Assessment of Regional Left Atrial Deformation Properties at the Left Atrial Free Lateral Wall by Tissue Doppler Imaging in Mitral Valve Disease

Thesis

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Sarah Ibrahim Mohamed Ali Halawa

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List of Abbreviations

ANP	:	Atrial natriuretic peptides
Ar	:	Atrial reversal
ASr	:	Atrial strain rate
CW	:	Continuous wave
EROA	:	Effective regurgitant orifice area
INR	:	International normalization ratio
LA	:	Left atrium
LV	:	Left ventricular
PALS	:	Peak atrial longitudinal strain
PMBV	:	Percutaneous mitral balloon valvuloplasty
PW	:	Pulse wave
RT3DE	:	Real time three dimensional echocardiography
RV	:	Regurgitant volume
STE	:	Speckle tracking echocardiography
TDI	:	Tissue Doppler imaging
TVI	:	Time velocity integral
VTI	:	Velocity-time integral

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Introduction

Atrial function is an integral part for the proper performance of circulatory system, the assessment of its haemodynamic and mechanical characteristics by use of non-invasive echocardiography, including tissue Doppler velocity, may provide a better insight into atrial function [1].

The haemodynamic function of the left atrium (LA) primarily modulates the left ventricular (LV) filling through its three components: a reservoir component during ventricular systole, a conduit component during early ventricular diastole, and a booster pump component during late ventricular diastole. The change of the LA function in different phases can be assessed non-invasively by echocardiography, using not only conventional methods such as changes in LA area and volume, but also novel techniques such as tissue Doppler imaging (TDI).

Tissue Doppler imaging quantifies regional tissue motion velocity; this novel technique has been validated for the assessment of both global and regional left atrium and left ventricle function [2].

From an electromechanical perspective, echocardiographic Parameters that assess LA mechanical function may provide a greater understanding of atrial performance and its relationship with ventricular function [2].

Doppler echocardiography relies on detection of the shift in frequency of ultrasound signals reflected from moving objects. With this principle, conventional Doppler techniques assess the velocity of blood flow by measuring high-frequency, low-amplitude signals from small, fast-moving blood cells.

In TDI, the same Doppler principles are used to quantify the higher-amplitude, lower-velocity signals of myocardial tissue motion TDI can be performed in pulsed-wave and color modes. Pulsed-wave TDI is used to measure peak myocardial velocities and is particularly well suited to the measurement of long-axis ventricular motion because the longitudinally oriented endocardial fibers are most parallel to the ultrasound beam in the apical views [3].

Pulsed wave tissue Doppler can assess the left atrial wall as it generates a triphasic signal formed by positive A_1 wave and two negative A_2 and A_3 waves.

The left atrial flow and Transmitral indicate that the A_1 component of the atrial wall occurs during ventricular systole and corresponds to the atrial relaxation period , this wave could be due to the movement of the mitral ring during the ventricular systole toward the base of the left atrial wall, the A_2 wave is produced during early diastolic filling (the passive phase of ventricular filling) and the A_3 wave coincides with the atrial contraction (left ventricular or active filling) [4].

Aim of the Work

This study is taken for the assessment of left atrial lateral free wall deformation properties in mitral valve disease using tissue Doppler imaging.