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Postoperative fever in patients of the Cardiocentro Ernesto Che Guevara

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ABSTRACT

Introduction: Fever is one of the difficulties that appear in the postoperative period.

Objective: To characterize the incidence of postoperative fever in cardiovascular surgery.

Method: Observational, descriptive, longitudinal, prospective study in 31 patients with fever in the postoperative period.

Results: Of all patients undergoing cardiovascular surgery, 15.6% (31 cases) had postoperative fever; and it had a septic cause in 20 of them. It appeared more frequently in males (74.2%), after two-valve surgery or coronary artery bypass grafting (67.7%) and in the 30-49 years age group (48.9%). Pleural (29.0%) and pericardial effusion (19.4%), and pulmonary inflammatory lesions (25.8%) were more commonly found; most patients had 2 central venous catheters (77.4%) and had been with bladder catheter (51.6%) or arterial line (48.4%) for more than three days. Metamizol was administered to 87.1% of patients, 58.1% received antimicrobial drugs and a sample for blood culture was taken in 25.8% of them. *Pseudomonas* and *Acinetobacter* were the germs most commonly found, and the outcome was satisfactory in most cases (only 1 patient died).

Conclusions: The frequency of postoperative fever in cardiovascular surgery was not high. There was a predominance of male patients, in the 30-49 years age group, with complex surgery. Pleural and pericardial effusions were more commonly found, as well as the use of multiple invasive procedures. Blood culture was useful in determining the cause of fever, and the type of germ. Most patients had a satisfactory outcome.

Key words: Fever, Postoperative period, Heart surgery

Fiebre postoperatoria en pacientes del Cardiocentro Ernesto Che Guevara

RESUMEN

Introducción: La fiebre es una de las dificultades que se presentan en el período posquirúrgico.

Objetivo: Caracterizar la incidencia de fiebre en el postoperatorio de cirugía cardiovascular.

Método: Estudio observacional descriptivo, longitudinal, prospectivo, en 31 pacientes con fiebre en el postoperatorio.

Resultados: Un 15,6 % del total de pacientes operados de cirugía cardiovascular (31 casos) presentó fiebre en el postoperatorio y en 20 de ellos la causa fue infecciosa. Apareció más frecuentemente en el sexo masculino (74,2 %), tras cirugía de dos válvulas o de revascularización miocárdica (67,7 %), y en el grupo etario de 30-49 años (48,9 %). Fueron más encontrados los derrames pleurales (29,0 %) y pericárdicos (19,4 %), y las lesiones inflamatorias pulmonares (25,8 %); la mayoría de los enfermos tenían colocados 2 catéteres venosos centrales (77,4 %) y llevaban más de tres días con sonda vesical (51,6 %) o línea arterial (48,4 %); al 87,1 % de los pacientes se le administró metamizol, al 58,1 % antimicrobianos y al 25,8 % se le tomó muestra para hemocultivo. Los gérmenes más encontrados fueron la pseudomona y el acinetobácter y predominó la evolución satisfactoria (solo 1 paciente fallecido).

Conclusiones: La frecuencia de aparición de la fiebre en el postoperatorio de cirugía cardiovascular no fue elevada y predominó en hombres, entre 30 y 49 años de edad, con cirugía compleja. Fueron más encontrados los derrames pericárdico y pleural, así como la utilización de varios procedimientos invasivos. El hemocultivo fue útil para determinar la causa de la fiebre y el germen. La mayoría de los pacientes evolucionó satisfactoriamente.

Palabras clave: Fiebre, Período postoperatorio, Cirugía cardíaca

INTRODUCTION

Postoperative fever is the elevation of body temperature after some surgical procedure[1,2]. How often it is present depends on the type of surgery; for instance, in orthopedics, it varies from 39 to 100% of cases; in gynecology, it is approximately 40%, and in abdominal surgery, is less than 10%[3].

