

Myocarditis in Bronchiolitis Caused by Respiratory Syncytial Virus

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Abstract

Background- Bronchiolitis is one of the common respiratory infections of infancy and is most commonly caused by respiratory syncytial virus (RSV). This study was conducted to find the incidence of myocarditis and cardiac dysrhythmia in RSV bronchiolitis.

Methods- During the winter and spring of 1999-2001, infants admitted with bronchiolitis to our department were studied. ECG was taken at time of admission and discharge. After RSV was determined as the etiologic agent by IFA, 50 infants were chosen for the study.

Results- There were ECG changes in 19 cases, but persistent changes fitting criteria of myocarditis were present in three cases. Statistically and in comparison with the control group, the incidence of myocarditis in RSV bronchiolitis was not significant ($p=0.0546$).

Conclusion- The findings of this study show that while ECG is beneficial in bronchiolitis, persistent specific changes can be helpful in the diagnosis of clinical and subclinical myocarditis (*Iranian Heart Journal 2004; 5(1,2):46-50*).

Key words: Bronchiolitis ■ RSV ■ myocarditis

Acute bronchiolitis is a common disease of the lower respiratory tract of infants. Respiratory syncytial virus (RSV) is the most common causative agent, and adenovirus, parainfluenza, rhinovirus and mycoplasma infection produce the remaining cases.^{1,2} Bronchiolitis occurs most frequently in infants between 1 and 6 months of age and is unusual in those older than 18 months.³ The pathophysiologic and clinical findings are the result of small size airway in infants, edema of the bronchioles, accumulation of mucus and cellular necrotic debris, and invasion of smaller bronchial radicles by virus, which leads to the obstruction of smaller airways.

Ventilation-perfusion mismatch results in hypoxemia early in the course of the illness.^{2,4}

One of the reasons for more severe lower respiratory obstruction in young infants may be an antigen-antibody reaction involving transplacentally-acquired serum antibody against RSV. An antigen-antibody mechanism was probably the basis for more severe disease observed in infants who received a killed RSV vaccine and then were naturally exposed to the virus.⁴

One child in 50 with RSV bronchiolitis requires hospitalization, out of which respiratory failure develops in 3-7%, and 1% ultimately die.

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Children with significant cardiopulmonary disease or immunodeficiency are at much

greater risk of serious sequelae from bronchiolitis. Atelectasis, apnea and respiratory failure are the most important acute complications of the bronchiolitis.⁵

Non-specific ST-T changes, often in the inferior leads, are the most common abnormalities in myocarditis. In young patients with acute viral infection, the development of ST-T abnormalities, partial atrioventricular block and conduction defects (especially left bundle branch block) suggest myocarditis.

Scott, et al. studied 845 patients with lower respiratory infection including bronchiolitis.⁷ The following findings were considered evidence of possible myocardial involvement in standard limb leads:

1. Flat or inverted T-waves in V5 and V6,
2. Displacement of the ST segment by 1mm or more,
3. First degree atrioventricular block,
4. Frequent ventricular extra systoles and arrhythmias and
5. Low voltage of the QRS complex.

In a study done by Hashiro, 80% of patients with subacute myocarditis had ECG changes in the form of ST displacement and T-wave changes. In this study, ST-T changes were found to be the most sensitive criteria for myocardial involvement, and prolonged P-R interval was a non-specific finding.⁸

Material and Methods

This research was done as a prospective case control study during the winter and spring of 1999-2001.

One hundred and forty-eight patients under 2 years of age were admitted with clinical diagnosis of bronchiolitis; 50 patients with RSV as the etiologic agent were selected. Clinical criteria for bronchiolitis included rhinorrhea, coughs, retraction of nares,

dyspnea, and wheeze with or without fever. WBC count was 6000-12000, ESR less than 30mm in the first hour and CRP was negative or slightly positive. In chest X-ray, there was hyperinflation with or without bronchovascular markings in more than 80% of the patients.

Two throat swabs taken from all the patients were sent to the virology laboratory in ice dishes. The samples were studied with an immunofluorescent microscope for RSV antigen identification IFA method (Merck Company).

Finally, the 50 patients chosen had the following criteria:

1. Age less than 12 months,
2. RSV as causative agent,
3. First attack,
4. Absence of any congenital or acquired heart and lung disease in the past and
5. Negative blood culture.

Eighty-five patients in the control group were chosen from the infants less than 12 months of age. They were admitted with non-respiratory problems such as gastroenteritis, urinary tract infection and osteomyelitis.

