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ASSESSMENT OF SERUM PROCALCITONIN LEVEL AS A MARKER TO DIAGNOSE LATE ONSET SEPSIS IN NEONATES

Neonatology

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ABSTRACT

Introduction: Sepsis constitutes one of the most prevalent cause of mortality in newborns, eminently in developing countries. There are several investigations available that may be used as indicators to identify sepsis, however, the inability of a single laboratory investigation for rapid detection and diagnosis of sepsis, calls for the need of a specific investigation. Lately, it has been proclaimed that procalcitonin can be used as a reliable predictor for diagnosis and to determine severity as well as outcome of neonatal sepsis.
Objective: To assess levels of serum Procalcitonin level as a marker to diagnose late-onset sepsis in a neonatal intensive care unit (NICU).
Methods And Materials: A cross-sectional study was performed between the June 2018 to November 2018 at Sree Balaji Medical College and Hospital. Serum procalcitonin levels were determined for 25 neonates of age between 3-30 days.
Results: Distinct elevations of procalcitonin levels were observed in neonates with late-onset sepsis caused mainly by coagulase-negative staphylococci. Currently nosocomial infection due to coagulase-negative staphylococci is a frequent occurrence in NICUs.
Conclusion: Serum procalcitonin is an efficient tool to diagnose Late Onset of Sepsis.

KEYWORDS

INTRODUCTION:

Incidence of sepsis in neonatal intensive care units (NICUs) is often high [1]. Initial detection of sepsis in newborns may be daunting by virtue of the nonspecific and minimal signs, which may be observed in various other non infectious conditions and definitive blood sample results, including blood culture may not be available immediately and easily. Furthermore, culture negative sepsis is now emerging, especially in cases of maternal antibiotic usage [2]. Hence, the availability of a single laboratory investigation is necessary for early detection as well as to predict the outcome of neonatal sepsis, also to minimize unnecessary treatment of non infected NICU cases [3].

As per recent reports, procalcitonin, a propeptide of calcitonin, undergoes posttranslational proteolysis into its hormonal derivative and increases significantly in sepsis [4-10]. However, the cellular source and mechanisms underlying the increase in sepsis and infective conditions is not yet identified. Two studies have demonstrated that procalcitonin is of significant importance in neonatal sepsis. In a study by Gendrel et al. [11] it was illustrated that escalated levels of serum procalcitinin levels were observed in neonates with sepsis, when equated to those who were noninfected and asymptomatic. In an investigation by Monneret et al. [12] it was demonstrated that procalcitonin levels were performed in both NICU babies and those admitted in regular nurseries, done after 72 hours. It was observed that procalcitonin levels were significantly raised.

METHODS AND MATERIALS:

A Cross-sectional study was performed over a period of six months, commencing from June 2018 till November 2018 at our institution, Sree Balaji Medical College and Hospital. 25 babies admitted in our NICU during the above specified time period were included in the study.

Serum procalcitonin levels were determined for babies between 3 days and 30 days of age who presented with systemic infectious conditions and admitted in the NICU, at the onset of signs of infection and after recovery was attained. Those neonates who had suffered from a documented episode of systemic infection within the previous 7 days were excluded. Venous blood samples were obtained using a sterile technique, following the universal precautions, after obtaining consent and centrifuged for 30 minutes after collection of sample. Serum procalcitonin levels were assessed using the immunoluminometric assay.

The objective was to determine the accuracy of serum procalcitonin to diagnose late onset neonatal sepsis. All statistical tests were based on a significance level of <0.05

RESULTS:

A total of 25 cases with late-onset infection, ranging from 3 days to 30 days of age were evaluated (mean post natal age being 15.72 days), and the sensitivity and specific concentrations were assessed.

Twenty two of the 25 cases tested positive for sepsis by blood culture, three cases had necrotizing enterocolitis, but were culture negative. All cases positive for coagulase negative staphylococci, had clinical signs of sepsis, and also demonstrated positive sepsis screens. Four of the 12 neonates with late-onset sepsis due to coagulase-negative staphylococci proved to demonstrate more than one blood culture positive for the same species.

All the twenty five cases demonstrated to have accentuated levels of serum procalcitonin (mean level being 39.524, P value being approximately 0.0001). The procalcitonin ranged from 2.0 ng/ml to 249.1 ng/ml. Two of the 25 cases died, and 23 survived. There was no decline in procalcitonin levels in the babies who did not survive, until death. Whereas in those who survived, procalcitonin levels were within the normal range (approximate level being 1 ng/ml) in 3-7 days after administration of the appropriate antimicrobial therapy.

