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## Cardiac Surgery

### 1. Review

#### TAVI specific sex consideration

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**Cite this article:** Masiero G, Paradies V, Franzone A, Bellini B, De Biase C, Karam N, Sanguineti F, Eltchaninoff H, Fraccaro C, Chieffo A. TAVI specific sex consideration. *Mini-invasive Surg* 2022;6:4.

<http://dx.doi.org/10.20517/2574-1225.2021.104>

#### Abstract

The impact of sex on baseline characteristics and morphological and clinical presentation of degenerative aortic stenosis has been widely demonstrated but poorly understood. Moreover, differently from valve surgery, where patients were predominantly male, both sexes have been well represented in percutaneous treatment of aortic stenosis (AS), and women appeared to derive greater benefit with transfemoral aortic valve implantation (TAVI) compared to surgical treatment. This review focuses on sex-specific differences in epidemiology, pathophysiology, diagnostic issues, treatment options, and clinical outcomes of degenerative AS. Moreover, we evaluate how sex-based TAVI management, from device selection to procedural tricks, may affect outcomes.

### 2. Review

#### Valve-in-valve transcatheter aortic valve replacement: the challenge of the next future

[HTML](#) [PDF](#)

**Cite this article:** Annibali G, Scrocca I, Musumeci G. Valve-in-valve transcatheter aortic valve replacement: the challenge of the next future. *Mini-invasive Surg* 2022;6:12. <http://dx.doi.org/10.20517/2574-1225.2021.101>

## **Abstract**

In recent years, an increasing number of bioprostheses have been implanted, and in the near future more and more patients will be candidates for reoperation due to structural deterioration of the valve. Valve-in-valve transcatheter aortic valve replacement (ViV TAVR) has become a safe and effective alternative to surgery and is currently approved for higher-risk, inoperable patients. From the most recent studies, early mortality has decreased and improvements in symptoms and quality of life of treated patients have been documented. ViV TAVR is a complex procedure that can present many pitfalls and therefore must be performed in high volume centers and with experienced staff because the risk of peri- and post-procedural complications is much higher than TAVR on native valve. In this review, we analyze the main procedural issues reported in the literature during ViV TAVR procedures: elevated postprocedural gradients, coronary obstruction and thrombosis of the leaflets of the bioprosthesis. Because of the opening of TAVR to younger and younger patients, thus with a longer life expectancy than the durability of the bioprosthesis, the next challenge will be the management of the lifetime strategy of patients with aortic stenosis, as the first type of intervention will influence all future therapeutic choices of our patient.

## **3. Review**

### **Management of concomitant coronary artery disease and aortic valve stenosis in the era of transcatheter aortic valve treatment**

[HTML](#) [PDF](#)

**Cite this article:** Cangemi S, Aurigemma C, Romagnoli E, Bianchini F, Bruno P, Nesta M, Burzotta F, Trani C. Management of concomitant coronary artery disease and aortic valve stenosis in the era of transcatheter aortic valve treatment.

*Mini-invasive Surg* 2022;6:3. <http://dx.doi.org/10.20517/2574-1225.2021.99>

## **Abstract**

Severe calcific aortic stenosis (AS) and coronary artery disease (CAD) have common risk factors and are frequently encountered in the same patient in clinical practice. CAD has been reported in  $\geq 50\%$  of AS patients undergoing both surgical treatment and transcatheter aortic valve implantation (TAVI). In the last two decades, TAVI has been established as a less invasive alternative to surgery. Recently, more and more young and low surgical risk patients undergo TAVI. Despite the high prevalence of CAD in patients treated with TAVI, the management strategy of concomitant CAD in these patients remains an area of considerable uncertainty. This review provides an updated overview of the current knowledge about this topic and offers points for reflection about the best approach to use.

