Original Article

Community Acquired Pneumonia and Cardiac Diseases: A Fatal Association

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Abstract

Background. Community acquired pneumonia (CAP) remains a common disease condition attributing to a significant mortality and morbidity worldwide. Acute cardiac events (ACEs) are one of the most life-threatening complications in patients with severe pneumonia.

Methods. Retrospective study of burden of ACE in 105 patients admitted with CAP.

Results. Twenty-five patients with (CURB-65) score ranging between 0 – 2 did not require intensive care unit (ICU) admission and were admitted in the ward and high dependency unit. Of these, 12 developed ACE and 4 required to be shifted to the ICU for further management. Eighty patients with a CURB—65 score of greater than 3 were admitted to the ICU. Of the patients admitted to the ICU, 10 with ACE died; 2 patients without ACE also died.

Conclusions. Our observations suggest that ACE constitute an important cause of morbidity and mortality in patients with CAP requiring hospitalisation. **[Indian J Chest Dis Allied Sci 2014;56:153-156]**

Key words: Community acquired pneumonia, Acute coronary events.

Introduction

Community acquired pneumonia (CAP) is a common condition and attributes to a significant amount of mortality and morbidity. In the United States of America, it is estimated that 5-6 million people suffer from CAP, 1.1 million people require to be admitted to hospitals and 60,000 deaths occur per year.[1,2] Recent studies have documented major cardiac complications in patients with CAP, particularly in patients requiring hospitalisation.[3] Multiple epidemiological studies[4-7] demonstrate that respiratory tract infections are associated with an increased risk for the development of an acute cardiac event (ACE). Thus, CAP and cardiac diseases are mutually aggravating conditions. There is a surge of interest in the association between major cardiac conditions and CAP, and therefore, the present study was done.

Material and Methods

This was an observational study where we did a retrospective analysis of patients admitted with CAP between January 2011 and January 2012 at our tertiary care referral centre, in Bengaluru, Karnataka, India.

We studied patients with the association of CAP and ACE on admission or any patient with CAP on admission, developing ACE after 48 to 72 hours of hospital stay. The patients who were admitted in the hospital with ACE but developed a CAP after 48 to 72 hours of admission were excluded from the study. Patients with a diagnosis of severe sepsis with a concomitant elevated troponin levels were also excluded from the study, as troponin elevations can occur in patients with severe sepsis even in the absence of myocardial ischaemia.[8]

Community-acquired pneumonia was defined as the presence of a consolidation or pulmonary infiltrate on chest radiograph at the time of hospital admission, with cough, with or without sputum production, abnormal temperature (<35.6 °C or >37.8 °C), or an abnormal serum leukocyte count (leukocytosis or left shift, or leukopaenia).The severity of CAP was objectively assessed by the CURB-65 scoring system[9] where C=confused mental state of new onset, U=urea greater than 19mg/dL, R=respiratory rate more than 30 breaths/min, B=systolic blood pressure less than 90mm of mercury; diastolic blood pressure less than 60mm of mercury and age more than 65 years. Each risk factor scores one point, for a maximum score of 5. The patients with a CURB-65 score greater than 3 were admitted in the intensive care unit (ICU). Severe CAP was defined as the need for admission into ICU.

Acute cardiac event was defined as an increase of biochemical markers of myocardial necrosis along with ischaemic symptoms, development of Q waves on electrocardiogram (ECG), ECG changes indicative of myocardial infarction or ischaemia (i.e., ST segment elevation or depression) and arrhythmias.

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Statistical Analysis

Descriptive statistics are reported. Comparison of nature of admission and antibiotic use in patients with and without ACEs was carried out using Chi-square test. The statistical analysis was performed by STATA11.1 (College Station TX USA). A p-value less than 0.05 was considered as statistically significant.

Results

At our tertiary care centre, 105 patients were admitted with CAP between January 2011 and January 2012 (Figure 1).

