Study of Free Radicals in Neonates Born Through Meconium Stained Amniotic Fluid Deliveries

Free radical injury has been implicated in the pathogenesis of several neonatal diseases including birth asphyxia(1,2). However, the status of free radicals in babies born through meconium stained amniotic fluid (MSAF) has been unexplored. The present study was undertaken to determine whether there are any alterations in the levels of malondialdehyde (MDA), hypoxanthine and xanthine in babies born through thick MSAF.

The study was carried out in the Unit of Neonatology, Department of Pediatrics in collaboration with the Department of Biochemistry, Institute of Medical Sciences, BHU, Varanasi. Forty seven full term (FT), appropriate for gestational age (AGA) babies (control 14 - Group AI, severe birth asphyxia 8 - Group A2, meconium stained 14 - Group B1, meconium stained with birth asphyxia 11- Group B2) were subjects of the study. Informed consent was taken from the parents. Only FT-AGA babies were included so as to avoid other confounding variables. Babies with neonatal sepsis, hyperbilirubinemia and congenital malformations were excluded. The levels of malondialdehyde (MDA), hypoxanthine and xanthine were estimated in cord and 24 hours serum samples(3,4). Severe birth asphyxia was defined as Apgar score <3 at 1 minute. Student's t test, paired t test and one way Anova were applied for statistical significance.

Table I shows significantly high serum MDA levels in babies with meconium staining (with or without birth asphyxia) and those with only birth asphyxia as compared to controls at birth. There was significant fall at 24 hours but the values were still higher than control. Similar observations were also seen in the levels of hypoxanthine and xanthine. The

TABLE I–*Serum MDA, hypoxanthine and xanthine levels (cord blood and at 24 hours) in full term anoxic and non-anoxic babies in MSAF and non-MSAF deliveries.*

MSAF	Anoxia	No. of babies	Malondialdehyde (nmol/L)		Hypoxanthine (μg/L)		Xanthine (μg/L)	
			cord	24 hrs	cord	24 hrs	cord	24 hrs
(A)	1. No	14	992.5	907.5	39.2	32.3	26.5	25.6
No			±337.0	±323	±14.1	±8.3	±9.5	±5.6
	2. Yes	8	1255.1	932.5**	93.3	65.8***	79.3	52.6*
			±364.0	±252.6	±14.6	±19.0	±19.5	±15.4
(B)	1. No	14	1251.4	944.6**	114.5	91.5	95.6	77.0
Yes			±403.8	±292.6	±28.5	±28.8	±26.3	±20.4
	2. Yes	11	1200.5	851.2***	109.2	76.9***	86.9	58.6**
			±343.1	±215.3	±22.7	±18.4	±16.0	±15.7
F value			6.14**	N.S.	34.11***	21.44***	36.79***	27.27***

Significance between cord and 24 hour samples.
* $p < 0.05$ ** $P < 0.01$ *** $P < 0.001$

levels at 24 hours were significantly higher than controls. Nineteen babies suffered severe birth asphyxia of which 9 developed hypoxic ischaemic encephalopathy (HIE). Babies with HIE had higher values of serum MDA, hypoxanthine and xanthine both at birth and at 24 hours as compared to those who were clinically spared from HIE.

In the present study, the serum levels of MDA, hypoxanthine and xanthine were significantly increased in babies with meconium staining (both with or without birth asphyxia) and those who suffered only birth asphyxia. Such increased levels have been reported in newborns with perinatal asphyxia(5). However these increased levels have not been reported in meconium stained babies.

This study illustrates that there is a change in free radical levels in babies born through meconium stained amniotic fluid. These changes which are similar to those observed in perinatal asphyxia suggest that meconium stained babies suffer hypoxia irrespective of the Apgar score at birth. The clinical significance of these changes and their role in affecting neonatal outcome needs further study.

Acknowledgement

The authors thank Dr. G.R.K. Rao, Professor of Biochemistry at Institute of Medical Sciences, Varanasi for carrying out the biochemical analysis.

B.D Bhatia,
A. Goel,
Department of Pediatrics,
Institute of Medical Sciences,
Banaras Hindu University,
Varanasi 221 005, India.

REFERENCES

1. Varsila E, Hallman M, Anderson S. Free radical induced lipid peroxidation during the early neonatal period. Acta Pediatr 1994; 83: 692-695.
2. Bratteby LE, Swanstrom S. Hypoxanthine concentration in plasma during the first two hours after birth in normal and asphyxiated infants. Pediatr Res 1982; 16: 152-155.
3. Buege lA, Aust SD. Microsomal lipid peroxidation. In: Methods in Enzymology, vol 52, Part C eds. S. Fleischer & L. Packer, Academic Press, New York, 1978, p 302-310.
4. Plesner P, Kalckar HM. Enzymic Micro Detenninations of Uric acid. Hypoxanthine, Xanthine, Adenine and Xanthopterine by ultraviolet spectrophotometry. In: Methods of Biochemical analysis ed D. Glick, Interscience. Publishers Inc., New York, vol 3, 1970, p 97-110.
5. Saugstad GD. Hypoxanthine as an indicator of hypoxia: its role in health and disease through free radical production. Pediatr Res 1988; 23: 143-150.