

Short Communication

Diagnostic Value of Procalcitonin, C Reactive Protein, Erythrocyte Sedimentation Rate and White Blood Cell in Children with Pneumonia

Yan-Ping Zhang Ya-Mei Ji Fu-Yong Jiao

The Fourth People's Hospital of Yulin Shanxi, Yulin-719000, China

Abstract

Objective: To investigate the clinical value of Procalcitonin (PCT), C Reactive Protein (CRP), Erythrocyte Sedimentation Rate (ESR) and White Blood Cell (WBC) in the early diagnosis of bronchopneumonia in children.

Methods: 208 cases of bronchial pneumonia diagnosed by chest X-ray or chest CT were selected as the subjects of 2016.6-2017.6. According to the blood test, they were divided into bacterial group (92 cases), *Mycoplasma* group (70 cases) and virus group (46 cases). Another selection of healthy children during the same period as the control group were detected PCT, CRP, ESR and WBC levels, the differences were compared between the 3 groups of 4 indicators and compared with the control group children, positive PCT, CRP, ESR calculation and WBC in accordance with its corresponding positive rate and diagnostic criteria the value of the 4 indicators, with comprehensive evaluation in the diagnosis of pneumonia in children.

Results: The levels of PCT, CRP, ESR and WBC in the bacterial pneumonia group were higher than those in the *Mycoplasma pneumoniae* group and the viral pneumonia group, The difference was statistically significant ($P < 0.01$); In the positive rate of PCT and CRP, the bacterial pneumonia group and *Mycoplasma pneumoniae* group were higher than other indexes and the positive rate of serum PCT in the viral pneumonia group was lower than other indexes.

Conclusion: PCT and CRP can identify the etiology of pneumonia in children, combined detection of PCT, CRP, ESR and WBC has important significance in differential diagnosis of pneumonia in children, and has high value in guiding the application of clinical antibiotics. CRP, WBC determination and traditional auscultation can be used as a preliminary screening diagnosis of bronchial pneumonia, but with the development of technology innovation, detection, combined detection of serological indexes of various clinical value in infectious diseases gradually emerged, the detection method of the etiology of early replacement. At present, PCT and ESR are widely used in this study, and the diagnostic value of 4 inflammatory markers in bronchial pneumonia is expounded.

Keywords: Procalcitonin, CRP, Erythrocyte sedimentation rate, Leukocyte count, Pneumonia in children, Diagnostic value

Data and Methods

General Information: 208 cases of children with respiratory tract infection were accorded with chest X-ray or chest CT and diagnostic criteria of textbook bronchopneumonia. Among them, 110 were male and 98 were female. The age was (3 + 2 years). The patients were divided

*Corresponding author: Dr. Tianli Bai attending doctor The Fourth People's Hospital of Yulin Shanxi.China. E-mail Id:275101643@qq.com

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into bacterial pneumonia group, *Mycoplasma pneumoniae* group and viral pneumonia group by Hematology, serum virology test and chest X-ray or chest CT, At the same time, 110 healthy children were examined in the same period, aged (4 + 1.5 years).

Detection Method: 4 groups of patients were taken from the fasting blood, 4 inflammatory indexes were detected, The PCT with a fluorescence immunoassay instrument, VIDAS, CRP by immunoturbidimetric method, instrument for Roche-MODULAR, ESR for MONTOR20 by Westergren method, instrument, half an hour to read the results, using the WBC automatic blood cell analyzer instrument, Mindray, strict operation rules and the kit according to the instructions executed.

Statistical Analysis: SPSS17.0 software was used for statistical analysis, and the chi square test was used to measure the data, $P < 0.05$ indicated that the difference was statistically significant and $P < 0.01$ was highly significant. The multiple comparisons between groups were performed using Bonferroni adjusted test levels.

Results

The positive rates of PCT and CRP in bacterial group, *Mycoplasma* group and virus group were compared with those in control group, From Table 1, it can be found that the positive rate of bacteria group, *Mycoplasma* group, PCT and CRP is higher than the other two groups and the difference is statistically significant ($P < 0.01$), The difference between the virus group and the control group was not statistically significant ($P > 0.05$), and the results were shown in Table 1.

The positive rates of ESR and WBC in the 4 groups of children were compared, From table 2, it can be found that the positive rate of bacterial group ESR and WBC is higher than that of *Mycoplasma* group, virus group and control group, and the difference is statistically significant ($P < 0.01$), The positive rate of *Mycoplasma* group and virus group ESR and WBC was higher than that of control group, and the difference was statistically significant ($P < 0.05$). The results are shown in Table 2.

