Evaluating the frequency of postoperative fever in patients with coronary artery bypass surgery

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Abstract

BACKGROUND: Nowadays, coronary artery bypass graft (CABG) is a frequent surgery in treatment of coronary artery disease. According to high expense of this surgery and its important role in patients' quality of life, high survival rate of patients and success of surgery are necessary. The aim of this study was the evaluation of fever incidence (febrile events) due to incidence of pneumonia, wound infection, bacteremia, urinary tract infection and inflammatory response without infection after CABG.

METHODS: In an intergrades descriptive-analytical study, 107 patients who underwent coronary artery bypass graft (CABG) were enrolled in the study. The patients then were examined by the febrile events and also their characteristics including age, sex, duration of surgery, underlying diseases, and frequency distribution of antibiotics consumptions in pre-surgical and postsurgical periods, and incidence of infectious syndromes.

RESULTS: Frequency distribution of febrile events after CABG was 29.9 percent. The most common administered antibiotic before the surgery was cephalothin (Keflin) and then, cefazolin. The most common administered antibiotic after the surgery was cephalothin (Keflin) and cephalexin (47.7%) and then, cephalothin-gentamicin-cephalexin (31.8%). The average age of patients without febrile syndrome was 60.53 years and in those with febrile syndrome was 59.31 years. In terms of gender, 74.8% of the patients were males. So that 32.5% of males and 22.2% of females had fever. The incidence time of fever in most cases was in the postoperative fourth day. In terms of underlying diseases, 13 percent of them had hypertension and hyperlipidemia, 14 percent had only hypertension, 11.2 percent had only hyperlipidemia and 6.5 percent had diabetes.

CONCLUSION: This study showed that the prevalence of fever in patients undergoing CABG was 29.9 percent and the most common cause of fever was sternal infections. There was a significant correlation between administered antibiotics in preoperative and postoperative periods and febrile syndrome.

Keywords: Antibiotic, Infection, Coronary Artery Bypass Graft, Fever.

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Introduction

Today, coronary artery bypass graft (CABG) is considered as one of the techniques of surgery for helping patients with coronary artery disease.[1] The aim of this surgery was to treat and increase lifetime of patients who were not able to have normal activity due to coronary artery disease. Although the necessity of conducting this surgery has been proven, some subsequent infectious complications, identifying inflammations and the complications that frequently occur in postoperative period as well as controlling inflammation and infection after surgery properly which itself can be emerged in various forms and can have significant effect in postoperative complications after CABG are of high importance.[2]

For example, the onset of fever is the most important factor to evaluate postoperative fever including immediate fever, acute fever, subacute fever and delayed fever.

Differential diagnosis of fever is based on postoperative causative factors including infectious and non-infectious causes. For instance, patients who have been in hospital for a short time before the surgery would be more infected with normal flora of his body (usually at the wound site). Provided that patient has been hospitalized for a long time and

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broad spectrum antibiotics have been administered, he would be at risk of infection with antibiotic-resistant microorganisms. These microorganisms include methicillin-resistant bacteria, coagulase negative staphylococci, vancomycin-resistant staphylococcus aureus, enterococci and gram-negative bacilli.[3] Examples of infectious causes are wound infection, pneumonia (particularly pneumonia associated with ventilator), urinary tract infections and intravascular catheters which are the most common causes of postoperative fever. Furthermore, postoperative viral infections are usually associated with transfusion of blood products (e.g., West Nile Virus).[4] The incubation period between transfusion and onset of this symptom is varied between 2-21 days. Rarely, postoperative viral infections such as ventilator-related pneumonia might be due to activation of hidden viruses such as cytomegalovirus and herpes simplex virus (HSV) especially in patients who are immunocompromised.[5]

Other causes of postoperative infection are sinusitis, otitis media, bacterial meningitis, prostatitis (caused by staphylococcus aureus), cholecystitis, toxic shock syndrome (caused by staphylococcus aureus).[6] Other causes such as medications, malignant hyperthermia, surgical wound site inflammation (such as seroma and hematoma), necrosis, pancreatitis, deep vein thrombosis, fat embolism (in post-trauma surgeries), myocardial infarction, stroke, subarachnoid hemorrhage, blood transfusion reactions, hyperthyroidism or acute adrenal insufficiency (thyroid storm), Addison's crisis and atelectasis can lead to postoperative non-infectious fever.[7]

Inflammatory responses are usually due to cardiopulmonary pump in CABG. Generally, CABG-related complications include mortality, infarction, and stroke, infections, requiring mechanical ventilation for a long time, acute renal failure, hemorrhage and inflammatory response.[8] This study aimed to find the prevalence of febrile events in patients after CABG surgery and also find the causes of febrile events in the study population.