#### 4. Review

##### **Prevention and management of peri-procedural TAVR complications**

[HTML](#) [PDF](#)

**Cite this article:** Khokhar AA, Ruggiero R, Chandra K, D'Agostino A, Toselli M, Mangieri A, Dudek D, Colombo A, Giannini F. Prevention and management of peri-procedural TAVR complications. *Mini-invasive Surg* 2022;6:2. <http://dx.doi.org/10.20517/2574-1225.2021.97>

##### **Abstract**

Transcatheter aortic valve replacement (TAVR) is a safe and effective treatment strategy for severe aortic stenosis. However, peri-procedural complications can have a significant impact on acute and longer-term morbidity and mortality. Therefore, this review article provides a practical overview on how to prevent and manage the common and also rare but life-threatening peri-procedural TAVR complications.

#### 5. Original Article

##### **Referring hospital involvement in early discharge post transcatheter aortic valve implantation: the TAVI (R-) EXPRES program**

[HTML](#) [PDF](#)

**Cite this article:** van Wiechen MP, de Ronde-Tillmans MJ, Van Mieghem NM. Referring hospital involvement in early discharge post transcatheter aortic valve implantation: the TAVI (R-) EXPRES program. *Mini-invasive Surg* 2022;6:1. <http://dx.doi.org/10.20517/2574-1225.2021.96>

### **Abstract**

**Aim:** Over the past decade, transcatheter aortic valve implantation (TAVI) has matured into a valid treatment strategy for elderly patients with severe aortic stenosis. TAVI programs will grow with its adoption in low-risk patients. The aim of this study was to evaluate safety and feasibility of early discharge protocols, either home or back to a referring hospital.

**Methods:** Consecutive patients undergoing TAVI between July 2017 and July 2019 were stratified into three discharge pathways from TAVI center: (1) early home (EXPRES); (2) early transfer to referring hospital (R-EXPRES); and (3) routine discharge (standard). Baseline, procedural, and 30-day outcomes were prospectively collected and compared per discharge pathway.

**Results:** In total, 22 (5%) patients were enrolled in the EXPRES cohort [median age 78 (IQR: 73-81); mean Society of Thoracic Surgeons (STS)  $2.4\% \pm 1.5\%$ ], 121 (29%) in the R-EXPRES cohort [median age 81 (IQR: 77-84); mean STS  $4.3\% \pm 2.8\%$ ], and 269 (65%) in the routine discharge cohort [median age 80 (IQR: 75-85); mean STS  $4.4\% \pm 3.1\%$ ]. EXPRES patients trended to be younger ( $P = 0.13$ ) and had lower STS ( $P = 0.02$ ). Early clinical outcome was similar through the different pathways including re-hospitalization rate. Median length of stay was one day longer for R-EXPRES vs. routine discharge patients [5 (IQR: 4-7) vs. 4 (IQR: 3-6);  $P < 0.01$ ]. Median length of stay (LOS) was two days (IQR: 1-3 days) for EXPRES patients.

**Conclusion:** Early discharge pathways home and to referral hospitals are safe and help streamline TAVI programs. LOS in referring hospitals may be further reduced.

## 6. Review

### **Left atrial appendage occlusion in patients with atrial fibrillation: focus on current evidence and commercially available devices**

[HTML](#) [PDF](#)

**Cite this article:** Maurina M, Villaschi A, Pivato CA, Mangieri A, Chiarito M, Bertoldi L, Briani M, Fazzari F, Reimers B, Regazzoli D, Pagnotta P. Left atrial appendage occlusion in patients with atrial fibrillation: focus on current evidence and commercially available devices. *Mini-invasive Surg* 2021;5:53.

<http://dx.doi.org/10.20517/2574-1225.2021.88>

#### **Abstract**

Atrial fibrillation is the most common cardiac arrhythmia and is associated with morbidity and mortality due to cerebral or systemic embolization, with cardiac thrombi mainly forming in the left atrial appendage (LAA). Anticoagulation is the treatment of choice; however, in patients who do not tolerate anticoagulation, LAA occlusion (LAAO) is a valid alternative. Over the last decade, many different LAAO devices have been developed and tested in trials, providing good clinical results. The purpose of this paper is to make an overview of the current state of the art of LAAO procedure, with a focus on available devices and future perspectives.