Information on the frequency of postoperative fever in cardiovascular surgery is limited, and the results are different. So far, frequencies ranging from 12 to 73% have been described[3]. Furthermore, there does not seem to be a consensus as to the time of its onset; while some authors consider it is after the first 48 hours following surgery, others state it appears on the sixth day of the postoperative[4].

Several studies have investigated the causes related to the onset and duration of postoperative fever. In general, it is considered that its presence is associated with aspects such as metabolic response to surgical trauma, duration of surgery, accumulation of blood in closed spaces, insertion of drainage tubes, drugs administered during the perioperative period and infections[2-4]. For some authors, the inflammatory response subsequent to surgery is the main factor associated with postoperative fever[1]. In cardiovascular surgery, this type of fever has been generally linked to the use of the heart-lung machine for cardiopulmonary bypass, hypothermia, postperfusion syndrome, as well as to infections, blood transfusions, dehydration and atelectasis[1-3].

Nosocomial infections involve serious complications in the postoperative of cardiovascular surgery, which are associated with high morbidity, prolonged hospital stay and increased costs; for this reason a good prophylaxis and an early diagnosis are very important[5].

Because the information on this subject is limited, and considering the difficulties faced by doctors to determine the cause of fever in the postoperative of cardiovascular surgery, it was decided to conduct this study to characterize its incidence at this stage.

METHOD

Patients and type of study

An observational, descriptive, longitudinal, prospective study was conducted with the 31 patients who had

fever and had undergone cardiovascular surgery at the Cardiocentro Ernesto Che Guevara in Santa Clara, Cuba, from October 2012 to March 2013.

The study patients were selected by intentional sampling from a population of 198 patients who underwent cardiovascular surgery in the above mentioned period.

Temperature was controlled in all patients who underwent surgery. It was measured continuously in the intensive care and hospitalization wards, a process that ended at the time of hospital discharge.

Patients who met the selection criteria were strictly controlled from the moment that fever appeared, until its disappearance and their discharge.

The data of each variable, obtained from medical records, were collected in special formats devised for that purpose.

Variables

The study variables included: age, sex, personal medical history, type of surgery, invasive procedures, time of onset and duration of fever, clinical findings and complementary tests, therapeutic approach, isolated germs and patients' outcomes.

Statistical analysis

The data were included in the SPSS version 13.0. Tables and diagrams were devised and statistical tests analyzing the measures of association between the variables were conducted. From the inferential point of view, Chi square test (χ^2) was used to test the independence between variables. However, this is a descriptive study where the frequency distribution predominates.

Fever

It was defined as an axillary temperature ≥ 38 °C at any time after surgery, in two or more occasions over a period of 24 h.

RESULTS

It was found that 31 patients had fever in the postoperative of cardiovascular surgery, which represents 15.6% of all patients undergoing surgery in this period (**Table 1**). The most affected patients were those with double valve replacement or coronary artery bypass surgery (67.7%), those aged 30-49 years (48.4%) and males (74.2%).

Fever appeared in the first hours after surgery in 4 patients, and in 5 the second day. In total, there were 26 patients (83.9%) who had fever in the first 72 hours after surgery (**Table 2**). Between the fourth and the

Table 1. General distribution of patients with fever in the postoperative period of cardiac surgery at the Cardiocentro Ernesto Che Guevara. October 2012 - March 2013.

Patients with fever (n=31)	Nº	%
DVR or MR without CPB	21	67.7
Age group 30-49 years	15	48.4
Males	23	74.2

Source: Archive of the Department of Statistics and Register of patients in the Intensive Care Department
Legend: DVR, double valve replacement; MR, myocardial revascularization; CPB, cardiopulmonary bypass

Table 2. Distribution of patients according to the time of onset and duration of fever (n=31).

Time (days)	Nº	%
1 – 3	26	83.9
4 – 7	9	29.0
> 7	9	29.0

Table 3. Distribution of patients according to clinical findings and complementary tests (n=31).

