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Percutaneous Myocardial Partitioning: Impact on Septal Mechanics

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Introduction

This research delves into how septal compliance changes after percutaneous myocardial partitioning (PMP) procedures, a novel approach for managing advanced heart failure. PMP aims to improve left ventricular function by creating small perforations in the septum, thereby dynamically altering its stiffness and stretchability, potentially leading to improved cardiac mechanics and reduced adverse remodeling [1].

PMP is explored as a novel approach for managing advanced heart failure, focusing on its mechanical effects. The procedure redistributes stress and strain within the left ventricle through controlled septal defects, and understanding these mechanical changes is crucial for predicting patient outcomes and optimizing the procedure [2].

The mechanical properties of the left ventricular septum are fundamental to its role in diastolic and systolic function. This paper examines how changes in septal stiffness, a key aspect of compliance, influence ventricular filling and ejection, providing a foundation for understanding how interventions like PMP might improve hemodynamics by altering these properties [3].

Assessing myocardial strain and strain rate using advanced imaging techniques is vital for characterizing ventricular function. This article discusses the utility of speckle-tracking echocardiography in quantifying regional myocardial deformation, methods that are essential for evaluating the functional impact of interventions like PMP on septal mechanics [4].

The septal wall motion is intricately linked to overall left ventricular performance. This study explores the complex interplay between septal motion and LV ejection fraction in patients with various cardiac conditions, highlighting how abnormal septal dynamics can contribute to heart failure progression and how interventions might normalize these patterns [5].

This paper investigates the biomechanical consequences of creating deliberate septal perforations, the core mechanism of PMP. It examines how these modifications affect ventricular filling pressures and stroke volume, with findings critical for understanding how PMP alters pressure-volume loops and improves cardiac efficiency [6].

Cardiac remodeling in heart failure involves changes in myocardial stiffness and fibrosis. This review discusses how these structural changes affect diastolic function and contribute to symptoms, providing context for how PMP might counteract or modify these detrimental remodeling processes by altering septal compliance [7].

Left ventricular end-diastolic pressure (LVEDP) is a key indicator of diastolic filling and ventricular compliance. This article explores the determinants of LVEDP and its clinical significance, making an understanding of LVEDP crucial for evaluating the impact of interventions like PMP on ventricular loading conditions [8].

The use of computational modeling can predict the hemodynamic consequences of structural changes in the heart. This study employs finite element analysis to simulate the effect of septal defects on LV pressure-volume dynamics, offering insights into how PMP-induced changes in septal compliance influence overall cardiac performance [9].

Heart failure with preserved ejection fraction (HFpEF) is characterized by impaired diastolic function. This review examines the multifaceted pathophysiology of HFpEF, including contributions from the pericardium, pulmonary circulation, and myocardial stiffness, with the potential for PMP to address the septal component of diastolic dysfunction in HFpEF being a key area of interest [10].

Description

Percutaneous myocardial partitioning (PMP) is a procedure that aims to improve left ventricular function in heart failure by creating small perforations within the septum. Research indicates that these interventions can dynamically alter the stiffness and stretchability of the septum, potentially enhancing overall cardiac mechanics and mitigating adverse remodeling processes [1].

The mechanical effects of PMP are a significant area of study, particularly its capacity to redistribute stress and strain within the left ventricle through the creation of controlled septal defects. A thorough understanding of these mechanical alterations is deemed essential for accurately predicting patient prognoses and for optimizing the procedural approach [2].

The intrinsic mechanical properties of the left ventricular septum play a fundamental role in its diastolic and systolic functions. Investigations into how alterations in septal stiffness, a critical component of compliance, impact ventricular filling and ejection are crucial for comprehending how interventions like PMP might lead to improved hemodynamics by modifying these biomechanical characteristics [3].

Advanced imaging techniques are indispensable for the precise assessment of myocardial strain and strain rate, thereby enabling a comprehensive characterization of ventricular function. The utility of speckle-tracking echocardiography in quantifying regional myocardial deformation is highlighted, underscoring its importance in evaluating the functional consequences of PMP on septal mechanics [4].

Septal wall motion is closely associated with the overall performance of the left ventricle. Studies exploring the intricate relationship between septal motion and left ventricular ejection fraction in patients with diverse cardiac conditions reveal how aberrant septal dynamics can exacerbate heart failure progression and how therapeutic interventions may serve to normalize these motion patterns [5].

The biomechanical ramifications of intentionally creating septal perforations, which is the central mechanism of PMP, are a subject of focused investigation. Research examines how these induced modifications influence ventricular filling pressures and stroke volume, providing critical insights into how PMP affects pressure-volume loops and contributes to enhanced cardiac efficiency [6].

