

Cardiogenic Shock Treated non-invasively in an Emergency Cardiology Center

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Abstract

BACKGROUND: Cardiogenic shock represents one of the most dramatic presentations in Emergency Cardiology and is most often caused by acute myocardial infarction. Shock complicates about 7% of and, despite recent progresses in investigations and treatment, mortality remains high, over 60-80%.

MATERIAL AND METHODS: The present study is an audit of the patients presenting with cardiogenic shock of different etiologies in our hospital, during the year 2003. About 10% of ST-elevation acute myocardial infarction presented with cardiogenic shock and 55.2% of the patients with shock had ST-elevation acute myocardial infarction. Although a tertiary reference center, the Cardiology Department of our hospital was still treating cardiogenic shock conventionally, non-invasively in 2003.

RESULTS: Under these circumstances, in-hospital mortality was extremely high, 89.6%. An analysis of cardiac predictors and risk factors, association with cardiac arrest, necessity of cardiopulmonary resuscitation, inotropic and ventilatory support and potential benefit of medical treatments is presented. Also accurate admitting diagnosis and selection of therapy is discussed.

CONCLUSION: Numbers presented are concordant with data in the literature and support change of strategy to rapid invasive therapy, according to actual guidelines. (Revista de Medicină de Urgență, Vol. 2, Nr. 1, 24-28)

Key words

cardiogenic shock, acute myocardial infarction, mortality

Introduction

Cardiogenic shock is defined as a syndrome characterized by tissue hypoperfusion caused by cardiac dysfunction, manifested as systolic BP < 90mmHg for at least one hour, associated with presence of cardiac dysfunction and arrhythmias and lack of response to administration of fluids and also with signs of peripheral hypoperfusion or cardiac index < 2.2 L/min and pulmonary capillary wedge pressure > 18 mmHg [1]. The most common cause of cardiogenic shock is acute myocardial infarction (AMI), but other causes can be encountered, as final-stage cardiomyopathy, severe acute or chronic valvular disease, myocardial contusion, myocarditis. Cardiogenic shock complicates about 7% of AMI, half of the patients presenting with shock on admission and the other half developing shock in the fol-

lowing course, mostly in the first 24-48 hours [2]. In-hospital mortality of cardiogenic shock is very high, varying between 50 and 80%. Decreased mortality was associated with early revascularization treatment in the SHOCK Registry [3-5] and also in other trials [6,7], using invasive methods as percutaneous angioplasty (PTCA) or surgery. However, it is difficult to study the whole population of patients presenting with cardiogenic shock, as the large trials published in literature present a selected population of survivors. In practice, many patients with cardiogenic shock present also with cardiac arrest in the first hours or die in the Emergency Room (ER) without getting admitted to the coronary intensive care units (ICCU) and so the real mortality is even higher. Fibrinolytic treatment is still controversial for patients with AMI and shock and appears to have no benefit [8-10], unless used in conjunction with intra-aortic balloon counterpulsation (IABC) [11-13]. Algorithms and strategies developed in the new guidelines after publication of the large trials as SHOCK and GUSTO-1 [6, 8, 14] appear to reduce mortality in cardiogenic shock complicating AMI, but timing and availability of treatments for this category of critical patients remain crucial and severity of in-hospital course cannot be over-emphasized. The present audit was designed to analyze the whole unselected population with cardiogenic shock presenting to an emergency center that is also a tertiary reference center of Cardiology in the year of 2003, treated conservatively and to determine accuracy of diagnosis and selection of therapies, in-hospital mortality and possible predictors of unfavorable prognosis.