## 7. Review

### **Hybrid coronary revascularization: the Emory experience**

[HTML](#) [PDF](#)

**Cite this article:** Pusca SV, Halkos ME. Hybrid coronary revascularization: the Emory experience. *Mini-invasive Surg* 2021;5:51.

<http://dx.doi.org/10.20517/2574-1225.2021.45>

#### **Abstract**

This article reviews the Emory University Experience with hybrid coronary revascularization and identifies key factors essential for the success of this relatively new and evolving strategy for the treatment of coronary artery disease. Key decisional and technical factors were identified. In addition, careful patient selection, stepwise progression in learning the different aspects of the procedure, and close collaboration between cardiac surgery-interventional cardiology are key factors for success.

## 8. Technical Note

### **Deep learning-driven catheter tracking from bi-plane X-ray fluoroscopy of 3D printed heart phantoms**

[HTML](#) [PDF](#)

**Cite this article:** Torabinia M, Caprio A, Jang SJ, Ma T, Tran H, Mekki L, Chen I, Sabuncu M, Wong SC, Mosadegh B. Deep learning-driven catheter tracking from bi-plane X-ray fluoroscopy of 3D printed heart phantoms. *Mini-invasive Surg* 2021;5:32. <http://dx.doi.org/10.20517/2574-1225.2021.63>

#### **Abstract**

Minimally invasive surgery (MIS) has changed not only the performance of specific operations but also the more effective strategic approach to all surgeries. Expansion of MIS to more complex surgeries demands further development of new technologies, including robotic surgical systems, navigation, guidance, visualizations, dexterity enhancement, and 3D printing technology. In the cardiovascular domain, 3D printed modeling can play a crucial role in providing improved visualization of the anatomical details and guide precision operations as well as functional evaluation of various congenital and congestive heart conditions. In this work, we propose a novel deep learning-driven tracking method for providing quantitative 3D tracking of mock cardiac interventions on custom-designed 3D printed heart phantoms. In this study, the position of the tip of a catheter is tracked from bi-plane fluoroscopic images. The continuous positioning of the catheter relative to the 3D printed model was

co-registered in a single coordinate system using external fiducial markers embedded into the model. Our proposed method has the potential to provide quantitative analysis for training exercises of percutaneous procedures guided by bi-plane fluoroscopy.

## 9. Review

### **3D printing applications for percutaneous structural interventions in congenital heart disease**

[HTML](#) [PDF](#)

Cite this article: Tredway H, Pasumarti N, Crystal MA, Farooqi KM. 3D printing applications for percutaneous structural interventions in congenital heart disease.

*Mini-invasive Surg* 2020;4:78. <http://dx.doi.org/10.20517/2574-1225.2020.77>

#### Abstract

The past several decades have seen remarkable advancements in percutaneous interventions for treatment of congenital heart disease (CHD). These advancements have been significantly aided by improvements in noninvasive diagnostic imaging. The use of three-dimensional (3D) printed models for planning and simulation of catheter-based procedures has been demonstrated for numerous cardiac defects and has been shown to reduce complications, procedure times, and limit radiation exposure. This paper reviews the process by which patient-specific 3D cardiac models are produced, as well as numerous applications of these models for use in percutaneous interventions in CHD.

## 10. Review

### **Intraprocedural guidance in percutaneous mitral valve repair**

[HTML](#) [PDF](#)

Cite this article: Ancona F, Stella S, Capogrosso C, Melillo F, Ingallina G, Boccellino A, Napolano A, Agricola E. Intraprocedural guidance in percutaneous mitral valve repair. *Mini-invasive Surg* 2020;4:79. <http://dx.doi.org/10.20517/2574-1225.2020.80>

## Abstract

Percutaneous mitral valve intervention is emerging as a valid alternative for patients affected by mitral regurgitation. By addressing the pathophysiology, therapeutic options mainly target the leaflets, annulus or left ventricle. The present review will cover the intraprocedural guidance of the most used approaches, such as edge to edge repair, adjustable transapical beating-heart chordal implantation and percutaneous direct or indirect annuloplasty. Intraprocedural monitoring relies on integration of fluoroscopy and echocardiography, and is based on the continuous communication between the interventional imager and the interventional cardiologist.

