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CORRELATION OF MICRONUCLEUS SCORE WITH ORGAN DYSFUNCTION IN PERINATAL ASPHYXIA

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ABSTRACT

The present study was conducted to correlate the micronucleus score with organ dysfunction and severity of perinatal asphyxia. Severity of asphyxia and organ system involvement of babies with perinatal asphyxia was assessed. Blood samples were collected from babies for estimation of MDA (Malondialdehyde), micronucleus score and other investigations. Clinical and biochemical findings were correlated with organ system involvement. Among eighty term asphyxiated babies 25% had five and four system involvement whereas 35% had three systems and 23.8% had two system involvement. Micronucleus score was significantly increased with number of systems affected (P<0.001). There was significant Positive correlation between micronucleus score and oxidative stress (P <0.001). Micronucleus score also had significant correlation with Apgar score, Sarnat and Sarnat score and Seizure (P <0.001).

KEYWORDS: Perinatal asphyxia (PA), Multiorgan dysfunction (MOD), CBMN assay, MDA.

INTRODUCTION

In Perinatal asphyxia organ dysfunction is common due to tissue hypoxia.[1,8,9] DNA damage and chromosomal breakage in perinatal asphyxia are caused by reactive oxygen species.[6] Cytokinesis block micro nucleus (CBMN) assay is a technique used to detect the double strand breakage of DNA.[4] Oxidative stress can be measured by estimation of serum MDA level.[5] The current study was conducted to determine the double strand break in DNA by mononuclear score and correlate it with organ dysfunction and oxidative stress in perinatal Asphyxia.

Subjects and Techniques

The current study was performed in the cytogenetic laboratory of department of Anatomy in collaboration with department of neonatology and biochemistry of JIPMER, Pondicherry from February 2008 to July 2010. The study was approved by institute human ethical committee. Term asphyxiated babies were involved. Their Apgar scores and Sarnat and Sarnat score was noted. Preterm or post term babies, large (LGA) or small (SGA) for gestational age babies, those with congenital malformations and delivered of mothers with significant illness were excluded. Blood samples (3ml) were collected from all the babies. CBMN Assay was done based on guidelines of Bonassi et al.[4] Serum MDA was measured according to the calorimetric method of Satoh K. et al.[5] CBMN score and MDA levels were correlated with clinical findings and organ dysfunction.

Statistical analysis

Differentiation between various groups of systems was done by one way ANOVA. Correlation between micro nuclear score and organ dysfunction was carried out by Carl Pearson Correlation Coefficient. Data was analysed by Graph Pad (InstatSan Deigo USA) and p value <0.05 was considered significant.

RESULTS

The various systems affected in perinatal asphyxia were nervous, respiratory, cardiovascular, urinary and digestive system. Among 80 asphyxiated babies studied, 20 infants (25%) had dysfunction of five organ systems and another 20 infants (25%) had dysfunction of 4 organ systems, nineteen infants (23.8%) had 3 organ involvement and 21 infants (26.3%) had dysfunction of 2 organ systems. Twenty eight babies (35%) expired and they suffered from dysfunction of four or more organ systems. There was significant correlation between

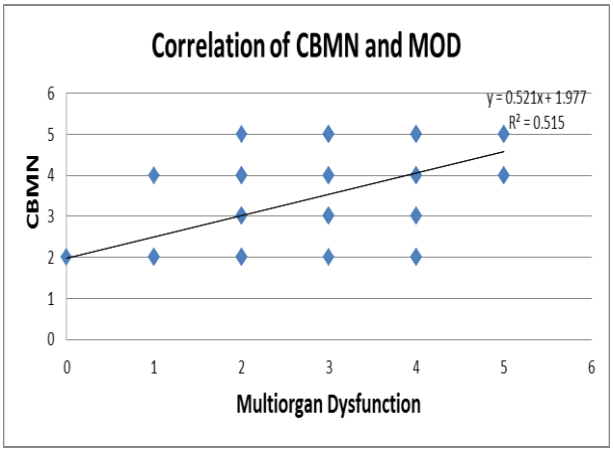
multiorgan dysfunction and miconucleus score. Double stand break of DNA (CBMN score) significantly correlated with oxidative stress (MDA levels). There was positive correlation between Sarnat and Sarnat score and multiorgan dysfunction.

Table 1: CBMN score, Serum MDA level with Multiorgan Dysfunction.

No. System Affected	CBMN Score	Serum MDA level
Two	1.85 ± 1.107926	4.703476±0.894624
Three	2.7± 0.714143	5.543737±1.257756
Four	3.1±1.178983	7.1174±0.502454
Five	3.75 ± 0.887412	8.4883± 0.576468

Table 2: Showing Correlation Co-effient (r) between Parameters.

Parameter	Variables			
	HIE	MOD	CBMN	MDA
APGAR	-0.7315**	-0.6301**	0.575**	-0.5045**
HIE		0.9235*	0.592*	0.8070*
MOD			0.515*	0.9341*



Correlation Coefficient (Pearson) CBMN and MOD ($p<0.01$ and $r= 0.515$).

DISCUSSION

The current study explored double strand break of DNA due to oxidative stress and correlated these with organ dysfunction in perinatal asphyxia. To the best of our knowledge there is no published data on the correlation between micronucelus score and organ dysfunction. Multiorgan dysfunction was investigated in perinatal asphyxia based on low five minute Apgar scoring by Martin Ancel et al.[9] In this study the involvement of nervous and respiratory system was proceeded by cardiovascular, excretory and digestive systems. Nonetheless Martin Ancel et al reported that CNS was frequently affected followed by renal, cardiac, Pulmonary and G.I.T dysfunction. We found all asphyxiated babies in this study had MOD. Our findings were similar to that of Shah et al.[8]

The authors previously noted that the level of DNA damage increases with severity of asphyxia based on comet tail length. There was significant association with serum MDA and MOD.[10] Micronucleus score significantly increased with severity of asphyxia,[3] and number of organ systems affected. Apgar score inversely correlated with micronuclear score and oxidative stress. However Sarnat and Sarnat score was positively correlated with Double strand breakage of DNA and oxidative stress.[7]

In our study the mortality rate of the asphyxiated babies were high and many of them had five and four system involvement. Seizure was also significantly associated with micronucelus score and Oxidative stress due to excess amount of free radical in the deoxygenated blood shunted into the nervous system.

CONCLUSION

Double strand breakage of DNA indicates more damage from perinatal asphyxia. Oxidative stress leads to strand breakage of DNA and multi organ dysfunction.

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