

นิพนธ์ต้นฉบับ

Original Article

Baseline Level of Cardiac Troponin-I and CKMB in ESRD Patients at Ratchaburi Hospital and Effect of High Flux Dialysis on the Level

ระดับเอนไซม์ Cardiac Troponin-I และ CKMB ในผู้ป่วยไตวายเรื้อรังระยะสุดท้ายที่โรงพยาบาลราชบุรี และผลของการฟอกเลือดล้างไตด้วยตัวกรองคุณภาพสูงต่อระดับเอนไซม์

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ABSTRACT

Objective: To evaluate baseline levels of cardiac troponin-I, CKMB and effect of high flux dialysis on their levels in chronic hemodialysis patients at Ratchaburi hospital.

Design: A cross-sectional study was done on forty chronic hemodialysis ESRD patients.

Material and method: Blood samples were collected pre and post hemodialysis with high flux membrane for cardiac troponin-I and CKMB. Correlation of cardiac markers with gender, BMI, underlying DM and adequacy of hemodialysis(Kt/Vurea) were also done.

Results: Level of pre-hemodialysis cardiac troponin-I was ranged from 0 to 0.59 ng/ml (mean = 0.0345 ± 0.1) and post-hemodialysis cardiac troponin-I was ranged from 0 to 0.49 ng/ml (mean = 0.035 ± 0.1). Pre-hemodialysis CKMB level was ranged from 0.04 to 35.7 ng/ml (mean = 4.03 ± 5.7) and post-hemodialysis CKMB was ranged from 0.03 to 34.8 mg/ml (mean = 4.11 ± 5.01). Pre and post hemodialysis level of cardiac troponin-I and CKMB were no statistically different. No statistically significant correlation of cardiac markers with gender, BMI, underlying DM and adequacy of hemodialysis (Kt/Vurea)

Conclusion: Baseline cardiac troponin-I and CKMB were below significant level in the majority of our patients. High flux dialysis had no significant effect on cardiac troponin-I and CKMB level.

Key words : High flux dialysis patients,cardiac troponin-I,CKMB

บทคัดย่อ

ได้ศึกษาถึงระดับของเอนไซม์ cardiac troponin-I และ CKMB ในผู้ป่วยไตวายเรื้อรังระยะสุดท้ายจำนวน 40 คน ที่รับการฟอกเลือดล้างไตด้วยตัวกรองคุณภาพสูงที่โรงพยาบาลราชบุรี และผลของการฟอกเลือดล้างไตต่อระดับเอนไซม์ เหล่านี้ เป็นการวิจัยเชิงวิเคราะห์ ณ เวลาหนึ่ง โดยทำการเก็บเลือดก่อนและหลังการฟอกเลือด ผลที่ได้พบว่าระดับ cardiac troponin-I และ CKMB ในผู้ป่วยส่วนใหญ่มีระดับต่ำกว่าปกติอย่างมีนัยสำคัญทางคลินิก การฟอกเลือดล้างไต ไม่มีผลต่อระดับเอนไซม์เหล่านี้อย่างมีนัยสำคัญ และไม่พบความสัมพันธ์ของระดับเอนไซม์เหล่านี้กับความแตกต่างในเรื่องเพศ, ดัชนีมวลกาย, โรคเบาหวาน และความเพียงพอของการฟอกเลือด

Introduction

The prevalence of ischemic heart disease in hemodialysis patients is 10-20 times higher than general population, with 50% mortality. According to the US Renal data system, 42% of patients undergoing hemodialysis have had a myocardial infarction or coronary revascularization.

In non-uremic patients with suspected myocardial damage, the determination of CKMB and cardiac troponin-I has been shown to be reliable for early diagnosis and risk stratification. However, some literatures showed the controversy regarding their sensitivity and specificity in the patients with end stage renal disease (ESRD). Nonspecific elevation in uremic environment may occur. I undertook a study of baseline cardiac troponin-I and CKMB levels in asymptomatic ischemic heart patients who received the maintenance hemodialysis, and effect of high flux dialysis on the range of reading. Correlation of gender, underlying DM, BMI and adequacy of hemodialysis with pre-hemodialysis CKMB and cardiac troponin-I levels was analyzed.

Subject and method

This is a cross sectional study of 40 ESRD patients who received maintenance hemodialysis in

Ratchaburi hospital for at least 3 months. Age, gender, underlying DM, adequacy of hemodialysis (Kt/V urea) and BMI were evaluated in each patient. None had had an acute cardiac event requiring admission to the hospital during the preceding month. Pre and post hemodialysis venous blood was analyzed for CKMB and cardiac troponin-I level (access immunoassay system). Values were showed as mean \pm SD. Baseline pre and post hemodialysis cardiac markers (cardiac troponin-I and CKMB) and other univariate analysis were statistic analysed by t-test. Statistical significance was assumed for p-value < 0.05 . In this study, the cut-off valued for cardiac troponin-I was 0.05 ng/ml and 5ng/ml for CKMB. Correlation of prehemodialysis troponin-I and CKMB with gender, underlying DM, BMI, and Kt/V were also analyzed.