## 11. Review

### **Predictors for procedural success and all-cause mortality in patients undergoing transcatheter mitral valve edge-to-edge repair for mitral regurgitation**

[HTML](#) [PDF](#)

Cite this article: Stolz L, Orban M, Braun D, Nabauer M, Hagl C, Massberg S, Hausleiter J, Orban M. Predictors for procedural success and all-cause mortality in patients undergoing transcatheter mitral valve edge-to-edge repair for mitral regurgitation. *Mini-invasive Surg* 2020;4:76.

<http://dx.doi.org/10.20517/2574-1225.2020.69>

## Abstract

A growing body of evidence shows that transcatheter mitral valve edge-to-edge repair (TMVr) for mitral regurgitation (MR) improves symptoms and prognosis of patients with heart failure. Still, as recently shown by two large randomized controlled trials (COAPT and MITRA-FR), there is differing information on which patients have the largest benefit. We aimed to summarize the current knowledge of clinical and anatomic predictors for acute procedural failure and long-term all-cause mortality after TMVr. TMVr is an effective treatment option for patients with symptomatic MR fulfilling certain echocardiographic and clinical criteria or being ineligible for surgery

despite optimal medical therapy. Acute procedural failure is influenced by anatomic features of the mitral valve, among those are increased tenting and mitral valve leaflet configuration, leaflet-to-annulus index, as well as the mitral valve opening area. In contrast, anatomy of the mitral valve plays a minor role in predicting all-cause mortality after TMVr. This endpoint is associated with patient comorbidities (e.g., renal failure and chronic lung disease), severe heart failure as expressed by New York Heart Association functional class (NYHA) IV, left and right heart dysfunction, laboratory parameters (NT-proBNP), clinical scoring systems (STS and EuroScore), and procedural MR reduction. In patients undergoing TMVr for severe MR, careful preprocedural evaluation of relevant comorbidities, mitral valve anatomy, as well as left and right heart function can provide detailed prognostic value regarding acute procedural success and long-term survival.

## 12. Review

### **Multimodality imaging for preprocedural planning of percutaneous mitral valve repair: a comprehensive review**

[HTML](#) [PDF](#)

Cite this article: Melillo F, Boccellino A, Ingallina G, Ancona F, Capogrosso C, Napolano A, Stella S, Agricola E. Multimodality imaging for preprocedural planning of percutaneous mitral valve repair: a comprehensive review. *Mini-invasive Surg* 2020;4:81. <http://dx.doi.org/10.20517/2574-1225.2020.83>

#### Abstract

New transcatheter mitral valve (MV) therapies are now available as alternatives to surgical and medical treatments in patients at high or prohibitive operative risk. Multimodality imaging including echocardiography, cardiac magnetic resonance, and cardiac computed tomography provide complementary information to guide patient and device selection. Morphology and functional anatomy of the MV should be carefully evaluated to determine the feasibility of percutaneous treatment; to identify

the best therapeutic approach, either leaflet or annulus or combined; and to predict the probability of procedural success that is crucial for subsequent outcome and should be integrated by comprehensive preprocedural assessment of chamber size, biventricular systolic and diastolic function, valvopathy hemodynamic impact and aortic or peripheral vascular disease. The spectrum of transcatheter options is now wide and encompasses leaflet repair, direct or indirect annuloplasty, and cordal implantation. The aim of this review is to provide an overview on the role of multimodality imaging in the patient selection and preprocedural planning of percutaneous mitral valve repair.

