress. Giving more oxygen as a precaution in these patients may eliminate the chance of a similarly severe reaction to the sedative effects.

Anesthetic technique

Ample peripheral IV access should be ensured to quickly provide drugs and large amounts of fluid when needed. ASA standard monitoring, arterial catheter, and central venous catheter are routinely used during the procedure with the addition of cerebral oximetry and Bispectral index monitoring depends on availability and institutional practice. A Swan Ganz catheter might also be needed depending on the patient's clinical condition. Medications that are commonly used to induce anesthesia, such as etomidate, propofol, ketamine, narcotics like fentanyl, morphine with paralyzing agents, and readily available inhalational agents, can all be used as long as they are carefully titrated to maintain hemodynamic stability and a fine line that exists between a reasonable depth of anesthesia and hemodynamic stability. For any unwanted or rapid decline in cardiovascular function call for the emergency use of CPB, a skilled cardiac surgeon should be present, and perfusionists should be ready prior to inducing anesthesia. In order to facilitate quick defibrillation in the event of a cardiovascular collapse during induction or before sternotomy, external defibrillator pads should be placed beforehand. Transesophageal echocardiography (TEE) is helpful for intraoperative LV function, preload, and afterload monitoring. The LV outflow tract width can be used by TEE to predict the size of a prosthetic aortic valve. To facilitate deairing before weaning off CPB, it is also very helpful in detecting air. For the post-bypass evaluation of a prosthetic valve for paravalvular regurgitation and prosthetic valve stenosis, TEE is the recommended technique.



Pre bypass hemodynamic management

Anaesthesia aims to control heart rate around 60-80 beat/min with sinus rhythm and avoid any arrhythmia which lead to hemodynamic compromise. Managed tachycardia related to hypotension with a vasoconstrictor (e.g., phenylephrine, norepinephrine) and fluid administration. Slow HR with beta blockers if necessary. Administer a vasoconstrictor (e.g., phenylephrine, norepinephrine) to manage hypotension and maintain systemic vascular resistance (SVR). Maintain intravascular status and contractility. Other routine management should follow as per routine for any CPB procedure like blood coagulation, temperature, and fluid management. Ensuring adequate myocardial preservation with cardioplegic solution during bypass surgery can be difficult when myocardial hypertrophy is present. Myocardial integrity can be preserved by combining antegrade cardioplegia delivered via coronary Ostia with retrograde cardioplegia delivered via the coronary sinus.

Post-bypass hemodynamic management

Pulmonary artery pressures are largely normal, except for end-stage AS. It is not required to use special intervention to stabilize pulmonary vascular resistance. Because valve replacement reduces ventricular afterload, inotropic support is frequently not necessarily following CPB in the absence of preoperative ventricular dysfunction and associated coronary disease. PCWP and LVEDP promptly drop and stroke volume increases following a steep decline in the aortic valve gradient. Although the hypertrophied ventricle may still need an elevated preload to function normally, cardiac function quickly improves. Over a few months, there will be regression of LV hypertrophy. One must keep in mind that an elevated mean pressure gradient (i.e., approximately 7 to 19 mm Hg) may result from an appropriately sized and functionally prosthetic aortic valve.

References

1. Weiss N, Applegate RL. Hensley's Practical Approach to Cardiothoracic Anesthesia. Anesthesia & Analgesia. 2019;129(3):e101.
2. Beyersdorf F, et al. Corrigendum to: 2021 ESC/EACTS Guidelines for the management of valvular heart disease: Developed by the Task Force for the management of valvular heart disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS) [Eur J Cardiothorac Surg 2021; https://doi.org/10.1093/ejcts/ezab389]. European Journal of Cardio-Thoracic Surgery. 2022;62(1):ezac209.1.

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Assessment of Aortic Stenosis through Transesophageal echocardiography

Assessment of Aortic Valve through Transesophageal echocardiography (TEE) is pivotal for any cardiac anesthetist as it provides noticeably clear views of the Aortic Valve in different angles.
These are the most common specific TEE views to visualize the aortic valve:

1. **Mid-esophageal long-axis view:** This view provides a longitudinal section of the left ventricular outflow tract (LVOT) and the aortic valve to assess the morphology and function of the aortic valve. It is used for assessing the Aortic Valve Annulus and quantification of the AR.

