

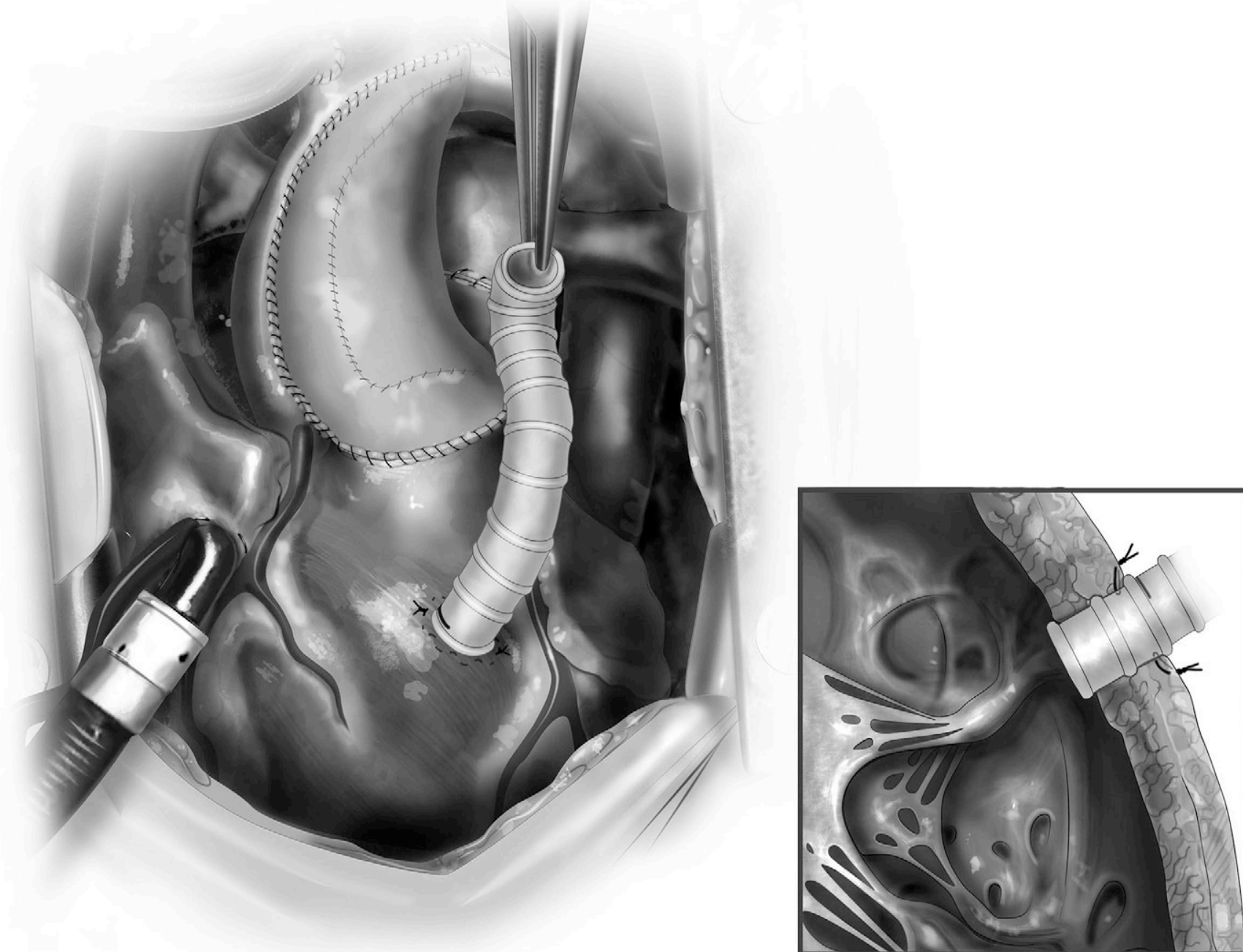
Echocardiographic Flow Patterns in the Right Ventricle-to-Pulmonary Artery Conduit after Norwood-Sano procedure

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INTRODUCTION

Stage I Surgical palliation for hypoplastic left heart syndrome (HLHS) and other Single Ventricle physiology diseases is based on the Norwood procedure with two different variants based upon the source of pulmonary blood flow, either a modified Blalock-Taussig shunt or a Right Ventricle-to-Pulmonary Artery Conduit (RV-PAC).



This study aimed to assess the echocardiographic Doppler flow patterns and the Diastolic Regurgitation Fraction (DRF) through the RV-PAC.

Moreover, we investigated the possible correlation between the Diastolic Regurgitation Fraction and numerous clinical parameters.