### **13. Review**

#### **Percutaneous mitral balloon valvuloplasty - state of the art**

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Cite this article: Palacios IF. Percutaneous mitral balloon valvuloplasty - state of the art. *Mini-invasive Surg* 2020;4:73. <http://dx.doi.org/10.20517/2574-1225.2020.72>

#### Abstract

Since its introduction in 1982, percutaneous mitral balloon valvuloplasty (PMV) has been used successfully as an alternative to open or closed surgical mitral commissurotomy in the treatment of patients with symptomatic rheumatic mitral stenosis. PMV is safe and effective and provides sustained clinical and hemodynamic improvement in patients with mitral stenosis. The immediate and long-term results appear to be similar to those of surgical mitral commissurotomy. Proper patient selection is an essential step for being able to predict the immediate results of PMV. Candidates for PMV require precise assessment of the mitral valve morphology. The Wilkin's echocardiographic score (Echo-Sc) is currently the most widely used method for predicting PMV outcome. Leaflet mobility, leaflet thickening, valvular calcification, and sub valvular disease are each scored from 1 to 4. An inverse relationship exists between the Echo-Sc and PMV success. Both immediate and

intermediate follow-up studies have shown that patients with Echo-Sc  $\leq 8$  have superior results, significantly greater survival, and event free survival compared to patients with Echo-Sc  $> 8$ . We identified other clinical and morphologic predictors of PMV success that include age, pre-PMV mitral valve area, history of previous surgical commissurotomy, and mitral regurgitation (MR), and post-PMV variables (e.g., post-PMV MR  $\geq 3+$  and pulmonary artery pressure), that may be used in conjunction with the Echo-Sc to optimally identify candidates for PMV. This concept demonstrates a multifactorial nature of the prediction of immediate and long-term results. Other echocardiographic scores have been developed for the screening of potential candidates for PMV. They include a unique score that take into account the length of the chordae. A novel quantitative score that included the ratio of the commissural areas over the maximal excursion of the leaflets from the annulus in diastole. The components of this score include mitral valve area  $\leq 1$  cm<sup>2</sup>, maximum leaflet displacement  $\leq 12$  mm, commissural area ratio  $\geq 1.25$ , and sub valvular involvement. Finally, a score that is able to identify patients who are more likely to develop significant mitral regurgitation post-PMV. This score takes into account the distribution (even or uneven) of leaflet thickening and calcification, the degree and symmetry of commissural disease, and the severity of subvalvular disease. The transvenous transseptal approach is the most widely used PMV technique. The two major techniques of PMV are the double-balloon technique and the Inoue technique which are equally effective techniques of PMV. Encouraging results of PMV have been reported in special mitral stenosis population cohorts including pregnant women, patients with previous surgical commissurotomy, patients with atrial fibrillation, patients with pulmonary hypertension, elderly patients, patients with calcific mitral stenosis, and patients with associated aortic regurgitation. To summarize, PMV is the preferred form of therapy for relief of mitral stenosis for a selected group of patients with symptomatic mitral stenosis and suitable valve anatomy for valvuloplasty. Patients with Echo-Sc  $\leq 8$  have the best results, particularly if they are young, are in normal sinus rhythm, have no pulmonary hypertension, and have no evidence of

calcification of the mitral valve under fluoroscopy. The immediate and long-term results of PMV in this group of patients are similar to those reported after surgical mitral commissurotomy. Patients with Echo-Sc > 8 have only a 50% chance to obtain a successful hemodynamic result with PMV, and the long-term follow-up results are worse than those from patients with Echo-Sc ≤ 8. In patients with Echo-Sc ≥ 12, it is unlikely that PMV could produce good immediate or long-term results and they preferably should undergo mitral valve replacement. However, PMV could be considered in these patients if they are high-risk or unqualified surgical candidates.

