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Perspective

Mitral Valve Replacement in Mitral Annular Calcification

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DESCRIPTION

Interventions to treat mitral stenosis were the first in the history of mitral valve surgery. This happened during a time when the frequency of rheumatic disease was significant, even in western societies. One of the oldest references to this topic is found in a note by Sir Lauder Brunton from 1902, in which he suggests that mitral stenosis might be treated using commissurotomy or valvotomy. Between 1906 and 1914, there are numerous surgical publications describing the use of a valvulotome to treat a stenotic valve through the left atrial appendage without using direct vision. The operation was then carried out directly by inserting a cardioscope *via* the left atrial appendage in a research conducted in 1922 by Allen and Graham.

The first case report of an open mitral valvotomy using a trans-apical approach was published in 1923 by Cutler and Levine. The patient was a 12-year-old female with severe symptomatic mitral stenosis. In 1925, Souttar performed a case report on a 15-year-old girl who had severe symptoms of mitral stenosis. The left atrial appendage was cut, and a finger was passed through the opening to reach the mitral valve. This allowed for measurement of the degree of regurgitation/stenosis, as well as passage of a thin blade for valvotomy, which was not done in this case. Harken carried out several closed mitral valvuloplasty procedures in the 1940s. The first open annuloplasty for mitral regurgitation was described by Lillehei in 1957, while the first chordae tendineae rupture-related mitral regurgitation repair was described by McGoon in 1960. Worldwide, mitral valve pathology continues to be a major cause of disease, and mitral valve repair has become more popular as a result of the epidemiology's shift away from mitral stenosis. Carpentier produced a seminal study in 1983 that characterised various mitral valve abnormalities and presented the surgical techniques for effective treatment of mitral regurgitation in a systematic manner, building on the experience of mitral valvotomies and related mitral valve surgery. Since 1996, mitral valve repair techniques have advanced from the conventional sternotomy, which involved open visualisation and direct cross-clamping, to hemi-sternotomy and mini-thoracotomy approaches, which could make use of videoscopic imaging and indirect cross-clamping *via* the use of a transthoracic clamp or an occlusive endovascular balloon. By 2011, robotic surgery had become widely available, enabling increasingly high definition and three-dimensional (3D) imaging of the surgical field together with the adaptability of robotic equipment and its agility. In order for the mitral valve to function normally, the two leaflets must work together, the mitral valve annulus must have a normal shape, the chordae tendineae must be properly attached to the valve leaflet and the papillary muscle, and the papillary muscle must contract normally and be attached to the myocardium. Mitral regurgitation may be caused by an anomaly at any one of these levels, while mitral stenosis may be caused by an abnormality at the level of the leaflets or annulus. While secondary mitral regurgitation typically results from left ventricular alterations compromising mitral valve function without abnormalities at the primary level of the leaflet or annulus, primary mitral regurgitation involves abnormalities of the mitral valve or annulus. For the treatment of mitral regurgitation, both open sternotomies and minimally invasive procedures are available. This review will address these therapeutic options for mitral valve disease with a special emphasis on minimally invasive procedures, mostly for mitral regurgitation. A degenerative process of the fibrous annulus of the mitral valve is called Mitral Annular Calcification (MAC).

It frequently usually manifests incidentally, is asymptomatic, and is underreported. A higher incidence is seen in people who are older, have atherosclerosis, chronic renal disease, hypertension, or valvular heart disease. The prevalence is between 8% and 15%. According to certain research, the frequency among those over 65 years old can reach 40%. MAC has been linked to systemic atherosclerosis and is a standalone predictor of un-favourable results. In addition, severe mitral annulus calcification might result in mitral regurgitation or stenosis. A higher incidence of perioperative complications, myocardial infarction, arrhythmias, cardiac failure, and stroke has also been linked to MAC. Due to their comorbidities, patients with MAC are not only at a significant surgical risk, but they also provide a technical challenge during mitral valve surgery.

According to a study, individuals undergoing isolated mitral valve surgery had a 6 fold higher operational death rate when MAC was present. Others have said that up to 28% of MAC patients

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have early death following Surgical Mitral Valve Replacement (SMVR). Transcatheter Mitral Valve Replacement (TMVR) may offer a less intrusive option in these high-risk patients. Initial reviews have been positive, and TMVR has established itself as a viable alternative, particularly in patients who pose an unacceptably high surgical risk. In order to evaluate the effectiveness of these methods critically and methodically, we compiled a list of surgical and transcatheter methods for mitral valve replacement in patients with MAC and mitral valve disease.

Transcatheter devices have been created over the past 20 years to treat or replace damaged Mitral Valves (MV). The effectiveness and safety of Transcatheter Mitral Valve repair (TMVr) devices have been shown, although numerous anatomical structures are incompatible with these procedures. The higher and more reliable reduction in mitral regurgitation is the key benefit of Transcatheter Mitral Valve Replacement (TMVR) versus transcatheter repair.