MATERIALS AND METHODS

12 subjects who underwent a modified Norwood-Sano procedure during 2020 at our center were enrolled.

Diagnosis	n.
Hypoplastic Left Heart Syndrome	7
Double Outlet Right Ventricle- HLHS like	3
Unbalanced Atrio-ventricular Septal Defect	1
Aortic Valve Stenosis with borderline LV	1

Evaluations performed early after surgery (T1), at 1 month (T2), and before stage II palliation (T3) were taken into account.

We considered Echocardiographic parameters (TAPSE, RV End Diastolic Volume, Tv S', Neo-aorta Regurgitation, Systemic AV Valve Regurgitation) and clinical parameters (Mean Arterial Pressure, Lactates Blood levels, pro-NT BNP).

We analyzed the Diastolic Regurgitation Fraction using CW Doppler to measure velocity time integrals (VTI) of retrograde diastolic and anterograde systolic flow within the proximal, mid-portion and distal part of the conduit (Diastolic VTI /Systolic VTI × 100).

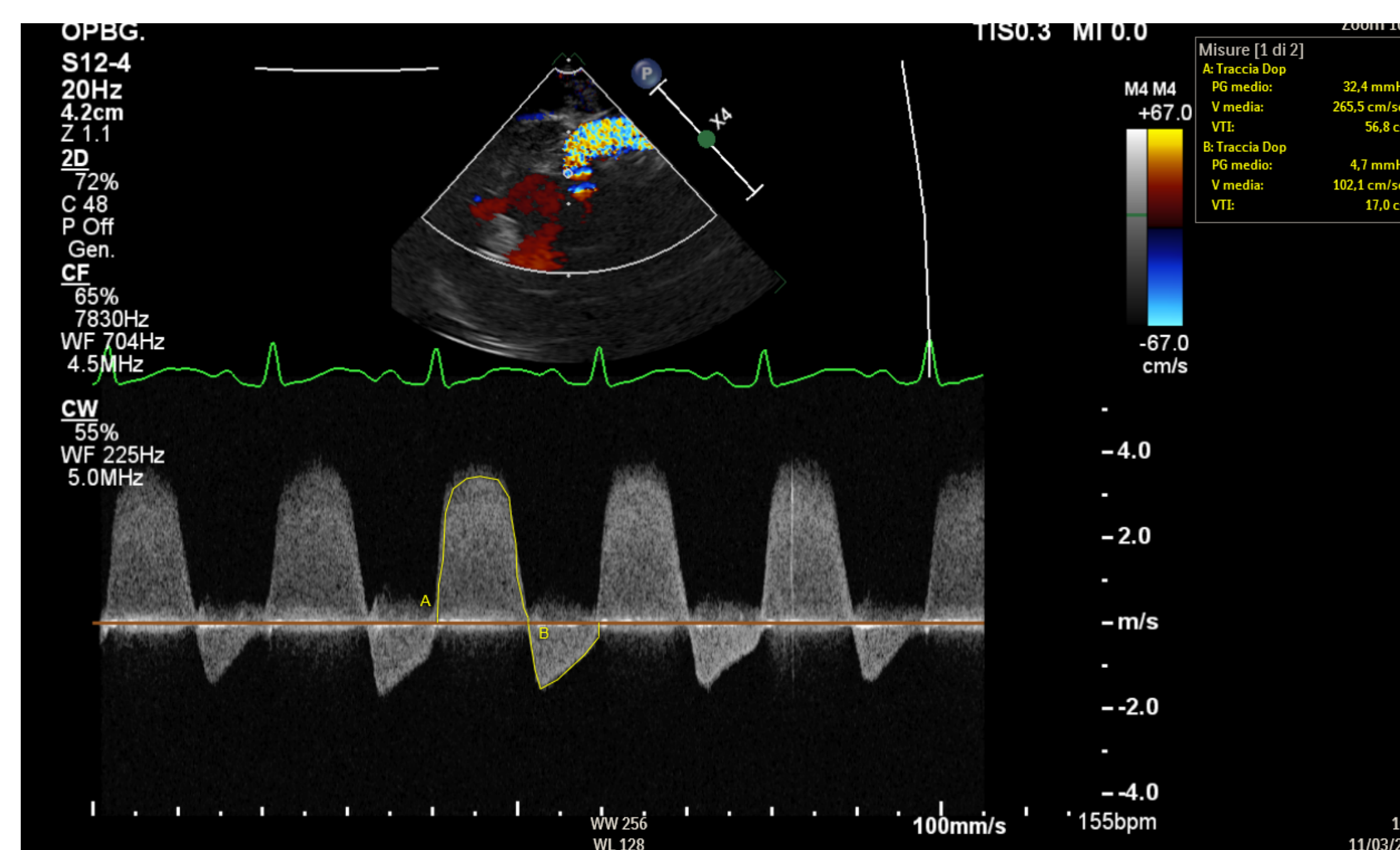
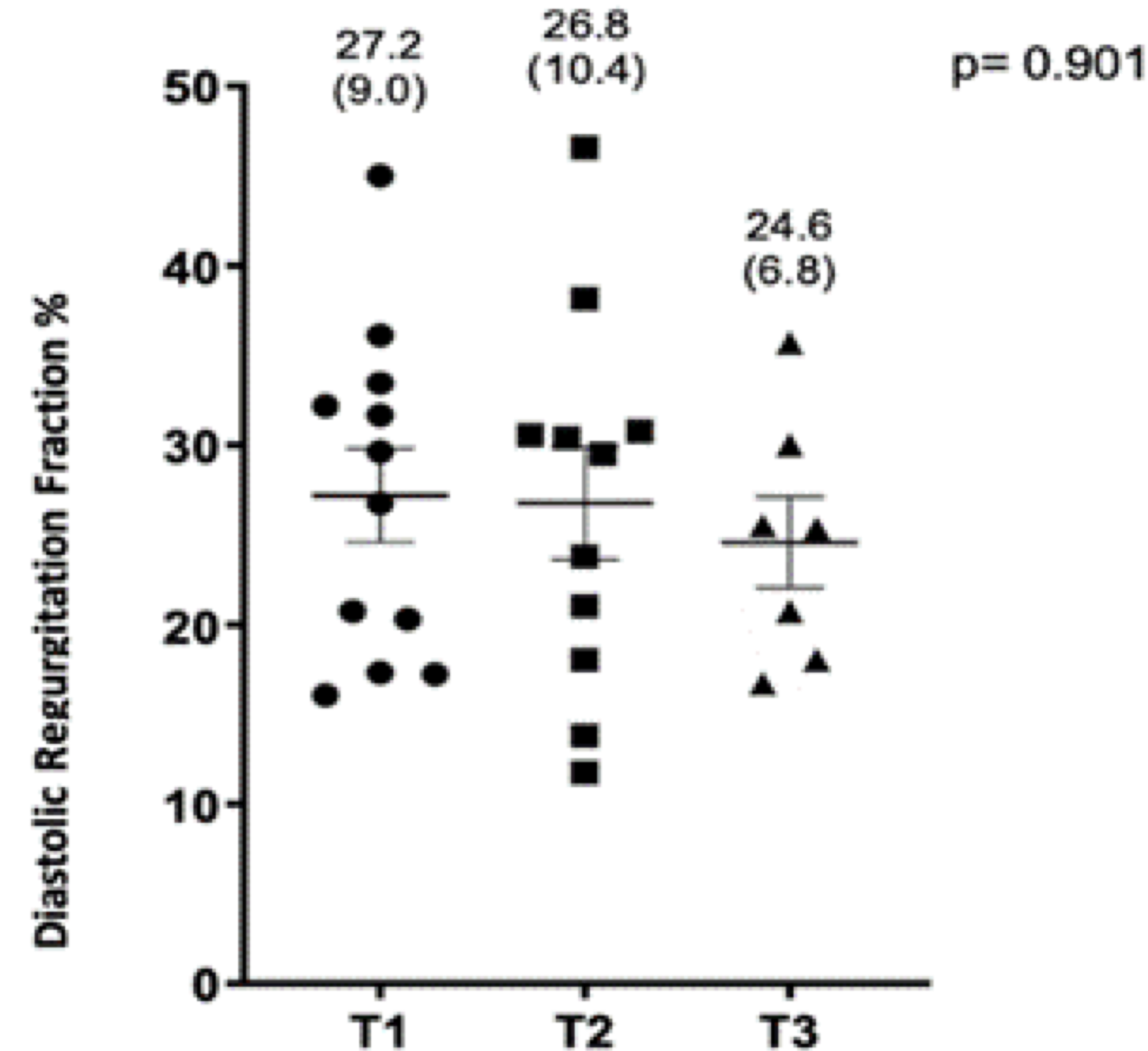


Figure 2. Evaluation of the Diastolic Regurgitation Fraction in the proximal portion on the RV-PA Conduit