Clinical and complementary findings	Nº	%
Shivers	3	9.7
Pleural effusion *	9	29.0
Inflammatory lesions*	8	25.8
Pulmonary edema*	3	9.7
Neutrophilia	3	9.7
Pericardial effusion	6	19.4
Anemia	4	12.9
Diarrhea	1	3,2
Dysuria	1	3.2
Abdominal pain	1	3.2
Surgical wound secretions	2	6.5
Jaundice	1	3.2

* On chest radiography

seventh day fever was detected in 9 patients (29.0%), and after the seventh day it was also found in 9 patients.

Table 3 shows the distribution of patients according to their clinical findings and complementary tests. The conditions most frequently associated with the occurrence of postoperative fever were pleural effusion (29.0%) and pericardial effusion (19.4%), pulmonary inflammatory lesions (25.8%) and anemia (12.9%). Similarly (**Figure 1**), it was found that the invasive procedures performed, the presence of two intravenous catheters (77.4%), and having a bladder catheter (51.6%) or an arterial line (48.4%) for more than three days were factors most associated with the presence of fever.

Metamizole was given to 87.1% of patients with fever (**Table 4**). Blood (25.8%) and respiratory secretions cultures (16.1%) were the most used to determine the cause of the fever, and more than half of patients (58.1%) required the use of antimicrobials.

Respiratory infections (35.5%), intravascular infections (22.6%) and those located in the surgical wound (9.7%) were the main causes of fever in these patients (**Table 5**). The most common isolated germs in nosocomial infections (**Table 6**) were *Pseudomonas aeruginosa*, which was present in about a third of respiratory infections (27.3%) and in 28.6% of intravascular infections, and *Acinetobacter baumannii*, which was present in 9.1% of respiratory sepsis and 28.6% of intravascular sepsis. Although *Staphylococcus aureus* was only isolated in two patients, it accounted for 14.3% of intravascular infections and a third (33.3%) of surgical wound infection.

In the study, 32.3% of patients had a satisfactory outcome without infectious complications, 1 patient (3.2%) died because of this, and 20 patients (64.5%) had a confirmed sepsis with a favorable outcome after treatment (**Figure 2**).

Figure 1. Invasive procedures performed and its relationship with the fever.

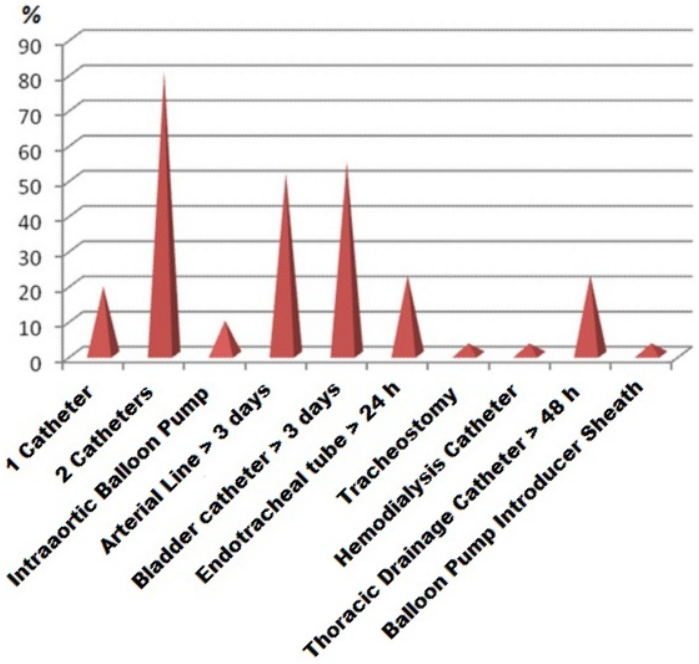


Table 4. Distribution of patients with fever according to the therapeutic approach and samples for culture (n=31).

