

Advancements in Surgical Interventions for Obstructive Cardiomyopathy

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DESCRIPTION

Obstructive cardiomyopathy is a complex cardiac condition characterized by the obstruction of blood flow out of the heart due to structural abnormalities, often leading to significant morbidity and mortality. Over the years, surgical interventions have played a pivotal role in managing obstructive cardiomyopathy, aiming to alleviate symptoms, improve cardiac function, and enhance the quality of life for affected individuals. This article explains the various surgical approaches and advancements in the management of obstructive cardiomyopathy, focusing on their efficacy, outcomes, and evolving techniques. Before delving into surgical interventions, it's crucial to understand the pathophysiology of obstructive cardiomyopathy. This condition primarily involves Hypertrophic Cardiomyopathy (HCM) and acquired conditions such as aortic stenosis and hypertensive heart disease. In HCM, the hypertrophied myocardium, particularly in the Left Ventricular Outflow Tract (LVOT), obstructs blood flow during systole, leading to symptoms like dyspnea, chest pain, and syncope.

Traditional pharmacological and lifestyle interventions may not suffice in severe cases, necessitating surgical approaches for effective management. Septal myectomy, also known as surgical septal reduction therapy, remains the gold standard surgical intervention for obstructive HCM. This procedure involves the surgical removal of a portion of the hypertrophied septum, thereby relieving LVOT obstruction and improving Left Ventricular Ejection Fraction (LVEF).

Advanced imaging techniques such as Intraoperative Transesophageal Echocardiography (TEE) aid surgeons in precise septal assessment and resection. Studies have demonstrated significant symptomatic relief, reduction in LVOT gradient, and improved exercise capacity following septal myectomy. In cases where mitral valve abnormalities contribute to LVOT obstruction, concurrent mitral valve repair or replacement may be necessary. Mitral valve repair techniques, including chordal shortening, leaflet plication, and annuloplasty, aim to correct mitral valve malpositioning and reduce Systolic Anterior Motion (SAM), consequently relieving LVOT obstruction. Minimally invasive approaches, such as robotic-assisted surgery, offer reduced surgical

trauma and faster recovery compared to traditional sternotomy. Alcohol septal ablation is a catheter-based intervention alternative to septal myectomy, particularly suitable for patients deemed high risk for surgery or those unwilling to undergo open-heart procedures. During ASA, ethanol is injected into the septal perforator artery supplying the hypertrophied septum, inducing localized myocardial necrosis and subsequent septal thinning. While ASA may offer symptomatic improvement and LVOT gradient reduction, long-term outcomes regarding survival and durability remain debated, and careful patient selection is crucial.

Emerging transcatheter mitral valve interventions, including Transcatheter Mitral Valve Repair (TMVR) and Transcatheter Mitral Valve Replacement (TMVR), hold promise in managing obstructive cardiomyopathy associated with mitral valve pathology. TMVR procedures involve the implantation of a prosthetic valve within the native mitral annulus, addressing both mitral regurgitation and LVOT obstruction. While still investigational, early clinical trials demonstrate feasibility and potential efficacy in selected patient cohorts.

Advancements and innovations

Imaging modalities: Advancements in cardiac imaging modalities, such as three-dimensional echocardiography, cardiac Magnetic Resonance Imaging (MRI), and Computed Tomography (CT) angiography, facilitate comprehensive preoperative planning, intraoperative guidance, and postoperative assessment of surgical outcomes. High-resolution imaging enables precise anatomical delineation, assessment of myocardial fibrosis, and identification of potential complications, enhancing procedural safety and efficacy.

Robotic and minimally invasive techniques

Robotic-assisted and minimally invasive surgical techniques continue to evolve, offering reduced surgical trauma, shorter hospital stays, and faster recovery compared to conventional open-heart surgery. Robot-assisted septal myectomy and mitral valve repair provide enhanced precision, dexterity, and visualization, minimizing operative morbidity and optimizing patient outcomes. Moreover, these approaches appeal to younger

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patients seeking cosmetically favorable surgical options and quicker return to normal activities.

Risk stratification and patient selection

Advancements in risk stratification algorithms and patient selection criteria enable tailored treatment strategies, optimizing outcomes and minimizing procedural risks. Multimodal assessment incorporating clinical, imaging, and genetic parameters aids in identifying high-risk patients who may benefit from early surgical intervention or alternative therapies. Personalized management algorithms consider individual patient characteristics, disease severity, comorbidities, and patient preferences, fostering shared decision-making and patient-centered care.

CONCLUSION

Surgical interventions play a pivotal role in the management of obstructive cardiomyopathy, offering symptomatic relief, hemodynamic improvement, and enhanced quality of life for affected individuals. From traditional septal myectomy to emerging transcatheter approaches, advancements in surgical techniques, imaging modalities, and patient selection criteria continue to refine treatment strategies and optimize outcomes. Collaborative efforts among cardiac surgeons, interventional cardiologists, and imaging specialists drive innovation in the field, promising further advancements in the surgical management of obstructive cardiomyopathy in the future.