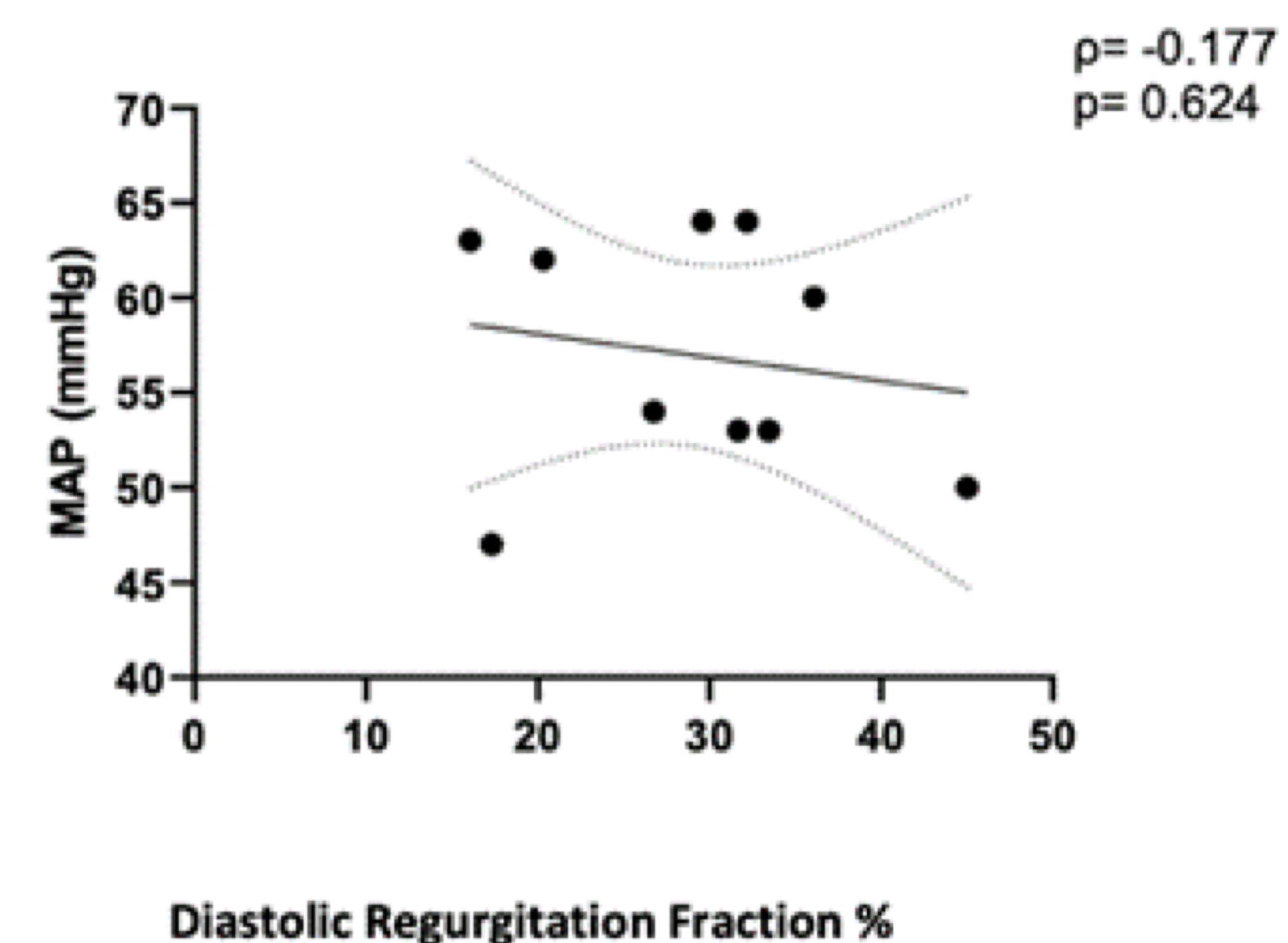
RESULTS

Diastolic Regurgitation Fraction through the conduit displayed no significant variation overtime (T1: 27.2 ± 9.0%; T2: 26.8 ± 10.0%; T3: 24.6 ± 6.8%; p=0,901).