#### **14. Review**

##### **Percutaneous “edge-to-edge” leaflet repair in patient with primary mitral valve regurgitation**

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Cite this article: Rodinò G, Masiero G, Tarantini G. Percutaneous “edge-to-edge” leaflet repair in patient with primary mitral valve regurgitation. *Mini-invasive Surg* 2020;4:70. <http://dx.doi.org/10.20517/2574-1225.2020.55>

##### **Abstract**

Mitral regurgitation (MR) is the most common left-sided heart valve disease in developed countries with a constantly rising number of patients requiring hospitalization or intervention. Organic MR is defined as a primary structural abnormality of the mitral valve (MV) apparatus which may be caused by a broad set of pathological processes, among which myxomatous degeneration of the leaflets causing MV prolapse is the most common. If left untreated, chronic severe MR leads to serious adverse outcomes, from heart failure to death, but medical therapy is unable to change the natural history of the disease. Surgical correction, by means of valve repair or replacement, is the gold standard for the treatment of symptomatic patients with severe primary MR. However, surgery is not feasible for a large percentage of patients because of old age, reduced left ventricular ejection fraction and the presence

of severe comorbidities. Therefore, in recent years, several percutaneous therapeutic alternatives suitable for high or prohibitive surgical risk patients were developed. In this review we discuss the transcatheter treatment of primary MR, from available evidence to technical practice, with a focus on the percutaneous “edge-to-edge” leaflet repair performed with the MitraClip System and the PASCAL Repair System.

## 15. Review

### **Percutaneous “edge-to-edge” leaflet repair in patients with secondary mitral valve regurgitation**

[HTML](#) [PDF](#)

Cite this article: Masiero G, Rodinò G, Tarantini G. Percutaneous “edge-to-edge” leaflet repair in patients with secondary mitral valve regurgitation. *Mini-invasive Surg* 2020;4:71. <http://dx.doi.org/10.20517/2574-1225.2020.56>

#### Abstract

Functional or secondary mitral regurgitation (MR) is a heterogeneous entity afflicting patients with heart failure both with reduced or preserved left ventricular ejection fraction. It results from an imbalance between closing forces and tethering or pushing strengths acting on the valve in the absence of structural alterations of mitral valve (MV) apparatus. According to previous studies, more than 20% of patients with heart failure and reduced left ventricular ejection fraction have severe MR, even though the definition of the severity of the MV disease in this setting remains a debated issue due to the poor reproducibility of quantitative measurements and its dynamic nature, highly dependent on left ventricular loading conditions and performance in relation to optimization of medical treatment. Furthermore, it is still unclear whether MR is a direct contributor to a worse prognosis or merely a marker of severity of the disease affecting the left ventricle. Isolated MV surgery in these patients is burdened by significant operative mortality, high rates of recurrent MR and absence of proven survival benefit. In recent years, percutaneous treatment of functional MR arose as a

viable and safe alternative to conventional surgery, proving capable of reducing symptoms and recurrent hospitalization rates for heart failure, and even improving prognosis in selected patients. In this review we will discuss the percutaneous treatment of functional MR through transcatheter “edge-to-edge” leaflet repair performed with the two systems currently available: the MitraClip System and the PASCAL Repair System, from available evidence to technical practice.

## 16. Original Article

### **The prognostic impact of frailty in patients undergoing percutaneous mitral valve repair**

[HTML](#) [PDF](#)

Cite this article: Benito-González T, Estévez-Loureiro R, del Castillo S, Minguito-Carazo C, Echarte-Morales J, Garrote-Coloma C, Fernández-Vázquez F. The prognostic impact of frailty in patients undergoing percutaneous mitral valve repair. *Mini-invasive Surg* 2020;4:67. <http://dx.doi.org/10.20517/2574-1225.2020.54>

#### Abstract

**Aim:** Percutaneous mitral valve repair (PMVR) with MitraClip® has proven to be an effective therapy to reduce mitral regurgitation in patients at high risk for conventional surgery. This population is currently characterized by advance age and high prevalence of comorbidities. Our aim was to evaluate the prevalence of frailty in a cohort of patients undergoing PMVR and its impact on clinical outcomes during follow-up.