Their mean age was 53 years (range 30-75 years); there were 65 males. There were 45 patients who had a family history of coronary artery disease (CAD). Co-morbid conditions included diabetes mellitus (n=96), hypertension (n=80), dyslipidaemia (n=75). Sixty patients were current smokers, 35 were ex-smokers and 10 patients were "never smokers".

Twenty-five patients had a CURB-65 score ranging between 0-2. They did not require ICU admission and were admitted in the ward and high dependency unit. Of these, 12 developed ACE and 4 of them required to be shifted to the ICU for further management (Figure 1). The remaining 80 patients with a CURB-65 score greater than 3 and were admitted to the ICU. Of these, 58 had ACE. Of the patients admitted to the ICU, 10 with ACE died; 2 patients without ACE also died (Figure 1).

Overall 70 patients (30 males) had developed ACE; 30 of them had a family history of CAD; 60 had diabetes mellitus; 55 had hypertension and 50 had dyslipidaemia; 50 were current smokers, 12 were ex-smokers and 8 patients were "never smokers".

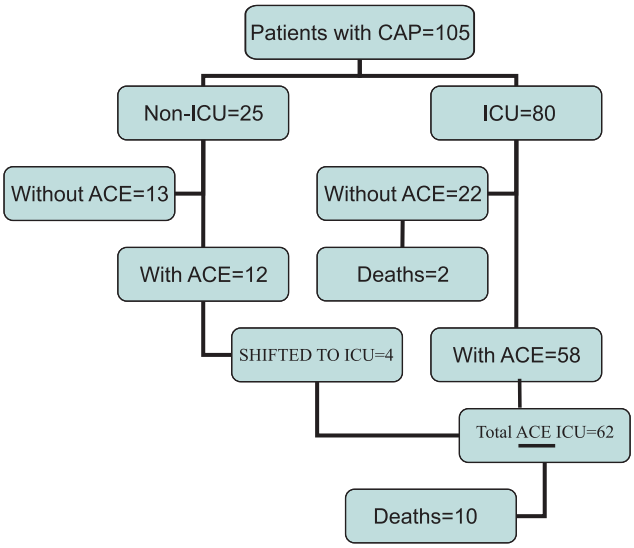

Figure 1.

The various ACE which occurred in these CAP patients were as follows: in the ICU, 25 patients had ST-T changes (suggestive of ischaemia), 15 patients had atrial fibrillation (AF), 8 patients had ventricular tachycardia (VT) and ventricular fibrillation (VFib), 10 patients had congestive cardiac failure (CCF) (Figure 2).

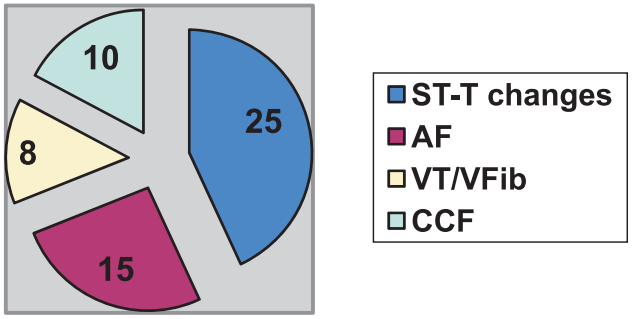

Figure 2. ACE in the ICU.

In the non-ICU setting, i.e. in the wards and high dependency unit, 7 cases had ST-T changes, 1 patient had AF, 2 patients had VT and VFib, 2 patients had CCF (Figure 3).

The median duration of stay in the hospital for patients with CAP and ACE was 18 days (range 2 to 3 weeks) while that of patients with CAP and without ACE was 9 days (range 1 week to 10 days).

