

# Markers of Hemodialysis Induced Silent Myocardial Injury: Correlation with Tissue Doppler and Systolic Strain Imaging

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## Introduction

Hemodialysis (HD) is an independent risk factor for the development of myocardial injury.

## Objectives

To evaluate Heart-type fatty acid binding protein (H-FABP) and cardiac troponinI (CTI) as markers of silent myocardial injury in children on regular HD and their correlation to cardiac tissue doppler and systolic strain imaging.

## Patients and Methods

This cross sectional study was conducted on 25 children, 12 (48%) males & 13 (52%) females on regular HD (mean age 13.5 ± 3.7 years) and a control group of 25 age and sex matched healthy children 18 (75%) males & 7 (25%) females, their age ranged from 6-16 years with mean age of 10.3 ± 2.3 years

## Methods

### All studied patients were subjected to:

Detailed history taking & clinical examination.

M mode, color, pulsed (PW) and continuous (CW) Doppler echocardiography and tissue Doppler imaging for assessment of chambers enlargement, valvular affection, systolic functions (EF and F<sub>s</sub>) and diastolic functions (E wave, a wave, E/a ratio)

Tissue Doppler imaging for assessment of E', A' waves, E'/A' (diastolic) & S'wave (systolic) of basal & mid segments of LV anterior, inferior, septal, lateral & RV lateral walls, peak systolic strain of mid & basal segments of LV anterior, inferior, septal, lateral & RV lateral walls and LV & RV Tei indices

### Strain imaging:

A sample volume was placed at the basal and mid segment of the left ventricle lateral, septal, anterior and inferior walls and the right ventricular free wall, aortic valve opening and closure were defined using pulsed wave Doppler interrogation of the left ventricular outflow tract, acquired during the same examination in order to determine the duration of ejection. Peak systolic strain was assessed from strain curves as a longitudinal deformation parameter

Echocardiography was performed pre & post dialysis with the use of a commercially available cardiac ultrasound unit, device module: (VIVID E9 Vingmed Horton, Norway).

## Laboratory investigations

Pre and Post dialysis serum Na, K & Ca., Heart-type fatty acid binding protein level 1 hour & 4 hours post dialysis by a solid-phase sandwich ELISA kit (BioVendor GmbH, Heidelberg, Germany). and cardiac troponin I level 1 hour & 4 hours post dialysis by a solid-phase sandwich ELISA kit (Monobind Inc., Lake Forest, USA).

Assessment of H-FABP and Troponin I concentrations are significantly influenced by renal clearance, so their serum levels were assessed post hemodialysis.

## Results

Serum H-FABP was significantly elevated in patients than controls (p <0.001). PD. Serum H-FABP was a more sensitive marker of myocardial injury than CTI (sensitivity was 100% versus 41.2% at 1 hour and 100% versus 50% at 4 hours PD respectively). TDI revealed significantly decreased global LV and RV systolic functions PD and significant segmental wall motion abnormalities. Peak systolic strain assessment revealed more segments with wall motion abnormalities. Significant correlations were found between serums H-FABP and TDI indicators of systolic functions and peak systolic strain values.

Table ( ): Sensitivity and specificity of serum H-FABP 1hr post dialysis

	Troponin(1h)		Total
	Increased n=8(%)	Normal n=17(%)	
H-FABP(1h)			
Increased (%)	8(100) 44.4	10(58.8) 55.6	18
Normal (%)	0 0	7(41.2) 100	7

Sensitivity and specificity of serum H-FABP 4hrs post dialysis.

	Troponin 4 h		Total
	Increased n=15(%)	Normal n=10(%)	
H-FABP(4h)			
Increased (%)	15 (100%) 75	5(50%) 25	20
Normal (%)	0 0	5(50%) 100.0	5

Table ( ): Correlation between H-FABP 1 hour post dialysis & peak systolic strain values in studied patients.

Strain values	H-FABP(1h)		
	r	P value	S
LV anterior wall mid segment %	-0.452	0.05	S
LV anterior wall basal segment%	-0.465	0.05	S
Septal wall mid segment%	-0.465	0.05	S
Septal wall basal segment%	-0.504	0.05	S
Inferior wall mid segment%	-0.498	0.05	S
Inferior wall basal segment%	-0.447	0.05	S
LV lateral wall mid segment%	-0.492	0.05	S
LV lateral wall basal segment%	-0.467	0.05	S
RV lateral wall mid segment%	-0.493	0.04	S
RV lateral wall basal segment%	-0.447	0.05	S

## Conclusion

Children on regular HD showed evidence of silent myocardial injury revealed by the elevated serum level of H-FABP, CTI and segmental wall motion abnormalities. H-FABP was a better marker for myocardial injury detection than CTI. Peak systolic strain was a better tool than TDI in detection of segmental wall motion abnormalities  
Topic: Pediatric nephropathy

## References

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