

PLASMA PROCALCITONIN LEVELS IN CHILDREN WITH ADENOVIRUS INFECTION- A RETROSPECTIVE STUDY

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Received : 17/07/2023
Received in revised form : 23/08/2023
Accepted : 04/09/2023

Keywords:

Procalcitonin, Adenovirus, Respiratory Infection, C-Reactive Protein, Antibiotics.

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DOI: 10.47009/jamp.2023.5.5.80

Source of Support: Nil,

Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (5); 407-410



Abstract

Background: Respiratory infections are frequently brought on by adenoviruses (ADV). They can be triggered by a potential acute phase parameter unlike other respiratory viruses. Procalcitonin (PCT) offers the possibility, particularly at elevated CRP levels between ADP and bacterial infections to distinguish and thus avoid antibiotic prescriptions. **Materials and Methods:** It was a retrospective record-based study were investigations which are a part of standard medical care in the pediatric department of a tertiary care hospital recorded. This involves the retrospective analysis of information from 50 children who have clinically significant respiratory AdV infections that have been confirmed by Polymerase-chain reaction (PCR) and who have the following conditions: tonsillopharyngitis (n = 18), upper airway infection (n = 16), pneumonia (n = 10), and obstructive bronchitis (n = 6). We separated the patients into two groups in order to address the study's research question: PCT 0.5 g/L in group 1 (n = 26), and 0.5 g/L in group 2 (n = 24). SPSS was used for analysis. **Result:** Clinical parameters were not significant which suggest parameters are comparable. Except duration of fever hospital stay, therapy duration was higher in PCT value >0.5. The male to female ratio (n = 27) does not reach statistical significance. 11 blood cultures were taken (27.9%, Group 1 n = 6, Group 2 n = 5), and all of them came back pathogen-free. Particularly, all Group 2 cultures with CRP concentrations greater than 40 mg/L were sterile. In cases of tonsillopharyngitis in particular, StrepA throat swabs tested negative 14 times (35%) with no indication of a significant difference between the PCT groups. Five patients had chest X-rays taken, and four of them (80%) exhibited infiltrations that were compatible with pneumonia. **Conclusion:** No antibiotic therapy is advised in the case of a PCR-confirmed respiratory ADV infection, even in patients with high CRP levels, as long as the PCT level is in the neighbourhood of 0.5 mg/L, or just mildly increased.

INTRODUCTION

Adenovirus infections in children can present with a variety of symptoms, such as fever, coughing, tonsillitis, keratoconjunctivitis, acute otitis media, febrile convulsions, and gastroenteritis. It can be challenging to distinguish between an adenovirus infection and a bacterial illness since, in contrast to other respiratory viruses, adenovirus infection affects 50% of children with raised total white blood cell counts (WBC) and serum C reactive protein (CRP) levels.^[1,2] within 4-6 hours of the start of a bacterial infection, plasma procalcitonin (PCT) increases.^[3] PCT levels in healthy individuals are typically under 0.05 ng/ml, while a rise to 0.5 ng/ml. Infections caused by adenoviruses (AdV) vary in form and severity. Airway infections are the most frequent. According to the research,^[4] febrile illnesses account

for about 10% of cases. To discriminate between viral and bacterial illnesses, greater has been proposed.^[4] In order to determine if PCT would be more effective than CRP at differentiating between adenoviral and bacterial infections, we compared PCT and CRP levels in children with an adenovirus infection.

MATERIALS AND METHODS

It was a retrospective record-based study were investigations which are a part of standard medical care in the pediatric department of a tertiary care hospital recorded. This involves the retrospective analysis of information from 50 children who have clinically significant respiratory AdV infections that have been confirmed by Polymerase-chain reaction (PCR) and who have the following conditions: tonsillopharyngitis (n = 18), upper airway infection

(n = 16), pneumonia (n = 10), and obstructive bronchitis (n = 6). We separated the patients into two groups in order to address the study's research question: PCT 0.5 g/L in group 1 (n = 26), and 0.5 g/L in group 2 (n = 24). The patient's age, gender, temperature, length of hospital stay, kind of therapy, and month of disease onset were among the data gathered about them.