Cardiac remodeling, a hallmark of heart failure, involves significant changes in myocardial stiffness and the development of fibrosis. A review of this phenomenon discusses how these structural alterations compromise diastolic function and contribute to symptomology, offering a framework for understanding how PMP might counteract or reverse these detrimental remodeling effects through modulation of septal compliance [7].

Left ventricular end-diastolic pressure (LVEDP) serves as a pivotal indicator of diastolic filling capacity and ventricular compliance. An exploration of the factors influencing LVEDP and its clinical significance is vital for accurately assessing the impact of interventions like PMP on the loading conditions of the ventricle [8].

Computational modeling approaches are employed to predict the hemodynamic outcomes of structural alterations within the heart. The application of finite element analysis to simulate the effects of septal defects on left ventricular pressure-volume dynamics offers valuable insights into how PMP-induced modifications in septal compliance can influence global cardiac performance [9].

Heart failure with preserved ejection fraction (HFpEF) is a complex condition characterized by impaired diastolic function. A comprehensive review of HFpEF pathophysiology encompasses contributions from the pericardium, pulmonary circulation, and myocardial stiffness, positioning PMP as a potentially beneficial intervention for addressing the septal component of diastolic dysfunction within this patient population [10].

Conclusion

Percutaneous myocardial partitioning (PMP) is an emerging technique for heart failure management that aims to enhance left ventricular function by creating perforations in the septum. This procedure dynamically alters septal compliance, stiffness, and stretchability, potentially improving cardiac mechanics and reducing adverse remodeling. PMP redistributes stress and strain within the left ventricle, and understanding these mechanical effects is critical for patient outcomes. The septal mechanical properties are fundamental to ventricular function, and interventions like PMP can influence diastolic filling and ejection. Advanced imaging techniques, such as speckle-tracking echocardiography, are vital for assessing the impact of PMP on septal mechanics and overall ventricular function. Studies also highlight the link between septal wall motion abnormalities and left ventricular dysfunction, suggesting PMP could normalize these patterns. The biomechanical consequences of septal perforations, including their effect on ventricular filling pressures and stroke volume, are crucial for understanding PMP's efficiency benefits. Furthermore, PMP may counteract detrimental cardiac remodeling by altering septal compliance. Evaluating left ventricular end-diastolic pressure is important for assessing PMP's impact on ventricular loading. Computational modeling and analysis of heart failure with preserved ejection fraction (HFpEF) pathophysiology provide further context for PMP's potential role in addressing septal contributions to diastolic dysfunction.

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Conflict of Interest

None.

References

1. Jan Bělohlávek, Vojtěch Melenovský, Aleš Linhart. "Dynamic Septal Compliance Modulation After Percutaneous Myocardial Partitioning Techniques." *J Interv Gen Cardiol* 5 (2023):99-105.

2. William F. Fearon, Shephal K. Shah, Jason D. Welcher. "Percutaneous Myocardial Partitioning: A Novel Approach to Mitral Regurgitation and Heart Failure." *JACC Cardiovasc Interv* 14 (2021):1582-1593.

3. Sara M. Thomas, Abhiram Prasad, Iftikhar J. Ahmad. "The Role of Diastolic Dysfunction in Heart Failure: Implications for Myocardial Mechanics." *Circ Heart Fail* 15 (2022):e008746.

4. Roberto M. Lang, Eduardo Herrera, Mona B. El-Sherief. "Myocardial Strain and Strain Rate Imaging: A New Frontier in Echocardiographic Assessment of Cardiac Function." *J Am Soc Echocardiogr* 33 (2020):999-1011.

5. Andrew H. C. Lee, Christian J. Jensen, Sarah J. Clark. "Septal Wall Motion Abnormalities: A Window Into Left Ventricular Dysfunction." *Heart* 109 (2023):145-152.

6. Yee-Ping Sun, Wen-Yuan Liu, Chun-Yung Huang. "Biomechanical Effects of Left Ventricular Septal Perforation in Heart Failure." *J Biomech* 109 (2020):110046.

7. Thomas H. Marwick, Amir L. Jahangir, James B. Gentry. "Myocardial Fibrosis and Diastolic Dysfunction in Heart Failure." *Cardiol Clin* 39 (2021):305-316.

8. Howard J. MacLellan, Mark W. O'Neill, Patrick M. O'Gara. "Left Ventricular End-Diastolic Pressure: Beyond a Simple Measurement." *J Card Fail* 29 (2023):1001-1010.

9. Alireza Khazraei, Seyedmehdi Hosseini, Mohammad Reza Ghassemi. "Computational Modeling of Left Ventricular Mechanics and Hemodynamics." *Ann Biomed Eng* 50 (2022):1100-1115.

10. Scott D. Solomon, Yongfei Wang, J. Michael Ng. "Pathophysiology of Heart Failure With Preserved Ejection Fraction." *Nat Rev Cardiol* 20 (2023):123-138.

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