**Methods:** A prospective registry was performed including all consecutive patients who underwent elective PMVR between June 2014 and March 2018 in our institution. Frailty was evaluated at admission with the functional FRAIL scale. In-hospital and 30-day procedural outcomes were collected. Clinical follow up was carried out including New York Heart Association (NYHA) functional class, heart failure hospitalization and death.

Results: Overall, 70 patients were included (mean age  $75.3 \pm 9.9$  years, 65.7% male). Among them, 27 patients (38.6%) had a pre-procedural FRAIL score greater than 2, meeting frailty criteria. No differences between frail and non-frail patients were found in technical success ( $P = 1.0$ ) or 30-day device success ( $P = 0.739$ ). At six months follow up, both groups showed a significant improvement in NYHA functional class compared to baseline (frail:  $P = 0.002$ ; non-frail:  $P < 0.001$ ). During a median follow up of 675 (range 416-976) days, frailty patients had a higher incidence of HF admission and all-cause mortality ( $P = 0.013$ ). In multivariate COX regression analysis, FRAIL score greater than 2 was significantly related to the primary composite endpoint (HR = 2.45; 95%CI: 1.02-5.88;  $P = 0.044$ ).

Conclusion: Frailty was common in patients undergoing PMVR in our institution. Despite post-procedural clinical improvement, frailty was related to adverse outcomes in our series.

## 17. Review

### Nanomaterial-based hydrogels for coronary interventions: a mini review

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Cite this article: Saxena V, Pandey LM. Nanomaterial-based hydrogels for coronary interventions: a mini review. *Mini-invasive Surg* 2020;4:62.

<http://dx.doi.org/10.20517/2574-1225.2020.68>

#### Abstract

Myocardial infarction (MI) has become a major health concern these days. Elevated levels of cholesterol due to improper diet cause severe damage to human health, resulting in the narrowing of blood vessels leading to MI. Different approaches have been used based on surgical and non-surgical treatments for these blockages to cure MI. In this regard, injectable and non-injectable hydrogel-based percutaneous coronary intervention has shown promising applicability for the treatment of cardiac damage and its repair. In this report, we summarize a few hydrogels based on natural

polymers such as chitosan, alginate, polyethylene glycol and extracellular matrices to be used for percutaneous coronary intervention in the treatment of MI. Their structure, biological properties and biocompatibilities are discussed, and their existing challenges are also detailed. In addition, the probable solutions to overcome certain set backs are also highlighted.

## 18. Review

**The Alfieri's edge-to-edge technique for mitral valve repair: from a historical milestone of cardiac surgery to the origin of the transcatheter era**

[HTML](#) [PDF](#)

Cite this article: Belluschi I, Buzzatti N, Castiglioni A, Alfieri O, De Bonis M. The Alfieri's edge-to-edge technique for mitral valve repair: from a historical milestone of cardiac surgery to the origin of the transcatheter era. *Mini-invasive Surg* 2020;4:58.

<http://dx.doi.org/10.20517/2574-1225.2020.48>

### Abstract

After 30 years since its introduction, the edge-to-edge technique has become one of the most popular and adopted worldwide for surgical repair of mitral regurgitation. The success of this procedure could possibly be explained by its unique simplicity and high level of reproducibility. Indeed, it possesses the ability of being very versatile and it has been used in a wide spectrum of mitral valve pathologies and lesions: from degenerative to functional disease, from posterior to anterior leaflet lesions, including commissural defects. The rapidity of this easy surgical gesture has also enhanced its application in minimally invasive approaches. Finally, it has become a true milestone for the era of transcatheter correction of mitral regurgitation. Here, we describe the history and evolution of this breakthrough in the world of cardiac surgery.

