

The Solution of Discrepancy of Late Deceleration and the Prevention of Cerebral Palsy by the Hypoxia Index



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Submission: April 23, 2018; Published: May 08, 2018

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Solution of Fetal Heart Rate Discrepancy

Although the late deceleration (LD) of fetal heart rate (FHR) was ominous outcome sign in fetal monitoring [1], there was discrepancy, namely, the neonatal outcome of 3 connective LDs was vigorous & normal, while the neonate after repeated LDs in 50 minutes was severe asphyxia, whose Apgar score was 3, and followed by brain hemorrhage & death 3 months later. However the difference was caused by the repetition of deceleration (transient fetal bradycardia) but not due to abnormal form of late deceleration.

Thus, the author intended to evaluate the sum of deceleration durations (min) divided by the lowest FHR (bpm, the hypoxic intensity) multiplied by 100, that was Maeda's hypoxia index (HI), which was the same as the hypoxic area (dip area), and it was the sum of hypoxic effects of repeated decelerations, that was as weak as 6 in 3 decelerations, but as strong as 26 after 50 minutes repetitions. The LD discrepancy was solved by hypoxia index.

Prevention of Cerebral Palsy Caused by Intrapartum Hypoxic Fetal Damage

As fetal brain reacts fetal movements then heart rate increases, fetal brain reacts by fetal movement group (movement bursts) forming acceleration (transient tachycardia), the acceleration disappears in early stage of hypoxia due to the suppression of fetal brain, while fetal brain reacts minor fetal movements, and forms FHR variability, which disappears at severe hypoxia after the loss of acceleration, the loss of variability is the most severe fetal hypoxia, that was the same as anencephalic fetus [2]. The hypoxia index of all 6 cases, whose variability was lost, developed severe fetal brain damage followed by cerebral palsy was 25 or more, whereas the hypoxia index of 16 cases of normal variability and followed by no cerebral palsy hypoxia index of 6 cases of normal variability, no intrapartum brain damage, and followed by no cerebral palsy was 24 or less (Table 1).

Table 1: Chi² test of hypoxia index of 25 or more and 24 or less in cases of cerebral palsy and normal outcome.

Intrapartum Brain Damage Followed by Cerebral Palsy				
Hypoxia index		Yes	No	p=0.000008
	25 or more	6	0	
	24 or less	0	16	

Thus, cerebral palsy caused by intrapartum hypoxic damage will be prevented, if hypoxia index is 24 or less.

Computerized Fetal Monitoring

FHR score, hypoxia index and FHR curve frequency spectrum will be included.

(1) FHR score calculated every 5 minutes.

Apgar score and UApH are expected by regression equations. Direct report to doctor from computer (Table 2).

Table 2: Expected Apgar score, neonatal asphyxia and umbilical arterial pH.

FHR Score	Expected Apgar Score	Asphyxia	UApH
<10	>7	No	>7.3
10	6	Mild	no acidosis
15	4	Moderate	Acidosis
20	3	Severe	Acidosis

- i. Hypoxia index
 - a) Direct report from computer to doctor when hypoxia index is positive.
 - b) Hypoxia index is reported every 5 minutes after positive hypoxia index.
 - c) Hypoxia index must be 24 or less at delivery.
 - d) No diagnosis of deceleration pattern (Observe FHR curve)

- ii. Frequency spectrum data
 - a) Pathologic sinusoidal FHR and its La/Ta and PPSD values are reported doctor.
- iii. Fetal hiccapping must be diagnosed in continuous spikes but no movement burst

(Observe actocardiogram, as no fetal movement is diagnosed by computer)



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DOI: [10.19080/CTBEB.2018.14.555883](https://doi.org/10.19080/CTBEB.2018.14.555883)

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