All the patients in both groups had their ECG taken in the first 48 hours of admission and then at the time of discharge or at the end of the week.

Patients with any of the following criteria in ECG were considered as abnormal:

1. Low voltage QRS,
2. Changes and displacement of S-T segment ,
3. flat or inverted T-wave,
4. Arrhythmia or dysrhythmia, and
5. Heart block.

The study and control groups were evaluated and followed up regarding the ECG findings.

Results

The mean ages of the study and control groups were 4.2 and 4.7 months, respectively. The average hospitalization period in the study group was 4.7 days. Twenty-eight males and 22 females were present in this group.

In the study group, the first ECG was normal in 31 cases (62%) and abnormal in 19 (38%). In those patients with normal ECGs, the electrocardiogram remained normal up to the time of discharge. In 19 infants with RSV bronchiolitis, the abnormal ECG findings were meaningful, and follow-up was done. Table I shows the abnormal ECG findings in this group.

Table I. ECG findings of 19 patients in the first 48 hours of admission.

ECG change	Patients	Percent
Elevated S-T	8	16
Depressed S-T	3	6
T wave change	14	28
Low QRS voltage	4	8
PVC		2
Complex dysrhythmia	1	2
Block	1	2

In 16 patients (84%) with abnormal ECGs, there were ST-T wave changes without clinical signs of myocarditis which were not persistent, and a second ECG at the time of discharge was normal. In 3 cases (16%), the ECG findings were persistent and compatible with myocarditis.

The first and 2nd cases had findings in favor of myocarditis during hospitalization such as cardiomegaly, enlarged liver, low blood pressure, pulmonary edema, depressed S-T segment and inverted T-wave in anterior leads with such several dysrhythmias as PVC, VT, VF and heart block. The first case was a 4-month-old infant, who died because of a continuing

dysrhythmia refractory to treatment. The ECG findings were persistent during hospitalization, and echocardiography was not done because of poor general condition.

The second case was a ten-month-old infant with mild dysrhythmia in the form of PVC for a short time. Echocardiography showed left ventricular dilatation and decreased ejection fraction in favor of myocarditis. This patient was treated with low dose digoxin and was discharged after recovery. At the time of discharge, there were no S-T segment changes, but the T-wave was flat.

The third case was an 11-month-old infant with abnormal ECG findings in favor of myocarditis. This patient was discharged after recovery from the respiratory problem while having no signs of myocarditis, although there were persistent ECG changes. This case was readmitted 2 weeks later with poor feeding, irritability and tachycardia while afebrile with weak pulses and cardiomegaly on chest X-ray. In echocardiography, there was a dilated left ventricle with decreased contractility of the ventricular wall and decreased ejection fraction.

In the control group, none of the 85 infants had clinical or ECG findings of myocarditis. Fifteen patients had S-T segment and T-wave changes which were reported as normal variants.

In statistical analysis, the P value for myocarditis in RSV bronchiolitis was not significant (P=0.0546).

Discussion

Several studies have been done on RSV bronchiolitis. Scott et al. studied 845 children with respiratory infection (including pneumonia, croup, bronchitis and bronchiolitis) with different etiologic

agents and reported non-specific ECG changes in many patients. Only 11 patients had ECG findings compatible with myocarditis.⁷

Giles et al. reported two patients with myocarditis and cardiomyopathy caused by RSV and explained a relationship between RSV and cardiac disease.⁹

In 1985, Menahem et al. reported a three-year-old child having RSV infection and irregular pulse with variable first or second degree heart block with transient electrocardiographic findings suggestive of myocarditis that later developed complete recovery and has remained asymptomatic for the past four years. It is tempting to suggest an association between the RSV infection and the development of heart block.¹⁰

Thomas et al. reported a relationship between RSV and severe myocardial dysfunction in two cases with dysrhythmias, cardiomegaly and cardiogenic shock. There was successful recovery with aggressive supportive treatment.¹¹

Hung et al. reported a case of RSV bronchiolitis and severe dysrhythmia from USA.¹² Vare et al. reported 11 cases of myocarditis from France, and RSV was found only in one of them.¹³

In the present study, there was a meaningful relationship between RSV bronchiolitis and myocarditis.

In comparison with the control group, RSV bronchiolitis is considered as a risk factor for myocarditis. In addition, this study showed that transient S-T segment and T-wave changes without clinical findings of myocarditis can be seen in acute RSV bronchiolitis.

If these changes are transient, they will usually not have any clinical importance, while persistent ECG findings are important in infants with RSV bronchiolitis and

warrants further evaluation and follow-up for myocarditis in the near future.

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