Original Article

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Cardiopulmonary Bypass Induced Inflammation in Patients with Stable Angina

Stabil Anginası Olan Hastalarda Kardiyopulmoner Bypass'ın Yol Açtığı İnflamasyon

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Abstract

Purpose: In this study, we aimed to investigate the relationship of cardiopulmonary bypass (CPB) time and PTX3 and TNFα levels in patients with stable angina.

Material and Method: For this purpose, we evaluated 92 patients aged 44-73 years with diabetes mellitus and stable angina of IHD 2-3 functional class who attended the Central Hospital of Oil Workers. PTX3, TNF(levels before and 8 and 24 hours after coronary artery bypass surgery were recorded in all patients.

Results: The results showed that PTX3 levels 24 hours after coronary artery bypass surgery increased in patients with CPB time up to 120 minutes. This dynamic change is characterized by the negative character after the CPB time exceeds 120 minutes. The results also showed that there is straight positive correlative relationship between the TNFα level in the blood and the time of CPB.

Discussion: All these indicate that the learning of PTX3 and TNFα level in the blood of patients who have coronary artery bypass surgery may be prognostic significance. *Turk Jem 2014; 2: 44-46*

Key words: Coronary artery bypass surgery, cardiopulmonary bypass, inflammatory mediators

Özet

Amaç: Biz bu çalışmada stabil angina nedeni ile koroner bypass cerrahisi olan hastalarda, bypass süresi ile kan PTX3 ve TNFα düzeylerinin arasındaki ilişkiyi değerlendirmeyi amaçladık.

Gereç ve Yöntem: Bunun için, Petrol İşçileri Merkez Hastanesi'nde takip edilen, yaşları 44-73 arasında olan, diyabetik ve stabil anjinası olan, IHD sınıflandırmasına göre fonksiyonel sınıfı 2 3 olarak saptanan ve kardiyopulmoner bypass cerrahisi uygulanan 92 hastayı değerlendirdik. Ayrıca tüm hastalardan koroner bypass öncesinde ve sonrasındaki 8 ve 24. saate PTX3 ve TNFα düzeyleri değerlendirildi.

Bulgular: Elde edilen sonuçlar, kardiyopulmoner bypass süresi 120 dakikayı bulan hastalarda 24. saat PTX3 düzeyinin yükseldiğini gösterdi. Süre 120 dakikayı aştığında bu dinamik değişikliğin negatif yönde olduğu izlendi. Sonuçlar ayrıca kardiyopulmoner baypas süresi ile TNFα düzeyi arasında pozitif ilişki olduğunu gösterdi.

Tartışma: Tüm bu sonuçlar koroner arter bypass cerrahisi geçirenlerdeki PTX3 ve TNFα düzeylerinin saptanmasının prognostik önemi olabileceğini göstermektedir. *Turk Jem 2014; 2: 44-46*

Anahtar kelimeler: Koronar arter bypass cerrahisi, kardiyopulmoner bypass, inflamatuar mediatörler

Introduction

Inflammatory reactions and inflammatory factors in the blood vessels have an important role in the formation of atherosclerosis. Chronic inflammatory reactions in endothelial layer of arteries cause to the formation of asymptomatic plaques. As a result, all of these lead to the plaque ruptures and ischemic heart disease (IHD) (1). The role of inflammatory mediators in the formation of IHD and their prognostic significance in the vessel injuries are studied widely in recent years. The increase of level of atherosclerotic biomarkers as C-reactive protein, pentarxin 3 (PTX3) and tumor necrosis factor (TNFα) in the blood and their increase cardiovascular events were indicated in numerous researches (2,3,4,5,6). PTX3 is similar to C-reactive protein for its structural and functional characteristics, but in contrast to it PTX3 is synthesized by macrophages, endothelial cells in the inflammatory place not in the liver (7). The synthesized PTX3 by accumulating in the neutrophil granules leap to the blood due to the impact of any irritative factors and its level in the blood increases sharply (8). In addition to the increase of PTX3 level in the blood the irritative factors also cause to increase TNFα level. PTX3 and TNFα level reaching peak level in a short period unlike the C- reactive protein during the myocardial infarction confirms