While evaluating CRP levels, seven out of twenty five cases illustrated a negative CRP, thus missing the seven sepsis cases. It was observed that the cause of sepsis in these seven cases was attributed by coagulase negative staphylococci.

DISCUSSION:

In the present study, the procalcitonin concentration after the first 48 hours of life proved to be an effective tool to diagnosticate late onset sepsis in its initial course. After excluding the subpopulation of nonsurvivors, in whom also the raised procalcitonin levels corresponded with the outcome, distinct elevations of procalcitonin in infants with late-onset infection due to coagulase-negative staphylococci, and we suspected that these levels, which were relatively lower than those found in other systemic infectious conditions, which may indicate a systemic response to the typically inert course of infection which generally occurs with these organisms [13]. Nosocomial sepsis due to coagulase-negative staphylococci is currently an important and frequent event in NICUs [14].

Although this study included small numbers of patients and more stringent data are needed, the results establish the significance of serum procalcitonin levels. DaSilva et al. [15] performed a study evaluating the value of leukocyte indices to diagnosticate neonatal sepsis and concluded that these indices, interpreted either independently or in combination, were of low diagnostic accuracy in cases wherein coagulase-negative staphylococci were responsible for causing late onset sepsis. Schmidt et al. [16] studied the pathogenicity of coagulase-negative staphylococci in neonates and observed that CRP levels were abnormal at the time of initial assessment in approximately 64% of subjects (mean postnatal age, 25 days) with sepsis due to these

pathogens. This finding is in agreement with our finding that when CRP levels are used alone for diagnosis, a significant proportion of patients with nosocomial infection that was attributed by coagulase-negative staphylococci will be missed in the early phase.

Clinical And Laboratory Findings For Newborns With Late-onset Infection.

Case no.	Organism Isolated		Postnatal day of sampling	PCT level (ng/mL)	CRP level (mg/dL)	Outcome
1	Sepsis	*Staphylococcus aureus*	3	12.4	1.8	Survived
2	Sepsis	*Staphylococcus epidermidis*	4	4.3	1.6	Survived
3	Sepsis	*Klebsiella pneumoniae*	6	249.1	5.9	Survived
4	NEC (IIIa)*	. . .	6	50.5	4.5	Died
5	Sepsis	*Staphylococcus haemolyticus*	7	8.8	0.2	Survived
6	Sepsis	*S. epidermidis*	7	2.0	1.4	Survived
7	NEC (IIa)*	. . .	7	8.1	2.8	Survived
8	Sepsis	*K. pneumoniae*	7	59.7	1.9	Survived
9	Sepsis	*S. aureus*	8	57.3	5.0	Survived
10	Sepsis	*S. epidermidis*	9	5.0	0.4	Survived
11	Sepsis	*S. epidermidis*	10	2.0	0.1	Survived
12	Sepsis	*S. epidermidis*	12	2.7	1.6	Survived
13	Sepsis	*S. haemolyticus*	14	235.7	3.2	Died
14	Sepsis	*S. epidermidis*	15	3.3	0.1	Survived
15	Sepsis	*Candida albicans*	17	15.6	3.9	Survived
16	Sepsis	*S. aureus*	19	62.9	8.6	Survived
17	Sepsis	*S. epidermidis*	20	6.7	0.3	Survived
18	Sepsis	*S. epidermidis*	21	2.4	0.3	Survived
19	Sepsis and meningitis	*Pseudomonas aeruginosa*†	25	101.4	4.2	Survived
20	Sepsis	*K. pneumoniae*	27	39.7	10.4	Survived
21	Sepsis	*S. epidermidis*	29	2.2	7.8	Survived
22	NEC (IIb)*	. . .	30	22.8	20.9	Survived
23	Sepsis	*S. epidermidis*	30	9.4	0.5	Survived
24	Sepsis	*S. aureus*	30	10.3	6.8	Survived
25	Sepsis	*K. Pneumoniae*	30	13.8	0.6	Survived

CONCLUSION:

It can be concluded that procalcitonin appears to be an effective tool to accurately diagnosticate late onset sepsis in the NICU setting. The amount of blood required to perform the investigation is small, and the results are available in a couple of hours.

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