2.**Mid-esophageal short-axis view:** This view allows for a cross-sectional image of the aortic valve. It helps in assessing the valve's structure, mobility, and any signs of stenosis and regurgitation. Planimetric area measurement is done on this view.

3.**Transgastric views (5 Chamber and Long Axis):** These views involve angulating the probe to obtain views from the stomach while withdrawing it slowly. Trans-gastric views can provide an opportunity to measure the gradients in the LVOT and across the Aortic Valve to apply continuity equation.

4.**Upper-esophageal Long Axis View:** Assessment of Root and STJ and Ascending Aorta.

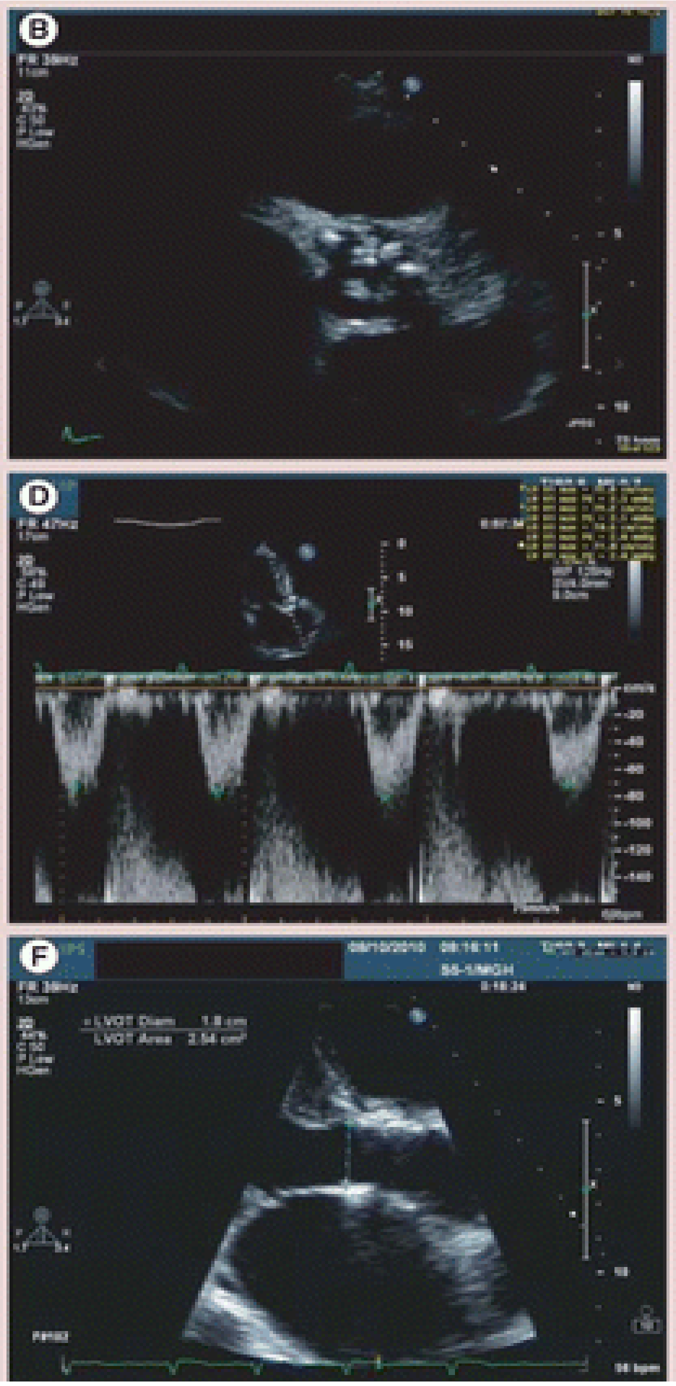
5.**Descending Aorta View**

Criterion of Diagnosing Aortic Stenosis:
In terms of criteria for diagnosing aortic stenosis using TEE, the key parameters to assess include:

1. **Aortic Valve morphology:** The TEE allows for a detailed examination of the aortic valve leaflets. Thickening, calcification, and restricted mobility of the leaflets are characteristic of aortic stenosis.
2. **Aortic Valve area (AVA) - Effective Orifice Area (EOA):** A reduced aortic valve area is indicative of aortic stenosis. AVA is <1.0 cm2 and measured by VTI method (continuity equation), planimetry and by Vmax method.
3. **Jet velocity:** Increased blood flow velocity across the aortic valve, measured by Doppler echocardiography, is another indicator of aortic stenosis.
4. **DVI:** Dimensionless index is the ratio of LVOT velocity over Aortic Valve velocity.
5. **Max and Mean PG:** Measurement of Max and Mean PG is done in the Trans gastric views (Mean PG >40mmHg is Severe AS).
6. **Effective Orifice Area Indexed:** EOA Indexed is less than <0.60 is considered Severe Aortic Stenosis.

7. TEE can assess for any obstruction in the left ventricular outflow tract, contributing to aortic stenosis.
8. TEE is also used to identify associated features like LVH, LVEF, LA size, Presence of MR, TR, and measurement of Pul Artery Pressure. The presence of any of these findings defines the stage of Aortic Stenosis. Stage 3 and 4 are high risk for intervention.
9. TEE is also used to assist in the Trans-catheter Aortic Valve replacements. The principles and views remain the same.

TEE is also used post-operatively to assess valve function and heart function in general. It is important to note that the diagnosis of aortic stenosis is typically based on a combination of clinical findings, echocardiographic assessments, and other relevant tests. The specific criteria may vary based on the guidelines and practices of different medical institutions.



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Anatomy and Pathophysiology of Mitral Regurgitation

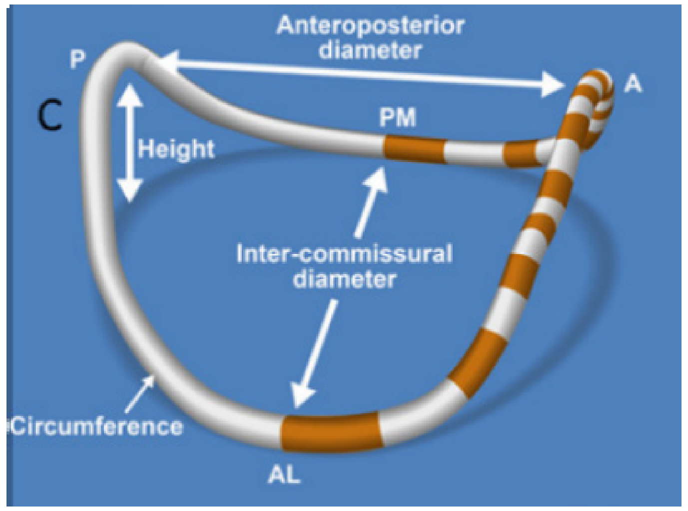
Anatomy of Mitral Valve
The mitral valve is situated between the heart's left atrium and left ventricle.

Leaflets: The mitral valve consists of two leaflets or cusps.
Anterior Leaflet (also known as the aortic Leaflet): This Leaflet is larger and faces the aorta. Posterior Leaflet (also known as the mural Leaflet): This Leaflet faces the posterior wall of the left **ventricle.**

Chordae Tendineae: Tough, fibrous cords connect the free edges of the mitral valve leaflets to the papillary muscles within the left ventricle.

Papillary Muscles: Small, muscular projections from the inner surface of the left ventricle. The chordae tendineae connect the papillary muscles to the mitral valve leaflets, preventing the valve from prolapsing into the left atrium during systole.