Material and methods

The study was designed as a retrospective audit of the patients admitted via the Emergency Department in the Coronary Intensive Care Units (ICCU) with cardiogenic shock, in the year of 2003. To note our hospital was the center that received the largest number of acute coronary syndromes in Romania (more than 300 ST-elevation AMIs per year). The patients were selected by collecting from the admission registries of the 2 ICCU in the Cardiology Department all the patients that received parenteral inotropic support with dobutamine and/or dopamine during the year 2003. Patients admitted with the diagnosis of "cardiogenic shock" or "haemodynamical unstable" were also selected from the computerized database of the Emergency Department (ED). This selection produced a number of 81 patients and their hospital files were extracted from the archives, producing after analysis 29 patients (35.8% of the pre-selected categories) that fulfilled the diagnostic criteria for cardiogenic shock

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according to current guidelines [1, 8]. The files were included in an exhaustive Microsoft Access 2000 Database, consisting in clinical, paraclinical and treatment data and also the in-hospital course according to pre-specified codes. Post-mortem data were also included, when available. Data were processed using the statistics EpiInfo 2003 package, with uni-variate analysis (t-student and chi-square tests for small samples). Significance was considered for $p < 0.05$.

Results

We studied 12 women (41,4%) and 17 men (58,6%) with mean age 68.27 ± 11.14 years. Basic characteristics of the group are presented in table 1.

Table 1. Basic characteristics of the studied group.

Characteristic	No. of patients	No. of patients who died
Presence of coronary risk factors	24	22
Hypertension	15	15
Dyslipidemia	7	7
Smoking	10	10
Diabetes mellitus	8	8
Previous pulmonary hypertension	2	2
History of stroke	6	6
History of myocardial infarction	8	8

Looking at the risk factors, a 100% mortality was noted in diabetic patients (vs 83.3% in non-diabetic group). Presence of diabetes mellitus was therefore a negative predictive marker ($p < 0.05$) in studied patients with cardiogenic shock. To note the high prevalence of sequelae of myocardial infarction (MI), 1 in 3 patients, 5 patients having history of anterior MI and 3 history of multiple infarctions. Admitting symptoms in the ER is presented in figure 1. Diagnosis on admission was mostly acute coronary syndrome, frequently associated with acute heart failure. Figure 2 presents admission diagnosis, with predominance of ST-elevation AMI. However, a high percentage of patients (8 from 29) did not present with angina in the ER. Infarct localization based on admission ECG was anterior in 13 cases, circumferential in 9 cases, 4 inferior and 3 non-ST-elevation AMI. In 2 cases myocardial necrosis was confirmed only by biological markers, as ECG was non-interpretable (left bundle branch block or other). Admission ECG showed sinus rhythm in 10 patients, atrial fibrillation in 4, complete atrio-ventricular block in 4, and asystole in 5 cases. Ventricular tachycardia was also noted in 5 cases. Valvular heart disease was noted in 5 patients and only in one of them was pre-existent to cardiogenic shock. The rest associated acute valve disease as a complication of AMI.

Practically, the etiology of cardiogenic shock in the studied group was as follows:

- 24 out of 29 patients: acute myocardial infarction;
- 1 patient: mitral valve disease with severe pulmonary hypertension and bradycardia, low output syndrome evolving in cardiogenic shock;
- 2 patients: dilative cardiomyopathy, one presenting as sustained ventricular tachycardia and shock.

Admission ECG was also analyzed for ischemic changes and the results are presented in figure 3. Echocardiography was performed in emergency at bedside in 9 patients and was impossible in the rest of them due to severe pulmonary edema or very short survival. Out of 9 patients, 4 presented left ventricular aneurysm, 2 wall akinesis and 3 hypokinesia. In 2 patients intracardiac thrombosis was noted, no cardiac rupture was evident on echocardiography. Emergency coronary angiography was tempted in one patient 6 hours after developing shock, but was impossible due to severe dyspnea and haemodynamical unstable patient. The patient stabilized and angiography re-attempted on day 7, with ventricular fibrillation and subsequent death before femoral puncture.

In-hospital treatment is presented in its main aspects in table 2.

Table 2. Medication on admission or during hospitalization.

Drug	No. of patients	No. of patients who died
Adrenaline	22	20
Atropine	24	22
Amiodarone	6	5
Digoxin	3	3
Diuretics	14	12
Dobutamine	28	26
Dopamine	28	27
GIK solution	21	19
Thrombolysis with SK	5	4
Thrombolysis with tPA	1	1

Thrombolysis was administered in a small number of patients (6), although more than 50% of patients presented with ST-elevation AMI, because of prolonged unsuccessful resuscitation or late presentation. Only one patient presented signs of reperfusion, being one of the 3 survivors. Necessity of intubations and mechanical ventilation was exceptionally high: 15 (51.7%) of patients on presentation to hospital and other 9 (31.3%) after admission.