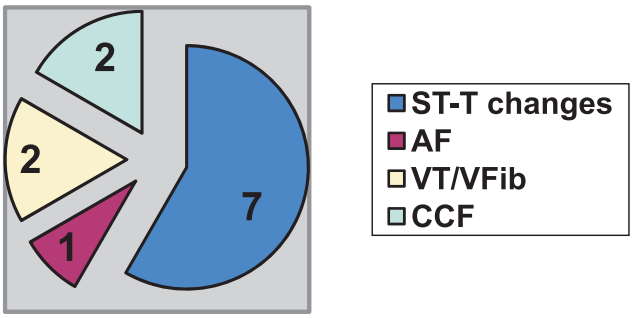

Figure 3. ACE in the non-ICU.

Twelve of the 105 patients with CAP had been vaccinated with influenza vaccine yearly and pneumococcal vaccine every 5 years.

In this study, 65 patients (81%) received either a macrolide or quinolone for the treatment of atypical organisms like *Mycoplasma pneumoniae*, and *Legionella* species. Out of the 70 patients who had ACE, 45 of them (64%) received either a macrolide or quinolone (Table).

Discussion

Infection and inflammation plays an important role in the pathogenesis of the ACE in patients with CAP. Infection causes an increase in the inflammatory markers like C-reactive protein (CRP), inflammatory cytokines, fibrinogen, and this in turn, can increase the risk of thrombogenesis.[10-12] Various studies[13-15] showed documented changes in the ECG consistent with

Table. Comparison of nature of admission and antibiotic use in patients with and without acute coronary events

	ACE	Non-ACE	Total	P-Value
Nature of admission				
ICU	58	22	80	Chi Square =5.145; p = 0.023
Ward	12	13	25	
Treatment with macrolides/fluoroquinolones				
Yes	65	5		Chi Square = 64.82; p<0.001
No	5	30		

ischaemia in 22% of patients with pneumonia and arrhythmias like atrial flutter, AF in 6% of patients. Studies have also shown that ACE like acute myocardial infarction is greater in patients with infection associated with a severe inflammatory response like respiratory infections, rather than infection with a mild inflammatory response.[7] Inflammatory cytokines produced by these infections triggers endothelial dysfunction, organ failure, instability of the atheromas and plaque rupture. Direct bacterial invasion of the atheromatous plaque also attributes to plaque instability, and thus, considered as a possible mechanism underlying this association between CAP and acute coronary syndrome (ACS).

Infection also increases the myocardial oxygen demand and decreases the oxygenation of blood due to ventilation-perfusion mis-match. Patients with CAP are hypoxic and this further decreases the blood oxygenation. Tachycardia, common in acute infections, increases the myocardial oxygen need but decreases the duration of the diastole, which is the only period when coronary perfusion takes place.[16,17] The result of these effects leads to a shift in the metabolic demand and supply of the myocardium, causing further impairment in heart function and cardiac failure. In addition, many patients suffering from viral pneumonias develop complications like myocarditis and this pushes them further into incident heart failure.

Pneumonia was found to be the most common non-cardiac cause of AF in one study.[18] This was further confirmed in another study[19] where among patients admitted to the hospital with AF as a secondary condition, the leading primary diagnosis was found to be CCF in 13% of patients followed by pneumonia in 7% patients. It has been reported that the rates of overall cardiac complications, incident heart failure, ACS and arrhythmias in hospitalised patients with CAP were 17.7%, 14.1%, 5.3% and 4.7%, respectively.[3]

In the present study, patients with more severe CAP requiring hospitalisation had a higher incidence of ACEs, which increased their over all morbidity, mortality, duration of stay in the hospital and increased the financial burden on the health care system.

The treatment of CAP also may have a significant implication in precipitating the cardiac events. Hence, the drugs like macrolides and quinolones, should probably be used with careful cardiac monitoring as these are known to cause arrhythmias in patients with pre-existing cardiac illness.[20,21]

The limitation of our study is that the sample size is small and the patients were all from a single centre. Further, the duration of follow-up is short. These results need to be further studied in a larger sample of cases.

In conclusion, increasing the awareness among physicians, about the fatal association between CAP and cardiac disease will help clinicians to screen the high risk population with CAP and consider the possibility of a precipitating ACE when there is a clinical deterioration.

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