Annulus: The mitral valve is surrounded by a fibrous ring called the mitral annulus, providing structural support. It is dynamic throughout the cardiac cycle. It is non-planar and shaped like a saddle. The anterior portion of the mitral annulus is continuous with the aortic annulus and constitutes the most atrial part of the saddle shape. The posterior part of the mitral annulus includes the lowest points of the saddle close to the lateral and medial commissures. Compared with the anterior portion, the posterior mitral annulus is not anchored firmly to the neighboring tissue, allowing more free movement during myocardial contraction and relaxation.

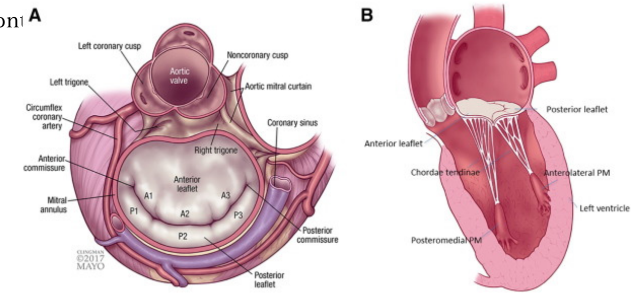


Function:
The primary function of the mitral valve is to ensure the unidirectional flow of oxygenated blood from the left atrium to the left ventricle during diastole (when the heart is relaxed) and to prevent the backflow of blood from the left ventricle to the left atrium during systole (when the heart contracts).

Blood Flow through the Mitral Valve:
During diastole, the mitral valve opens to allow blood from the left atrium to fill the left ventricle. During systole, the mitral valve closes to prevent the backflow of blood into the left atrium as the left ventricle contracts and pumps blood into the aorta.

Mitral regurgitation
Mitral regurgitation (MR) is a heart valve disorder characterized by the retrograde flow of blood from the left ventricle into the left atrium during systole. This condition can arise from various valvular and functional abnormalities affecting the mitral valve or its surrounding structures.

Causes
Valvular causes include mitral valve prolapse, where the leaflets bulge back into the left atrium during systole, mitral valve degeneration involving age-related changes or diseases affecting the valve structure, and rheumatic heart disease, an inflammatory condition resulting from untreated streptococcal infections that can cause damage to the mitral
Valve. Functional causes encompass left ventricular dysfunction, which can occur due to conditions like myocardial infarction or dilated cardiomyopathy, leading to the dilation of the left ventricle and preventing proper closure of the mitral valve. Annular dilatation, involving enlargement of the mitral valve annulus, also con



Pathophysiology of MR The pathophysiological mechanisms of MR involve volume overload on the left atrium and pulmonary circulation during systole. The regurgitant flow causes an increase in left atrial pressure, potentially leading to left atrial dilation. This elevated pressure is transmitted backwards to the pulmonary circulation, resulting in increased volume and pressure, possibly leading to pulmonary congestion and hypertension. Chronic mitral regurgitation can also induce left ventricular remodeling, causing structural and functional changes such as dilation and hypertrophy. Understanding these mechanisms is crucial for diagnosing and managing mitral regurgitation effectively, with interventions

Reference:
1.Clemence Antoine, et al. ADVANCES IN CARDIOVASCULAR IMAGING: Pathophysiology of Degenerative Mitral Regurgitation New 3-Dimensional Imaging Insights Circulation: Cardiovascular Imaging Volume 11, Issue 1, January 2018 https://doi.org/10.1161/CIRCIMAGING.116.005971

2.Yan Topilsky, Mitral Regurgitation: Anatomy, Physiology, and Pathophysiology—Lessons Learned From Surgery and Cardiac Imaging Frontiers in Cardiovascular Medicine, 29 May 2020 Sec. Structural Interventional Cardiology Volume 7 - 2020 https://doi.org/10.3389/fcvm.2020.00084:

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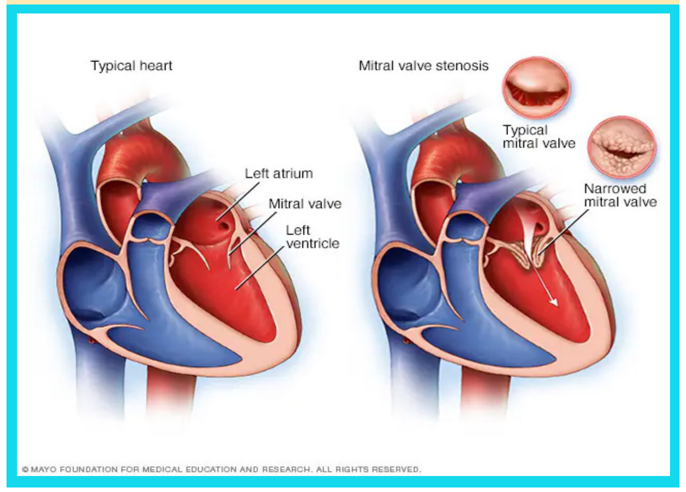
MITRAL STENOSIS: Understanding Anatomy, Pathophysiology, and Diagnosis

Mitral stenosis (MS) is a valvular heart disorder in which there is narrowing of mitral valve resulting in restriction of blood flow between left atrium and left ventricle. This causes increased pressure in the left atrium and potential backup of blood into lungs. In the following words, we will discuss the anatomy of mitral valve, pathophysiology of mitral stenosis and its diagnosis.

Anatomy of the Mitral Valve:

The mitral valve is situated between the left atrium and the left ventricle. It consists of two triangular-shaped cusps: the anterior and posterior cusps. These cusps are anchored by fibrous chordae tendineae to the small cone shaped papillary muscles within the left ventricle. These papillary muscles contract during ventricular systole and pull the chordate tendineae, preventing mitral valve cusps being forced into atrium. During diastole the mitral valve opens allowing blood from the left atrium to flow into the left ventricle. Subsequently, during systole the mitral valve closes tightly to prevent backflow into the atrium.



Pathophysiology of Mitral Stenosis:

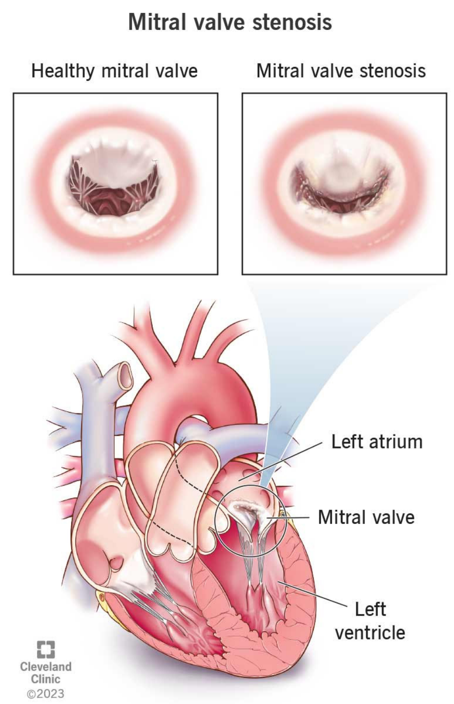
Rheumatic fever is the main cause of Mitral Stenosis. The pathophysiological process unfolds as follows:

Inflammatory Response: Rheumatic fever triggers an immune response in the body, leading to inflammation of the mitral valve. This inflammation damages the valve leaflets, resulting in scarring and fibrosis.

Valvular Thickening and Constriction: The scarring and fibrosis cause the leaflets to become thickened and less pliable, which narrows the valve orifice.

Impaired Blood Flow: As the stenosis progresses, blood flow from the left atrium to the left ventricle becomes compromised. The narrowed orifice obstructs the flow of blood, increasing the left atrial pressure.

Hemodynamic Consequences: The elevated pressure in the left atrium can lead to dilation and hypertrophy of the left atrium. This can subsequently result in pulmonary congestion and an increase in pulmonary artery pressure, potentially leading to pulmonary hypertension.



Diagnosis of Mitral Stenosis:

Key diagnostic methods include:

Clinical Evaluation: Symptoms of mitral stenosis include fatigue, shortness of breath and chest discomfort. On auscultation, characteristic heart sounds like an opening snap and a low-pitched diastolic rumble, may be present.