Diagnostic testing comprised the following: C-reactive protein (CRP), leukocytes and percentage of neutrophils, chest X-rays if pneumonia is suspected, PCT (KRYPTOR, ThermoFisher, Henningsdorf, Germany), Interleucin (IL)-6 (Elescys IL-6 test, Roche Diagnostics GmbH Mannheim, Germany), blood cultures (BACTEC FX, Heidelberg, Germany), throat swabs for group A streptococci (StrepA test) (möLab GmbH, Langenfeld, Germany); influenza virus RNA detection by PCR. On the first and second days of fever (median 1.5), a nasopharyngeal swab specimen was taken for real-time polymerase chain reaction (PCR) human AdV DNA testing.^[5]

Statistical Analysis

The statistical analysis was performed using SPSS for windows version 25.0 software. The findings were present in number and percentage analyzed by frequency, percent. Chi-square test was used to find the association among variables. The critical value of P indicating the probability of significant difference was taken as <0.05 for comparison.

RESULTS

As per [Table 1] shows the information of clinical parameters comparison between groups as seen no parameters was not significant which suggest parameters are comparable. Except duration of fever hospital stay, therapy duration was higher in PCT value >0.5.

As per [Table 2] in terms of laboratory parameters procalcitonin was found to be significant along with IL-6 which was statistically significant (p<0.05). Other parameters were higher in PCT>0.5 group but was not significant.

According to [Table 3], the male to female ratio (n = 27) does not reach statistical significance. 11 blood cultures were taken (27.9%, Group 1 n = 6, Group 2 n = 5), and all of them came back pathogen-free. Particularly, all Group 2 cultures with CRP concentrations greater than 40 mg/L were sterile. In cases of tonsillopharyngitis in particular, StrepA throat swabs tested negative 14 times (35%) with no indication of a significant difference between the PCT groups. Five patients had chest X-rays taken, and four of them (80%) exhibited infiltrations that were compatible with pneumonia. Between the two groups, there were 75 and 25% more infiltrations, respectively. PCR testing for influenza virus A and B infection was performed on 34 patients (85%), and the results were negative.

Table 1: Comparison of Clinical Parameters among both groups

Variables	PCT<0.5		PCT>0.5		P
	Mean	SD	Mean	SD	
Age (month)	22.8	14.0	21.3	7.8	n.s.
Temperature (°C)	39.9	0.5	39.9	0.6	n.s.
Duration of fever (days)	5.3	2.3	4.7	1.2	n.s.
Days of fever	1.6	0.8	1.6	1.1	n.s.
Duration of hospitalization (days)	4.5	1.4	4.6	1.7	n.s.
Duration of therapy (days)	4.4	1.1	6.0	5.0	n.s.

Table 2: Laboratory parameters among both groups

Variables	PCT<0.5		PCT>0.5		P
	Mean	SD	Mean	SD	
PCT (µg/L)	0.21	0.12	1.56	1.07	0.01
CRP (mg/L)	40.2	28.0	60.2	67.4	n.s.
White blood cell count (Gpt/L)	17.9	7.0	19.0	7.6	n.s.
Neutrophils (%)	55.6	12.8	60.0	8.2	n.s.
Neutrophile count (Gpt/L)	10.3	4.6	11.6	5.1	n.s.
IL-6 (ng/L)	41.6	41.3	92.4	68.8	0.02

Table 3: Demographic and Diagnostic parameters among groups

		PCT < 0.5 µg/L %	PCT ≥ 0.5 µg/L %	p-value
Patients		57.4	42.3	0.01
Gender	Male	59.1	64.5	
	Female	47.6	35.2	n.s.
Blood culture	Blood culture	21.6	35.1	
	No blood culture	78.1	64.5	n.s.
Streptococcus A-test	Positive	0	0	
	Negative	46.1	53.3	n.s.
Influenza-virus-PCR	Negative	54.6	45.3	n.s.
Chest X-ray	Infiltration	66.2	33.6	
	No infiltration	0	0	n.s.
Diagnoses	Infection of the upper airways	54.3	56.7	
	Tonsillopharyngitis	22.8	18.5	
	Pneumonia	18.4	18.6	