Therapeutic approach and cultures	Nº	%
Use of metamizole	27	87.1
Use of diclofenac	2	6.5
Use of antimicrobials	18	58.1
Blood culture	8	25.8
Urine culture	3	9.7
Culture of respiratory secretions	5	16.1
Culture of surgical wound secretions	1	3.2
Culture of catheter tip	3	9.7

Table 5. Distribution of patients according to the site of infection (n=31).

Infectious complications	Nº	%
Respiratory	11	35.5
Intravascular	7	22.6
Urinary	1	3.2
Surgical wound	3	9.7
Endocarditis	1	3.2

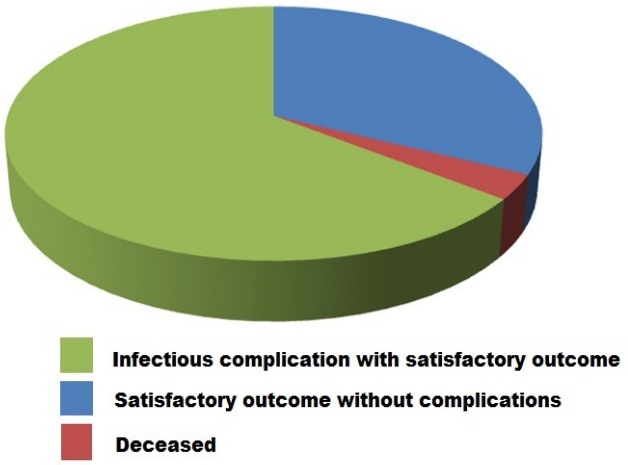
DISCUSSION

In this study, postoperative fever was found in 31 patients who underwent cardiovascular surgery, and only 20 of them had a proven infection. The majority of patients who presented fever in the first days of the

Table 6. Distribution of patients according to the isolated germs and the location of infection.

Isolated germ	Location of infection					
	Respiratory (n=11)		Intravascular (n=7)		Surgical wound (n=3)	
	Nº	%	Nº	%	Nº	%
Pseudomonas aeruginosa	3	27,3	2	28,6	0	0
Serratia marcescens	1	9,1	0	0	0	0
Acinetobacter baumannii	1	9,1	2	28,6	0	0
Staphylococcus aureus	0	0	1	14,3	1	33,3

Figure 2. Distribution of patients with fever according to their outcome.



Fuente: Archive of the Department of Statistics and Register of patients in the Intensive Care Department

postoperative period did not have infectious complications, and it disappeared within 72 hours, which is consistent with the normal response of the body to a surgical intervention[6,7].

Information on the frequency of postoperative fever in cardiovascular surgery is not uniform. The results are variable and so far frequencies between 12 and 73% have been described[3].

The literature on fever in adults after cardiac surgery reports a frequency of about 30%[3]. Villasís-Keever *et al*[3] found fever at some point after surgery in 46% of cases. Regarding the type of operation and the most affected age groups, our results agree with those of other autores[3,4], except concerning sex, where a prevalence of women has been reported[3-5].

There does not seem to be consensus on the time of onset of fever. While some authors consider it is more common at the beginning of the postoperative period, others state it is after the first 48 hours following surgery and some have found it on the sixth day of the postoperative[4].

These same authors[4] have found pleural effusions (78%), changes in ST segment and T wave (89%), and mediastinal widening in patients with fever after the sixth postoperative day, which is consistent with our results.

Moreover, Fariñas[1] showed that, in these patients, 75% of those who need manipulation of the urinary tract with a bladder catheter had bacteria in the urine, a figure that increased to 90% if the device was kept for more than 48 hours.

In our study, metamizol was used in almost all patients, but it is unclear whether the suppression of fever improves the results[6,7]; however, it is recognized that this drug is commonly used to treat pain and postoperative fever[8].

In a study of 38 surgical patients, in an Intensive Care Unit (ICU), who were randomized to external cooling or antipyretics, defervescence was comparable in both groups (although external cooling is considered ineffective because of the compensatory skin vasoconstriction may cause central heat retention)[7].