The diagnostic value of the above 4 inflammatory markers in bacterial group, *Mycoplasma* group and viral group bronchopneumonia PCT has the highest sensitivity in diagnosis of bacterial bronchopneumonia, about 93.47% and the Yoden index shows $PCT > CRP > ESR > WBC$.

Discussion

Pneumonia is an important and common disease in infancy. It is the first cause of death in hospitalized children in China. It seriously threatens the health of children, so it is very important to strengthen the prevention and treatment of the disease. The main causes of the disease are bacteria, viruses and *Mycoplasma pneumoniae* infection, especially the bacteria and virus caused by pneumonia [1]. But the positive rate of bacterial culture is low, and it takes a long time to reach the result. CRP, ESR and WBC are widely used in clinic as an index to identify bacterial and viral infections, but their sensitivity and specificity are not high.

The results showed that the level of serum PCT in children with bacterial pneumonia was significantly higher than that in *Mycoplasma*

Group	PCT (ng/L)				CRP (mg/L)			
	<0.5	0.5-2	>2	Positive rate (%)	<6	6-20	>20	Positive rate (%)
Bacterial group	6	50	36	93.47	11	49	2	88.04
Mycoplasma group	45	20	5	35.71	38	24	8	45.71
Virus group	43	2	1	6.52	31	13	2	35.06
control group	112	1	0	0.8	111	2	0	1.70

Table 1: Comparison of positive rates of PCT and CRP between 4 groups of children.

Group	ESR (mm/h)				WBC ($\times 10^9/L$)			
	<15	15-25	>25	Positive rate (%)	10.0~20.0	4.0~10.0 (%)	<4.0	Positive rate (%)
Bacterial group	10	64	18	89.13	23	55	14	75.00
Mycoplasma group	35	24	11	35.71	57	10	3	18.57
Virus group	31	8	7	32.60	40	5	1	13.04
control group	93	20	0	17.69	105	8	0	7.07

Table 2: Comparison of positive rates of ESR and WBC between 4 groups of children.

group and virus group, indicating that the combination of these 4 indicators can better determine the type of pneumonia.

PCT is the propeptide of calcitonin in the body, and stability are more ideal, under normal physiological conditions by the thyroid C cells produced a few PCT, the serum PCT level in healthy population is very low, usually less than 0.1 ng/ml [2], however, upon receipt of a bacterial infection, produced by the thyroid gland [3] and the virus infection, trauma, tumor etc. under the condition of PCT did not change significantly [4]. Related studies have shown [5] that PCT levels begin to rise after bacterial infection with 4h, peaking at 6-8 h and maintaining high levels in 48 h [6], when the PCT is positive, the chances of bacterial infection are very high. Therefore, PCT has a very high accuracy in identifying bacterial pneumonia, and has important reference value for identification of bacterial pneumonia and viral pneumonia.

CRP is a kind of acute reaction protein in inflammatory reaction after the start of hepatic cells [7] induced by various cytokines produced after 8-12 h can be detected from serum, especially bacterial infection positive rate was as high as 88.04%, and not affected by sex and age of patients, anemia, pregnancy and other external factors, the ratio of ESR and WBC a more reliable and sensitive, its clinical application scope is wide.

WBC has a very high clinical value in the identification of pathogens in pediatric pneumonia; The results showed that the positive rate of WBC in the bacterial pneumonia group, *Mycoplasma pneumonia* group and viral pneumonia group was significantly higher than that in the healthy control group. These results suggest that WBC has a certain value in clinical diagnosis and differential diagnosis of pneumonia in children.

Determination of ESR has been the traditional index of clinical diagnosis of bacterial infection, but lack of specificity. The data from the study can be seen, *Mycoplasma pneumonia* group and viral pneumonia group positive rate is respectively 50%, 32.60%, in addition to other factors such as temperature, age, gender, degree of hemolytic and drugs can affect the determination of ESR [8].

Conclusion

In conclusion, PCT can well identify the types of pneumonia, the clinical value of PCT, CRP, ESR and WBC have high in the diagnosis of pneumonia in children, can be used for early diagnosis of the type of children with bronchial pneumonia infection, so clinicians know as early as possible and reasonable use of antibiotics.

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