	Obstruktive bronchitis	4.2	6.4	
	Total	54.4	37.4	n.s.
Therapy	Antibiotics	47.4	64.4	
	No antibiotics	52.4	35.4	n.s.
Therapy	<5 days	22.2	37.2	
	≥ 5 days	22.7	25.0	
	No antibiotics	54.2	37.2	n.s.
Therapy (days)	No/prematurely terminated therapy ≤5 days	77.5	62.7	
	Therapy ≥5 Tage	22.1	37.2	n.s.

DISCUSSION

ADV and bacterial (super) infections may now be distinguished by high CRP levels thanks to PCT determination, helping doctors avoid giving unneeded antibiotic prescriptions. A significant percentage of CRP readings more than 40 mg/L were recorded by all examining physicians.^[1-3] PCT is mostly employed as a diagnostic indicator for bacterial infections, particularly sepsis and the severity of it.^[5] The efficacy of antibiotic treatment for lower respiratory tract infections is also confirmed using this technique. A PCT value of 0.1 mg/L has been identified as a marker indicating that antibiotic therapy is not necessary in children with acute respiratory infections.^[6]

Galetto-Lacour et al. showed a sensitivity of 97% and specificity of 61% based on the combination of PCT 0.5 g/L and CRP 40 mg/L, ruling out serious bacterial infection with a probability of 1% and 3%.^[7] In viral infections, PCT values of 0.26 (0.17) and 0.8 (0 - 4.4) have been established.^[8,9] Children with viral infections had PCT values of less than 0.71 g/L.^[10] Infections with the RS virus and the Epstein-Barr virus, respectively, had PCT values of 0.5 and 0.1 - 0.42 g/L.^[10] It has been discovered that H1N1 influenza virus infections had values of 0.4 (0.1 - 6.1) g/L.^[11] Bacterial infection is rare with a PCT result under 0.8 g/L and clinical progression. Values greater than 0.8 g/L strongly and specifically suggest bacterial coinfection.^[12] It has been demonstrated that an upper PCT limit of 0.25 and 0.5 g/L is helpful in clinical practice with regard to the prescription of antibiotics.^[13] Respiratory AdV infections have a unique constellation, unlike the previously listed viral illnesses.

A PCT value of 0.5 g/L is suitable for separating AdV infections from bacterial infections that may require antibiotic therapy because it helps to distinguish between medical disorders linked to elevated CRP (inflammation). The same holds true for PCT values between 0.5 and 1.3 g/L, according to our findings. The clinical constellations in patients with PCT values between 2 and 5 ng/L, normal CRP, clinically unremarkable course, no pathogens detected in blood cultures or Strep A tests, spontaneous thawing of fever, and no antibiotic therapy are pathogenetically unclear but most likely related to bacterial coinfection. Systemic inflammation and bacterial infection both cause PCT responses. In septic shock, the values are at their highest. If the systemic inflammatory response does not take place during

infection, then there is no significant PCT induction. The PCT typically rises to about 0.5 g/L.^[14,15] The limitations of the study are that it is based on the retrospective investigation of a small number of patients. Additional studies will be essential.

CONCLUSION

In lower respiratory infections, PCT at levels of 0.5 mg/L can discriminate between ADV illness and bacterial (super) infection and can be used as a criterion for the decision of antibiotic therapy, notwithstanding the guidelines for antibiotic therapy. No antibiotic therapy is advised in the case of a PCR-confirmed respiratory ADV infection, even in patients with high CRP levels, as long as the PCT level is in the neighbourhood of 0.5 mg/L, or just mildly increased. The majority of the investigators' reports are against the use of antibiotic therapy and emphasize that judgments must be made based on the clinical picture and the practitioner's experience. Close monitoring is advised when CRP and PCT readings are on the verge of being raised.

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