Materials and Methods

The present study was conducted in anterograde descriptive-analytical method with simple sampling method in 107 patients admitted in Chamran Hospital undergoing coronary artery bypass graft since 23-09-2006. The patients were monitored during the hospitalization (postoperative-preoperative) period and if a patient was discharged with a good health status and admitted again due to fever, he/she re-referred to care system. The patients of this study were studied in terms of fever, infectious syndromes and antibiotic administration with a certain objective as well as febrile events according to age, sex, underlying disease and surgery duration. Sampling was done in simple sampling method. Information of each patient such as age, sex, date of surgery, existence of infections, syndrome of fever and its cause, and underlying disease as well as surgery duration and the type of received antibiotic before and after the surgery were recorded in the checklists.

Therefore, collected data entered in software $SPSS_{13}$ and were analyzed through descriptive statistics and also t-student and chi-square tests and $P < 0.05$ was considered significant.

Results

In this study, 107 patients underwent bypass coronary graft were studied in terms of underlying diseases as well as incidence of postoperative febrile events. Eighty males (74.8%) and 27 females (25.2%) were enrolled in this study and their mean age was 60.53 ± 9.42 years. The patients who underwent CABG were evaluated in terms of underlying disease. 20 patients (18.7%) had no underlying disease, 14 (13%) had diabetes-hypertension and hyperlipidemia, 12 patients (11.2%) had hyperlipidemia and 11 patients (10.2%) had hypertension-hyperlipidemia.

Table 1 illustrates the frequency distribution of febrile events after CABG. In this study, the incidence of fever was 29.9 percent and among them 20.6 percent (i.e., 22 patients) had systemic inflammatory response symptoms (SIRS), 0.9 percent (1 patient) had pneumonia, 0.9 percent (1 patient) had urinary tract infection, 3.7 percent (4 patients) had superficial and deep sternal infection, 1.9 percent (2 patients) had atelectasis, 0.9 percent had diarrhea (1 patient), 0.9 percent had vein harvest site infection, 0.9 percent had deep sternal infection along with atelectasis (1 patient) and 0.9 percent had superficial sternal infection, urinary tract infection and pneumonia simultaneously. Moreover, totally 4.6 percent of the subjects had sternal infection and vein harvest site infection.

Out of 107 cases, 1 did not receive prophylactic antibiotic before CABG, 64 (59.8%) received cephalothin (Keflin) and 39 cefazolin; i.e., in 103 patients (96.2%), the antibiotic prophylaxis was first-generation cephalosporin. The rest had other antibiotics such as ceftriaxone, cefazolin and gentamicin which totally included 2.7% of the entire prophylactic antibiotic regimen administered. Out of 75 patients who did not suffer from fever, 59 patients (78.7%) received cephalothin prophylactic regimen.

Table 2 illustrates the frequency distribution of received antibiotics after CABG. According to this

study, 51 patients (47.7%) received cephalothin (Keflin) and cephalexin and 34 patients (31.8%) received cephalothin-gentamicin-cephalexin regimen.

In this part of the study, frequency distribution of febrile events was evaluated. For instance, in diabetic patients, 6 cases did not suffer from fever (5.7%) whereas 1 had fever due to inflammatory response.

In this study, the mean age of patients with febrile syndrome was evaluated compared to those without fever. The mean age of those without febrile syndrome was 60.53 years (75 patients) and the mean age of those with febrile syndrome was 59.31 years (32 patients). Out of 75 who had no fever (70.1%), 38 patients (35.5%) aged 40-60 years and 37 ones (34.5%) aged over 60 years. Besides, out of those who suffered from inflammatory response and related fever (22 patients or 20.6%), 12 patients (11.2%) were in the age group of 40-60 years and 10 ones (9.4%) in the age group of over 60 years. Frequency distribution of febrile events was evaluated in terms of sex. 26 males and 6 females (25% and 5.6%, respectively) had fever. However, 54 males and 21 females (50.5% and 19.6%, respectively) had no febrile complication.