Definition

1. High flux dialysis is defined as dialysis therapy which dialyzer has ultrafiltration coefficient (Kuf) > 15 mL/hr/mmHg, vitamin B12 clearance > 100 mL/min and patient blood flow rate ≥ 350 mL/min, dialysis flow rate ≥ 700 mL/min

2. Kt/V urea = $-\ln (R-0.03) + [(4-3.5R) \times (UF/W)]$

- R = postdialysis BUN/predialysis BUN
UF = ultrafiltration volume (L)
BW = postdialytic weight (kg)
3. BMI = BW(kg)/height(m.)²
4. Obesity is defined as BMI \geq 30 kg/m²

Results

There were 40 ESRD patients included in this study. Mean age was 62.3 years, which range from 18 to 88 years. 21 of 40 were female. 23 had the underlying disease of diabetes. Mean BMI was 22.56, with standard deviation of 3.33. Mean Kt/V was 3.7, with standard deviation of 0.69.

Table 1 Baseline pre-hemodialysis cardiac troponin-I and CKMB level in male and female

	male	female	p-value
Troponin I (mean \pm SD)	0.052 \pm 0.129	0.019 \pm 0.157	0.27
CKMB (mean \pm SD)	3.44 \pm 2.43	4.57 \pm 7.37	0.52

Table 2 Baseline pre-hemodialysis cardiac troponin-I and CKMB level in the patients who had the Kt/V less than 3.6 and more than 3.6

	Kt/V < 3.6	Kt/V \geq 3.6	p-value
Troponin I (mean \pm SD)	0.054 \pm 0.133	0.011 \pm 0.018	0.14
CKMB (mean \pm SD)	5.24 \pm 7.43	2.51 \pm 1.46	0.11

Table 3 Baseline pre-hemodialysis cardiac troponin-I and CKMB level in the obese and nonobese patients

	BMI < 25 (nonobese)	BMI \geq 25 (obese)	p-value
Troponin I (mean \pm SD)	0.039 \pm 0.112	0.015 \pm 0.019	0.25
CKMB (mean \pm SD)	3.19 \pm 2.45	7.38 \pm 11.76	0.35

Table 4 The correlation between pre and post hemodialysis cardiac markers in hemodialysis patients (non diabetes patients)

	predialysis	postdialysis	p-value
Troponin I (mean \pm SD)	0.0345 \pm 0.10	0.035 \pm 0.10	0.75
CKMB (mean \pm SD)	4.03 \pm 5.70	4.11 \pm 5.61	0.45

Table 5 The correlation between pre and post hemodialysis cardiac markers in diabetes patients

23 diabetes patients	predialysis	postdialysis	p-value
Troponin I (mean \pm SD)	0.048 \pm 0.13	0.050 \pm 0.13	0.75
CKMB (mean \pm SD)	5.18 \pm 7.29	5.27 \pm 7.14	0.60

Discussion

Biochemical markers of myocardial necrosis had been reported to be nonspecific elevation in uremic patients, leading to the question about their usefulness for diagnosis of acute myocardial infarction in hemodialysis patients. Increased level of CKMB can occur in skeletal myopathy and reduced clearance in ESRD patients. Some reports indicated that cardiac troponin-I was less likely to be nonspecific elevation in uremic patients. This cross sectional study was designed to evaluate baseline level of cardiac troponin-I and CKMB, and effect of high flux hemodialysis on its level in these patients. In this study, baseline cardiac troponin-I and CKMB were below significant level in the majority of subjects. Four patients had pre-hemodialysis cardiac troponin-I level above the cut-off value compared to eight patients with highly significant CKMB. Only two patients had both troponin-I and CKMB above the cut-off value. This group of patients who had cardiac markers above baseline level may be due to silent ischemia or endothelial dysfunction and may be related to long term prognosis indicator and need further and larger study. No correlation of baseline pre-hemodialysis cardiac troponin-I and CKMB level with gender, BMI, adequacy of hemodialysis and underlying DM. According to high flux dialysis, this

study does not show its significant effect on pre and post hemodialysis cardiac markers. It may indicate that either pre or post ESRD hemodialysis patient can use normal cut-off value as general population.

Summary

This study shows that we can use normal cut-off value of cardiac troponin-I and CKMB for diagnosis acute myocardial injury in end stage renal patients who received maintenance hemodialysis. More patients had baseline CKMB level above significant level when compared to cardiac troponin-I. Cardiac troponin-I may be preferable to CKMB. High flux hemodialysis had no significant effect on cardiac troponin-I and CKMB level. Longer follow up period for the patients who had elevated cardiac markers level would evaluate the usefulness of these markers as long-term prognosis indicator.

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