In-hospital course was extremely severe, with a mortality of 27,6% in the first 6 hours after admission (8 patients) and of 62.1% (24 patients) after the first 6 hours. Therefore, total mortality in the analyzed group was 89.6% (only 3 survivors in the group of 29). Cardiac arrest was frequently associated to cardiogenic shock, practically only 2 patients did not present cardiac arrest during hospitalization. Ten

patients (34.5%) presented with cardiac arrest in the MED. Other 7 patients arrested on the ICCU wards. In ten patients resuscitation failed. Cardio-pulmonary resuscitation (CPR) maneuvers are presented in figure 4. Hospitalization was less than 24 hours in 12 patients (41.4%), 2 days in 6 patients (20.7%) and over 5 days in only 6 patients (20.7%). Univariate analysis indicated the following predictors of in-hospital mortality in the studied group:

- necessity of adrenaline ($p=0.002$), respectively of atropine ($p=0.05$), basically the necessity to be resuscitated;
- presence of diabetes mellitus ($p=0.05$);

Out of 24 patients who died in hospital, only 4 underwent a post-mortem, due to request of the families, 2 of the post-mortems confirming myocardial necrosis.

Discussions

Despite a number of limitations related to the audit type of the study and its retrospective design, we believe that the presented data have the advantage of showing “real-life” data on a non-selected cardiogenic shock population in a center with un-availability of invasive approach at the time of the study and to emphasize the severity of such patients and the numerous difficulties related to their management. Practically, we could conclude that one in three patients admitted to hospital with the diagnostic criteria of cardiogenic shock was the survivor of resuscitated clinical death! The diagnosis of “cardiogenic shock” was the admitting diag-

nosis in 9 (31%) patients in whom cardiogenic shock was present according to definition on admission or was established later during hospitalization, so these patients were considered eligible for our audit.

Diabetes mellitus and necessity of CPR with use of inotropic and rhythm support as adrenaline and atropine were predictors of in-hospital death ($p<0.05$). CPR was ineffective from the start in 14 patients. The high mortality in our group, of 89.6%, is concordant with the literature data [15, 16, 17] and is higher than the one communicated by studies like the SHOCK Registry (3), in which patients were randomized to invasive versus conservative management. Our patient did not benefit of invasive monitoring, IABC or invasive revascularization treatment. Necessity of intubations and ventilation (24 patients), presence of sequelae of MI (even very high in the studied population) and thrombolytic therapy (20,7% very low versus the usual 60% in AMI patients in the same center) did not influence mortality in our group.

We concluded that cardiogenic shock caused mostly by AMI had a severe, rapidly fatal in-hospital course, with a very high 89.6% mortality, predominantly in the first 24 hours from presentation. The present study emphasizes the inability of conservative management to offer a survival benefit to patients in cardiogenic shock.

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Figure 1. Reasons for admission/presentation to the emergency department.

CR arrest = cardio-respiratory arrest

HU = haemodinamically unstable

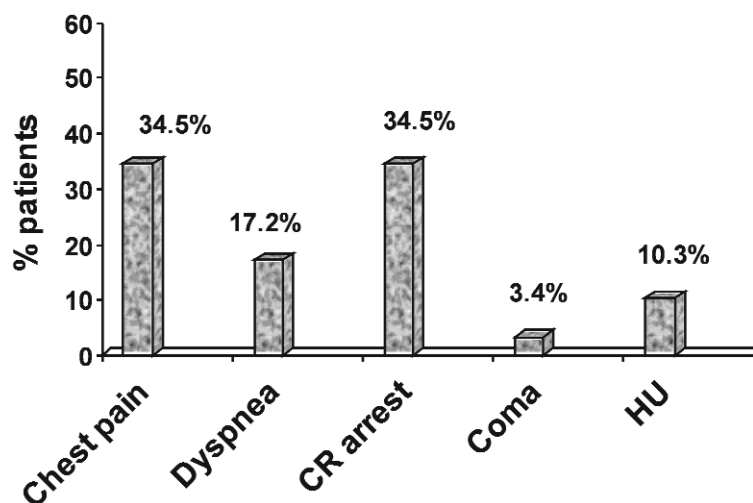


Figure 2. Diagnosis on admission and type of acute coronary syndrome.