Table 1. Frequency distribution of febrile events separated by reason after CABG

Febrile events	Number	Percent
No fever	75	70.1
Inflammatory response with no infection	22	20.6
Urinary tract infection	1	0.9
Vein harvest infection	1	0.9
Diarrhea	1	0.9
Pneumonia	1	0.9
Deep sternal infection	2	1.9
Atelectasis	2	1.9
Deep sternal infection, atelectasis	1	0.9
Superficial sternal infection, urinary infection, pneumonia	1	0.9
Total	107	100

Table 2. Frequency distribution of received antibiotics in postoperative CABG

Received antibiotics after CABG	Number	Percent
Cephalothin (Keflin)-Cephalexin	51	47.7
Cephalothin (Keflin)-Gentamicin	2	1.9
Ceftriaxone-Cefixime	1	0.9
Ceftriaxone-Vancomycin	1	0.9
Cefazolin-Gentamicin	1	0.9
Cephalothin-Cephalexin-Ceftriaxone	1	0.9
Cephalothin-Cephalexin-Gentamicin	34	31.8
Cephalothin-Ciprofloxacin-Gentamicin	1	0.9
Cephalothin-Cefixime-Gentamicin	2	1.9
Ceftriaxone-Vancomycin-Cephalexin	1	0.9
Cephalothin-Cephalexin-Ciprofloxacin	1	0.9
Cephalothin-Cephalexin-Ceftriaxone-Gentamicin	2	1.9
Cephalothin-Cephalexin-Ceftriaxone-Vancomycin	1	0.9
Cephalothin-Ceftriaxone-Gentamicin-Cefixime	3	2.8
Cephalothin-Ceftriaxone-Gentamicin-Vancomycin	1	0.9
Ceftriaxone-Cefixime-Cefazolin-Gentamicin	1	0.9
Cephalothin-Cephalexin-Ceftriaxone-Gentamicin-Imipenem	1	0.9
Cephalothin-Cephalexin-Ceftriaxone-Gentamicin-Amikacin	1	0.9
Ceftriaxone-Imipenem-Ciprofloxacin-Amphotericin B	1	0.9
Total	107	100

Discussion

The results of this study showed that the incidence of fever is a relatively common phenomenon in patients undergoing CABG. In addition, it was indicated that after the surgery, the patients who suffered from infective syndrome purposefully were treated with antibiotics. Besides, there was no correlation between relative frequency of febrile syndrome, gender, age and underlying diseases. 74.8 percent of the patients had pleural effusion and according to chi-square test, there was no significant correlation between pleural effusion and febrile syndrome.

In a study in Norway in 2011, it was indicated that totally, out of 2440 heart surgery, 5.1 percent had sternotomy infection and 8.9 percent had intravenous infection.[9]

In reviewing frequency distribution of febrile events in postoperative CABG in this study, 3.7 percent of patients had superficial and deep sternal infection which was more common than other infectious causes of fever. In other studies also, wound infection had been reported as one of the causes of fever after CABG.[10,11] In another study, the prevalence of sternal wound infection was 2.6% [12] although apparently deep sternal infection related to mediastinitis in 1-2% of cardiac surgeries such as CABG had been reported.[13] In the study of Olsen et al., the frequency of deep and superficial infection reported to be 1.9% and 2.3%, respectively[14]; 2 patients (1.9%) had urinary tract infection (UTI), two patients (1.9%) had pneumonia, and 3 (2.8%) had atelectasis. In other studies also, UTI had been mentioned as the second cause of infections after CABG and pneumonia as the third cause.[15,16] However, no association was found between atelectasis and postoperative fever.[17]

The results of the present study showed that the incidence of febrile events in the studied population was less than that in other countries so that 20.6% had fever resulted from inflammatory response with no clear infectious origin and 29.9% had fever with non-infectious inflammatory response whereas in other studies, 89% had postoperative fever.[18]

In this study, the most common administered antibiotic before the surgery was cephalothin (Keflin) and then, cefazolin. Chi-square test showed a significant correlation between postoperative CABG febrile events and prophylactic antibiotic before the surgery. This result had been also obtained in other studies; thus, prophylaxis has a very important effect on postoperative CABG infection.[19]

According to chi-square test, there was a significant correlation between administered antibiotic after CABG in patients with febrile or infectious syndrome. That means after CABG, the patients who had infectious syndrome purposively underwent treatment with antibiotic; i.e., in purposeful antibiotic administration, the rate of patients with fever was lower than that in those who had not been treated purposefully.

Furthermore, in this study, according to chi-square test, there was a significant correlation between underlying disease and febrile or infectious syndrome.

The limitation of this study was lack of postoperative blood culture, before starting the treatment with antibiotics.

Conclusion

Given that febrile events are inevitable after CABG, purposeful administration of antibiotics is recommended.

Conflict of Interests

Authors have no conflict of interests.

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