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the high sensitivity of PTX3-in vessel injuries (2). The cause of using cardiopulmonary bypass (CPB) apparatus during coronary artery bypass surgery to the emergence of inflammatory reactions was shown in some studies (9). But the mutual relation between the time of CPB used during the coronary artery bypass surgery and the levels of inflammatory mediators in the blood in patients with stable angina was not studied. By taking into account all of these we decided to study the mutual relation between PTX3 and TNFα levels in the blood and the time of CPB used during the coronary artery bypass surgery on the patients with stable angina.

Materials and Methods

For this purpose in Central Hospital of Oil Workers, 92 patients between the age of 44-73 with diabetes mellitus with stable angina of IHD 2-3 functional class were examined. Coronary artery bypass surgery in patients involved in the study process was carried out. During the operation the CPB time was recorded in all patients. Also in a blood sample taken (Central Hospital of Oil Workers, GenLab laboratory, Human, ELISA kit) from all the patients before and after 8, 24 hours of coronary artery bypass surgery PTX3, TNFα levels were recorded. For conducting the statistical analysis of the results "Statistics"-computer packet was used. For comparison and determination of reliability of distinctions quantitative values in groups Uilkokson (Mann-Whitney's) nonparametric criterion was used. Calculations were carried out by means of the MS EXCEL program.

Results

The analysis of the study results showed that, after 24 hours of coronary artery bypass surgery the PTX3 level in the blood were high in the patients whose CPB time is between 61-120 minutes ($p<0.05$). In the blood of patients whose CPB time is more than 120 minutes the PTX3 level is lower in comparison with the patients whose CPB time is between 61-120 minutes.

After 24 hours of surgery in the blood of patients whose CPB time is more than 120 minutes the PTX3 level was lower in comparison with the ones whose CPB time is between 61-120 minutes. The mutual relation between PTX3, TNFα level in the blood and the time of CPB was shown in (Table 1 and Figure 1 and 2).

Also the interaction between the increase of CPB time and TNFα level was observed. The obtained results showed that the highest TNFα level in the blood after 8 and 24 hours of surgery was observed in the patients whose CPB time was more than 120 minutes. ($p>0.05$). At the same time TNFα level was higher in the blood of patients whose CPB time is between 61-120 minutes in compariosn with the patients whose CPB time is lower than 60 minutes. But these changes were not statistically significant. The interaction between TNFα level in the blood and CPB time was shown in (Figure 2).

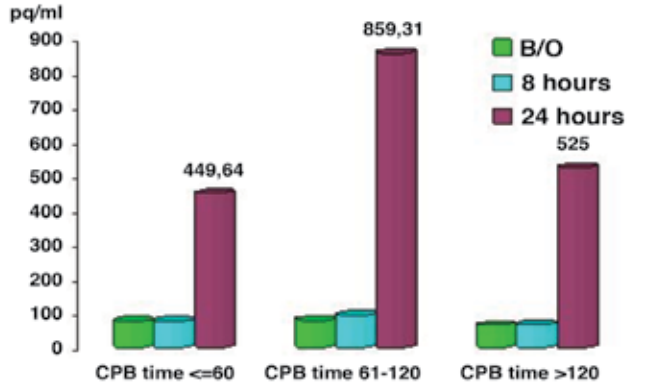

Figure 1. The mutual relation between PTX3 level in the blood and the time of cardiopulmonary bypass