Echocardiography: Transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) provide detailed images of the mitral valve and its function. TTE helps evaluate the severity of stenosis, while TEE offers higher-resolution images of the valve's structure.

Electrocardiogram (ECG): Atrial fibrillation is commonly associated with MS.

Cardiac Catheterization: It can be used to measure pressures in the heart chamber and assess severity of MS.

Imaging Studies: Chest X-rays and magnetic resonance imaging (MRI) can provide additional insights into cardiac structure and the extent of pulmonary congestion.

Reference:

1. Sanchez Vaca F, Bordoni B. Anatomy, Thorax, Mitral Valve. 2022 Jul 25. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 31751074.
2. Shah SN, Sharma S. Mitral Stenosis. 2022 Aug 8. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 28613493.
3. Al-Taweel A, Almahmoud MF, Khairandish Y, Ahmad M. Degenerative mitral valve stenosis: Diagnosis and management. Echocardiography. 2019 Oct;36(10):1901-1909. doi: 10.1111/echo.14495. Epub 2019 Oct 6. PMID: 31587368.

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TAVI: Overcoming the Challenges of Aortic Valve Disease in Third-World Countries

Transcatheter aortic valve implantation (TAVI), also known as transcatheter aortic valve replacement (TAVR), is a minimally invasive procedure that has revolutionized the treatment of aortic valve disease. TAVI offers an alternative to traditional open-heart surgery, particularly for patients with aortic stenosis.

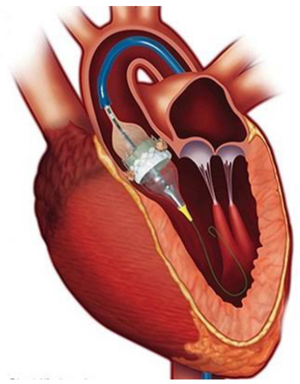
What is TAVI?

TAVI is a procedure that replaces a malfunctioning aortic valve without the need for open-heart surgery. The aortic valve is responsible for regulating blood flow from the heart to the aorta. Over time, the aortic valve can become narrowed or calcified, a condition known as aortic stenosis. This can restrict blood flow and cause symptoms such as chest pain, shortness of breath, and fatigue.

TAVI involves inserting a new valve through a catheter, typically via the femoral artery in the thigh or a small incision in the chest. The new valve is then deployed within the diseased aortic valve, effectively restoring proper blood flow.

When is TAVI Done?

TAVI is primarily indicated for patients with severe aortic stenosis who are not suitable for open-heart surgery. This may be due to the patient's age, overall health, or previous surgeries. TAVI is also increasingly being used for younger patients who are at substantial risk of complications from open-heart surgery.



Main Complications of TAVI

TAVI is a safe and effective procedure, but it is not without risks. Some of the potential complications of TAVI include:

1. Vascular complications: Damage to blood vessels during catheter insertion can lead to bleeding or vascular injury.
2. Paravalvular leak: The new valve may not fit perfectly, leading to a leak around the edges. This can affect its efficiency.
3. Stroke: Tiny debris or blood clots may dislodge during the procedure and cause a stroke if they block a cerebral artery.
4. Valve dysfunction: Over time, the newly implanted valve may develop issues, such as narrowing or leaking, requiring further intervention.
5. Infection: In rare cases, infection can occur at the site of catheter insertion.

Challenges in TAVI in Third-World Countries like Pakistan

TAVI has gained widespread acceptance in developed countries, but it faces several challenges when applied in third-world countries like Pakistan. These challenges include,

1. Limited access: Access to TAVI centers with the required infrastructure and expertise is restricted in many developing nations. In Pakistan, for instance, access to advanced medical facilities is concentrated in urban areas, leaving rural populations at a disadvantage.
2. High cost: TAVI is an expensive procedure, and the cost of the bioprosthetic valve and the equipment required for the surgery can be prohibitive for many patients in third-world countries.
3. Medical expertise: TAVI demands a high level of technical expertise and specialized training for medical professionals. The shortage of skilled healthcare personnel is a significant challenge in countries like Pakistan.
4. Infrastructure: Adequate healthcare infrastructure, including state-of-the-art catheterization labs and post-operative care facilities, is often lacking in developing nations.
5. Insurance and reimbursement: In many third-world countries, there is limited insurance coverage or government reimbursement for TAVI procedures, making it financially unattainable for most patients.