Although physical cooling measures are effective in reducing skin temperature when physiological thermoregulation mechanisms are altered, they do not lower the temperature of the thermoregulatory center and may increase the discomfort and metabolic stress in febrile patients who are not sedated. Suppression of fever with nonsteroidal anti-inflammatory drugs is more sensible, since it is regulated by the effect of prostaglandins on the hypothalamus, but their advantage has not been demonstrated, and the adverse effects of these drugs on gastric mucosa, on renal blood flow and on platelet aggregation may offset their beneficial effect in critical patients[7].

According Periáñez *et al*[9], in a study conducted by Barie, among 2,419 surgical patients, 625 (25.8%) had fever during their stay in the ICU, a higher percentage than that found in our study (15.6%). Barie's febrile

patients were sicker and older, and were more likely to develop organ dysfunction and to die. In only 46% of them an infectious cause was found, but 70% received antibiotics. Almost all of them had a systemic inflammatory response syndrome, and among these patients organ dysfunction was common.

Livelli *et al*[4] assessed the presence of fever from the sixth postoperative day and found an incidence of 73%, while only 22% of cases were due to infectious causes.

The guidelines for the treatment of infectious diseases in a hospital in Palma de Mallorca[9] suggest that the overall mortality rate from nosocomial infections was 18%, with significant variations depending on the site, ranging from 14% for respiratory infection to 4% for surgical wound infection, and that compared to uninfected patients, the risk of death is 5 times higher. In the literature, there are wide variations on the incidence of nosocomial infections in patients undergoing cardiac surgery. According Lola *et al*[10], in the European Study Group on Hospital Infections a prevalence of 26.8% of nosocomial infections was found in patients undergoing cardiac surgery; and in another study conducted by Fowler *et al* it was found an infection rate of 3.51% associated with a mortality rate of 17.3%.

According to Rodriguez-Baño[11], the infection of the saphenectomy incision occurs in 1-2% of patients, and the predisposing factors include obesity, peripheral vascular disease, diabetes mellitus and low cardiac output. Deniz *et al*[12] have published their incidence of infections after cardiac surgery in the following order: saphenectomy (20%), empyema (10%), and urinary tract sepsis (7%). Meanwhile, Lola *et al*[10], found an incidence of 14% of nosocomial infections with a mortality rate of 3%, and the primary infection was in the sternotomy (8%) due to *Staphylococcus epidermidis* (62.5%), *Enterococcus faecium*, *Acinetobacter baumannii* and *Pseudomonas aeruginosa*. These authors[10] found that diabetes mellitus was the main risk factor. They suggest that several researchers have shown that elevated blood glucose levels are associated with higher mortality rate, wound infection, hospital stay and costs. Mechanical ventilation for more than 48 hours and readmissions for any reason are also noted as risk factors.

Postoperative mediastinitis found by Snefjellå and Lappegård[13] was mainly caused by *Staphylococcus aureus*. In other studies[14,15], there is a predominance of Gram-positive bacteria (up to 77% of cases), mainly *Staphylococcus aureus* (50%), followed by Gram-negative bacteria (*Enterobacter*, 7-11%; *Serratia*, 7%; *Klebsiella*, 7%; *Enterococcus*, 5%); and others such as *Pseudomonas aeruginosa*, *Acinetobacter* (a highly virulent bacteria) and fungi (*Candida albicans*, and *Mycoplasma hominis*).

CONCLUSIONS

The frequency of postoperative fever in cardiovascular surgery was not high. There was a predominance of male patients, in the 30-49 years age group, with complex surgery. Fever appeared in response to sepsis, more frequently from the fourth day. Pleural and pericardial effusions were more commonly found, as well as the use of multiple invasive procedures (two intravenous catheters, arterial line, bladder catheter for more than 3 days). Blood culture was useful in determining the cause of fever and the bacteria. Most patients had a satisfactory outcome.

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