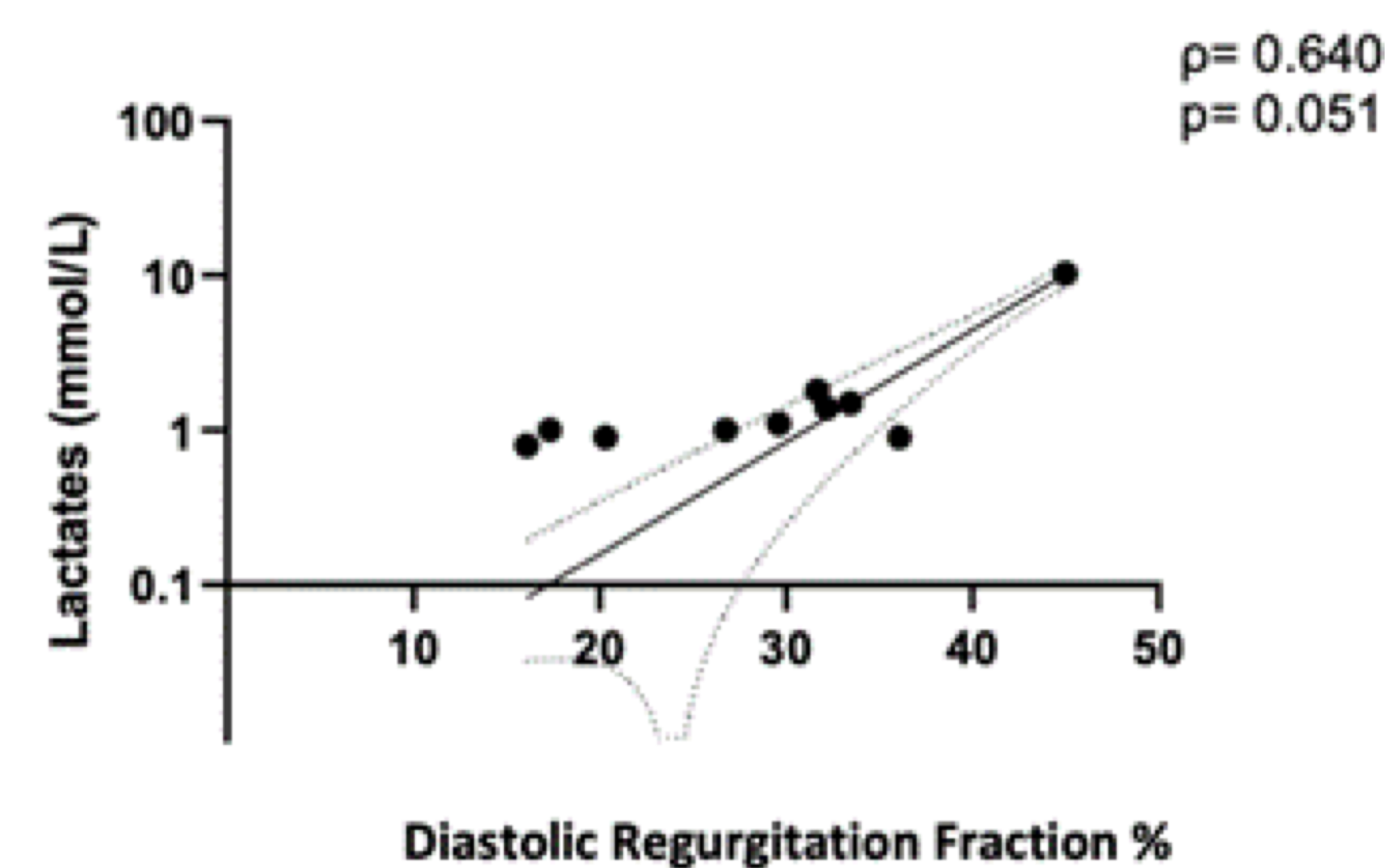


	T1	T2	T3
Systolic VTI (cm)	37.1 ± 10	56.75 ± 18	56 ± 8.6
Diastolic VTI (cm)	9.3 ± 6.4	13.75 ± 3.9	11 ± 0.5
DFR (%)	27 ± 9	26.8 ± 10	24.6 ± 6.8
RV-PA Conduit (V max)	2.03 ± 0.01	4 ± 0.06	3 ± 0.7

A positive correlation was detected between DRF at baseline with Lactates blood level (p=0.640, p=0.051).



DRF showed a negative correlation trend with the MAP, although this was not statistically significant (p=0.177, p=0.624).



No significant correlation was found between DRF with pro-NT BNP. Three patients developed progressive conduit stenosis and RV-PAC conduit stenting during the study period.

CONCLUSIONS

Analysis of the flow patterns in the RV-PAC may improve the understanding of the hemodynamic physiology after the Norwood-Sano procedure.

Our results demonstrate that flow patterns and DRF through the RV-PAC are stable after Stage I palliation. A high DRF might be associated with systemic hypoperfusion, as suggested by the correlation with lactates levels and possibly MAP.

Serial echocardiographic evaluations assessing RV-PAC patency and flow dynamics are recommended in the early postoperative period.