## 19. Review

**Echocardiographic evaluation of mitral valve regurgitation**

[HTML](#) [PDF](#)

Cite this article: Smer A, Nanda NC, Akdogan RE, Elmarzouky ZM, Dulal S. Echocardiographic evaluation of mitral valve regurgitation. *Mini-invasive Surg* 2020;4:52. <http://dx.doi.org/10.20517/2574-1225.2020.36>

Abstract

Echocardiography is the primary imaging modality for the evaluation of mitral valve regurgitation. A comprehensive assessment of mitral regurgitation using different echocardiographic techniques provides important information regarding the etiology and severity of mitral regurgitation and its consequences on cardiac function. In addition, echocardiography plays an important role in the management of patients with mitral regurgitation.

## 20. Review

**Percutaneous mitral valve repair in acute mitral regurgitation: case report and review of the literature**

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Abstract

Acute mitral regurgitation is a heterogeneous and life-threatening pathology, with severe hemodynamic consequences and extremely adverse outcomes. Traditionally, the definitive treatment is prompt surgical intervention after hemodynamic stabilization. Nowadays, however, percutaneous repair of mitral valve with MitraClip device has emerged as a safe and effective therapeutic option. Evidences in this field

are still scarce. Hereby, we report the case of an 82-year-old woman with lateral ST-elevation myocardial infarction determining severe acute mitral regurgitation (MR) with an asymmetric leaflet tethering mechanism. Due to prohibitive operative risk and unstable hemodynamic status, the patient underwent a successful urgent MitraClip procedure with optimal reduction of MR and immediate hemodynamic improvement. Moreover, we provide a review of the available literature regarding the echocardiographic assessment of acute MR, results of published cases and possible management of this complex pathology.

## 21. Review

### **Percutaneous mitral valve repair in patients with secondary mitral regurgitation and advanced heart failure**

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Cite this article: Scotti A, Margonato A, Godino C. Percutaneous mitral valve repair in patients with secondary mitral regurgitation and advanced heart failure.

*Mini-invasive Surg* 2020;4:49. <http://dx.doi.org/10.20517/2574-1225.2020.38>

#### Abstract

Advanced heart failure (HF) prevalence is increasing and ranges between 1% and 10% of the overall HF population, due to the growing number of patients with HF and their better treatment and survival in the last 20 years. The best treatment for these patients is represented by heart transplantation, which, unfortunately, is only available for a minority of them. A significant portion of patients with advanced HF has concomitant severe mitral regurgitation, which acts as a driving force in inducing and maintaining this end-stage condition in a vicious cycle. Percutaneous mitral valve repair with MitraClip is a treatment option to stop this vicious cycle, providing safer outcomes and clinical benefits in some of these patients. Preliminary clinical observations show a possible selective role for percutaneous mitral valve treatment

with MitraClip as a bridge to transplantation, candidacy or recovery. Further evidence will be necessary to confirm these preliminary data and support this new treatment framework of patients with advanced HF.

## 22. Review

### **Transcatheter mitral valve implantation: different fixation techniques**

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Cite this article: Lutter G, Frank D, Hansen JH, Liu Y, Cremer J, Haneya A, Puehler T. Transcatheter mitral valve implantation: different fixation techniques.

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#### Abstract

Transcatheter mitral valve implantation provides an off-pump treatment option for mitral valve regurgitation, especially for secondary mitral regurgitation. It offers an opportunity for the treatment of a large cohort of patients not referred for conventional surgery. One of the biggest challenges is the development of a valved stent that suits the complex anatomy of the native mitral valve. Furthermore, secure anchorage of the device is difficult in the mitral area without clearly defined structures. In the last few years, various new self-expanding nitinol valved stents for transapical implantation in the beating heart have been developed. Different design iterations were conducted to improve fixation and overall stent performance. The risk of paravalvular leakage was decreased and reproducibility enhanced. This article reviews the major achievements in the development process of our apically fixed mitral valved stent over the last few years, with prototypes that provide secure stent deployment, high reproducibility and low paravalvular leakage rates.