STEMI = ST-elevation acute myocardial infarction

Non STEMI = Non ST-elevation acute myocardial infarction

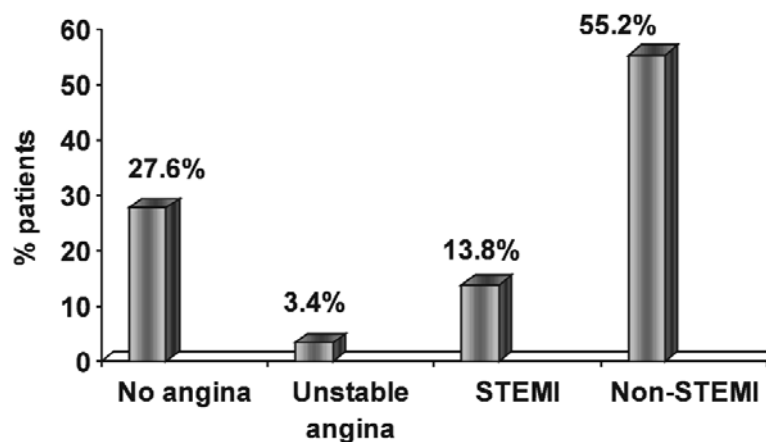


Figure 3. ECG ischemic changes on admission.

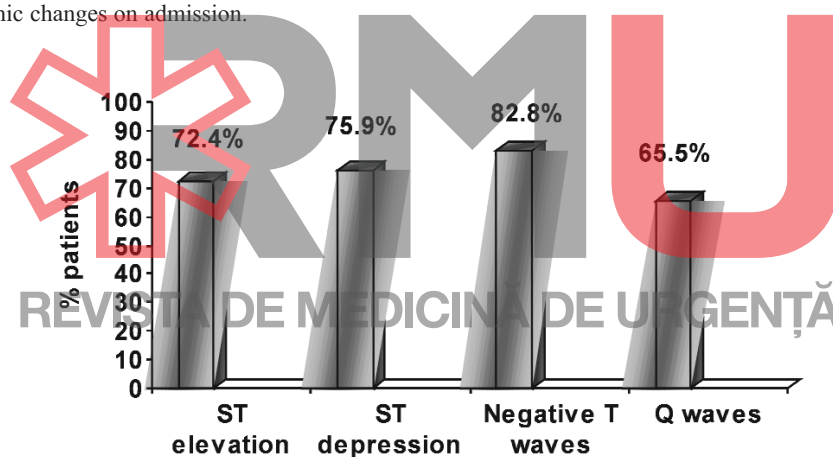
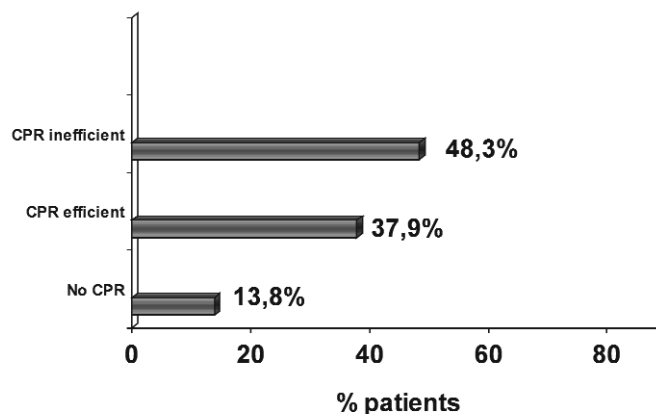


Figure 4. Necessity of cardio-pulmonary resuscitation (CPR) and its success.



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