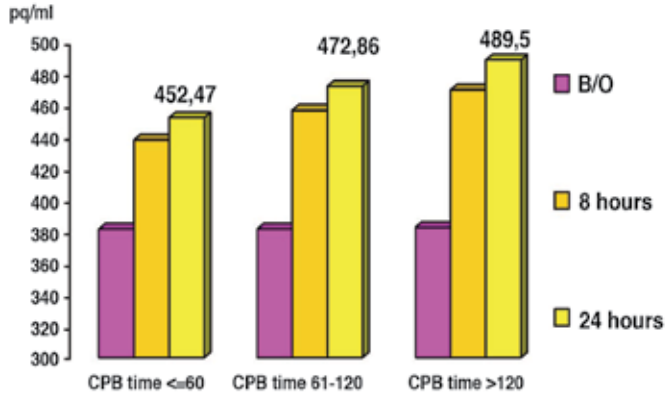

Figure 2. The interaction between TNFα level in the blood and the time of cardiopulmonary bypass

Table 1. The mutual relation between PTX3 and TNFα level in the blood and the time of cardiopulmonary bypass (M±m (min-max))

Pump duration	PTX3, pq/ml, M±m (min-max)			TNFα, pq/ml, M±m (min-max)		
	Before surgery	8 hour	24 hour	before surgery	8 hour	24 hour
≤60 (n=7)	78.0±0 (78-78)	78.0±0 (78-78)	449.6±98.3 (78-913.5) ***	318.6±42.6 (261-582)	470.1±93.7 (270.5-1002)	472.9±94.1 (293.5-1000)
61-120 (n=38)	78.9±8.2 (39-328)	94.0±12.4 (39-396)	859.3±74.2 (187-2185) *** ^	381.2±31.4 (189-954.5)	438.3±37.3 (228-1019)	452.5±41.7 (201-1045)
>120 (n=4)	65.0±13.0 (39-78)	67.3±10.7 (46-78)	525.0±247.3 (78-932)	392.8±71.9 (270-519)	467.3±55.7 (385-573.5)	489.5±142.1 (321-772)

Note: 1. Compared before surgery : *** - p0<0.001, 2. Compared with pump duration ≤60 : ^ - p<0.05

Discussion

The analysis of obtained results showed that PTX3 level in the blood after 24 hours of coronary artery bypass surgery is changed with increasing dynamics in the patients whose CPB time is up to 120 minutes. The patients whose CPB time is between 61-120 minutes PTX3 level in the blood after 24 hours of coronary artery bypass surgery was 859.31±61.4 pq/ml ($p<0.05$). This dynamic change is characterized by the negative character after the CPB time exceeds 120 minutes.

The patients whose CPB time exceeds 120 minutes, PTX3 level in the blood after 24 hours of coronary artery bypass surgery was 525.0±31.3 pq/ml.

The results also showed that there is straight positive correlative relationship between the TNFα level in the blood and the time of CPB. The patients whose CPB time exceeds 120 minutes, TNFα level in the blood after 24 hours of coronary artery bypass surgery was highest 489.5±23.7 pq/ml. There are small number of studies in the literature related to this subject. So that, the impact of CPB on PTX3 level in the blood of patients who have artery bypass surgery was learned in the research conducted by Kunes and his contributors. The results showed that the use of artificial blood circulation apparatus in the patients with coronary artery bypass surgery causes to the increase of PTX3 level in the blood (9). The main part of the research conducted by us which awakens interest is the observation of negative dynamics in the PTX3 level in the blood after 24 hours of surgery in the patients whose CPB time is more than 120 minutes. This shows the influence of the increase of CPB time to the response reaction of organism in the level of inflammatory mediators. At the same time the increase of TNFα level in the blood of patients whose CPB time is more than 120 minutes indicates the negative impacts of artifical blood circulation apparatus on the organism. It is known that the complications after the surgery becomes more in the patients with coronary artery bypass surgery whose CPB time becomes longer. All these indicate that the learning of PTX3 and TNFα level in the blood of patients who have coronary artery bypass surgery may be prognostic significance.

Conflicts of Interest

There are no conflicts of interest.

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