Conclusion

TAVI has emerged as a revolutionary solution for aortic valve disease, offering hope to patients who are not ideal candidates for open-heart surgery. However, its adoption and accessibility remain challenging in third-world countries like Pakistan, primarily due to financial constraints, limited expertise, and inadequate healthcare infrastructure. Bridging these gaps is crucial to ensuring that this life-saving procedure reaches those in need across the globe.

Reference:

1) Clayton B, Morgan-Hughes G, Roobottom C. Transcatheter aortic valve insertion (TAVI): a review. Br J Radiol. 2014 Jan; 87(1033):20130595. doi: 10.1259/bjr.20130595. Epub 2013 Nov 20. PMID: 24258463; PMCID: PMC3898978.
2) Swift SL, Puehler T, Misso K, Lang SH, Forbes C, Kleijnen J, Danner M, Kuhn C, Haneya A, Seoudy H, Cremer J, Frey N, Lutter G, Wolff R, Scheibler F, Wehkamp K, Frank D. Transcatheter aortic valve implantation versus surgical aortic valve replacement in patients with severe aortic stenosis: a systematic review and meta-analysis. BMJ Open. 2021 Dec 6; 11(12):e054222. do: 10.1136/bmjopen-2021-054222. PMID: 34873012; PMCID: PMC8650468.

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OBITUARY Dr. Kashif Anwar: 1967 – 2024

Inna lillahi wa Inna Ilayhi Raji'un: Verily we belong to Allah, and truly to him shall we return.

It is unfortunate to announce the demise of Dr. Kashif Anwar, who underwent Coronary artery bypass surgery in Peshawar but had a very turbulent postoperative course. He was re-operated and put on ECMO support but passed away after five days on ECMO on 5th February 2024.

It was shocking news for us as we met him in December last year at a symposium where he conducted a workshop on central line placement and its care. I can recall his remarkable ability to lead with both confidence and humility. His leadership style was not about authority, but about guiding juniors, helping them grow.

Dr. Kashif is a graduate of Khyber Medical college, Peshawar and achieved his specialization from Royal college of Anesthetists Ireland in 2006. He served in Dublin from 1994 – 2012, after that he returned to Peshawar, where he worked in different hospitals, including Rehman Medical Institute. His last appointment was Head of the department of Anesthesiology at Peshawar Institute of Cardiology. He was one of the pioneers of cardiac anesthesia in KPK. His colleagues considered him a very passionate and competent person who is always willing to teach his juniors.

He was a very active member of the anesthesia community. He participated in several PSA conferences. He was elected as President Pakistan Society of Anesthesiologists KPK chapter in 2021. He has the honor of executive member of PSA Centre as well. His contribution to cardiac anesthesia services and teaching will be remembered.

May Allah SWT grant him the highest place in Jannatul Firdous and give strength and solace to the family and friends in this time of mourning. AAmeen."

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Photo Gallery
(PACTA Academic Activities)

Transesophageal Echocardiography Hand on workshop at Army Medical Centre Lahore July, 2023

**Point of Care Ultrasound & Transesophageal Echocardiography workshop August 2023 in Quetta.
Aria Institute of Medical Sciences & Postgraduate Medical Institute Quetta.**

Courtesy By
Teleflex

Photo Gallery (PACTA Academic Activities)

Point of Care Ultrasound & Transesophageal Echocardiography workshop December 2023 at Peshawar Institute of Cardiology and Rehman Medical Institute.

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Photo Gallery (PACTA Academic Activities)

Hands on Transesophgeal Echocardiography workshop 23rd December 2023 at Aga Khan University Hospital Karachi

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Please send your comments and feedback to the editor's desk
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