



Fetal Monitoring Changed to Simple Numeric Decision Discarding Fetal Heart Rate Pattern Classification

Kazuo Maeda^{1*} and Masaji Utsu²

¹Department of Obstetrics and Gynecology, Tottori University Medical School, Japan

²Department of Obstetrics and Gynecology, Mikatahara Hospital, Japan

Case Study

As visual classification of Fetal Heart Rate (FHR) patterns into early, late and variable decelerations was vague and complicated, correct numeric threshold setting has been started from Maeda's FHR score in 1969 [1,2].

Methods: Since three connected typical Late Decelerations (LD) were followed by normal Apgar 9 neonate, while Apgar score was 3 and followed by the loss of FHR variability and severe brain damage after 50 mins' LD repetition. In addition, there was a rule that LD should be defined after 15 mins' repetition, thus, it was clarified that LD is ominous not due to its late appearance after uterine contraction, but due to its frequent repetition, which was the same in the other FHR decelerations, thus, novel Hypoxia Index (HI) was the sum of all FHR deceleration durations (min). That showed the total duration of hypoxia as the heart rate was closely parallel to the PaO₂ lower than 50 mmHg in rabbit divided by the lowest FHR, which showed the hypoxic intensity, in fetal monitoring, and multiplied by 100 to make the index integer [3]. The first target of the Hypoxia Index (HI) was the prevention of infantile cerebral palsy, where the HI was studied retrospectively in 22 infants who diagnosed by pediatric doctors, and intrapartum FHR record was preserved in obstetrics, of which HI was calculated.

Results: There was significant difference of cerebral palsy case numbers between 6 cases, whose HI was 25 or more, and 16 no cerebral palsy cases, whose HI was 24 or less (Table 1) [4].

Discussion 1: The HI of all 6 cases of cerebral palsy was 25 or more, while the HI of all 16 cases of no cerebral palsy was 24 or less. Thus, infantile cerebral palsy caused by intrapartum damage is prevented when HI is 24 or less in fetal monitoring. The HI is adopted all FHR decelerations including early, late and variable decelerations, as no lag time is included in the HI calculation, as well as sudden continuous fetal bradycardia. HI was evaluated in intrapartum FHR records of 6 cases of cerebral palsy and 16 infants of no cerebral palsy, who were diagnosed by Pediatricians.

Discussion 2: Cerebral palsy will be prevented, if the HI is 24 or less in intrapartum fetal monitoring. The 25 or more HI cases can receive very early therapy for the treatment of cerebral palsy in neonatal stage, which will improve the therapeutic results of cerebral palsy. As late deceleration disappeared by maternal lateral posture, lateral posture is recommended in all of decelerations [5]. The pattern classification method will be replaced by the objective numeric indices, where neonatal Apgar score and umbilical cord blood pH will be predicted by FHR score and also from the HI using regression equations, and reported attendant doctor in computerized FHR diagnosis. As the fetal blood pH is predicted also by the deceleration area by Cahill et al. [6], fetal evaluation will be revolutionary changed to digital analysis.

Conclusion: All FHR decelerations are evaluated with HI. Cerebral palsy is prevented, if the HI is 24 or less in the birth. Early cerebral palsy treatment can be started in neonatal stage. Lateral posture is recommended in all decelerations.

Table 1: Hypoxia Index (HI) was 25 or more in all of 6 cerebral palsy cases, while HI was 24 or less in all of 16 no cerebral palsy cases.

Hypoxia Index	Cerebral palsy cases	
	Yes	No
25 or more	6	0
24 or less	0	16

Cerebral palsy cases' χ^2 test: $P=0.0008 < 0.05$, significant difference

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*Correspondence:

Kazuo Maeda, Department of Obstetrics and Gynecology, Tottori University Medical School, Yonago, 3-125 Nadamachi, Yonago, Tottori ken, 683-0835, Japan, Fax: 81-859-22-6856; E-mail: maedak@mocha.ocn.ne.jp

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