




報告番号 香大医博乙 第 281号

学位論文審査の結果の要旨

平成 29 年 8 月 18 日

審査委員	主査	日下 隆 
	副主査	西山 佳宏 
	副主査	三木 京花 
申請者	Mohamed Ahmed Mostafa AboEllail	
論文題目	4D ultrasound study of fetal facial expressions in the third trimester of pregnancy	
学位論文の審査結果	<input checked="" type="radio"/> 合格 ・ <input type="radio"/> 不合格 (該当するものを○で囲むこと。)	

〔要旨〕

<Objective>

Fetal behavior represented by fetal movements and facial expressions reflect well-being of the fetal brain and central nervous system (CNS). Therefore, the evaluation of facial expressions, especially in the third trimester of pregnancy, might represent a direct method to assess developmental changes of the fetal brain and CNS. The aim of this study is to evaluate the frequencies of fetal facial expressions in the third trimester of pregnancy, when fetal brain maturation and development are progressing in normal healthy fetuses.

<Methods>

Four-dimensional (4 D) ultrasound was used to examine the facial expressions of 111 healthy fetuses between 30 and 40 weeks of gestation. The frequencies of seven facial expressions (mouthing, yawning, smiling, tongue expulsion, scowling, sucking, and blinking) during 15-minute recordings were assessed. The fetuses were further divided into three gestational age groups (25 fetuses at 30–31 weeks, 43 at 32–35 weeks, and 43 at ≥36 weeks). Comparison of facial expressions among the three gestational age groups was performed to determine their changes with advancing gestation.

<Results:>

Mouthing was the most frequent facial expression at 30–40 weeks of gestation, followed by blinking. Both facial expressions were significantly more frequent than the other expressions ($p < 0.05$). The frequency of yawning decreased with the gestational age after 30 weeks of gestation ($p = 0.031$). Other facial expressions did not change between 30 and 40 weeks. The frequency of yawning at 30–31 weeks was significantly higher than that at 36–40 weeks ($p < 0.05$). There were no significant differences in the other facial expressions among the three gestational age groups.

<Discussion>

Mouthing was the sole most frequent facial expression at 20-34 weeks in our previous studies. In the present study, mouthing and blinking were the most frequent facial expressions at 30-31, 32-35, 36-40, and 30-40 weeks of gestation, respectively. Brain functions regulate the rate of spontaneous eye blinking, and an increase in the spontaneous eye-blinking rate is thought to be related to central dopamine system maturation. These results suggest that the concurrence of mouthing movement and eye blinking may be related to the maturation of fetal brain development after 30 weeks of gestation. Yawning is concerned with the arousal process of the brain. With advancing gestation, the rhythmic control of sleep and wake times becomes more established. This results in frequent waking episodes and less of a need for yawning as a stimulus for brain arousal. The period of approximately 30 weeks of gestation might represent the emergence of distinct states of fetal brain arousal as indicated by significant decrease in yawning frequency.

<Conclusions>

The present study provided the normal parameters of fetal facial expressions in the third trimester of pregnancy, and suggests the possible link between facial expressions and brain development at this stage, when the fetal brain reaches advanced stage of maturity. Therefore, the full realization of fetal facial expressions and fetal behavior in different stages of gestation might enable us to better understand the functional development of the fetal brain and CNS. The developmental changes of facial expressions can selectively indicate the maturation and development of different parts of the fetal brain and CNS.

平成29年8月16日に行われた学位論文審査委員会においては、以下に示す様々な質疑応答が行われたが、それぞれに対して適切な回答が得られた。

- 1- Regarding the study design, the study was cross sectional study, would it be better if it were a cohort prospective study.
- 2- Why did you choose the face as a measure for neurodevelopment, it maybe another parts of the body or other parameters to assess, for example in KANET test we use face and limb movements.
- 3- In discussion, fetal expression smiling is correlated with mother condition.
- 4- Is it difficult to get the beautiful 2D pictures of the fetal face?
- 5- What is the difference between mouthing and smiling?
- 6- Regarding maternal stress status, is there any influence of mother time of sleeping in the day preceding the examination whether it is sufficient or not?
- 7- Regarding blinking frequency, in basic animal test, eye blinking is related to brain damage. So we should investing the aim of blinking in further studies
- 8- Yawning is related to jaw movements, blinking is related to eye movements, so both movements are controlled by trigeminal nerve which is connected to medulla and pons, so developmental changes of mouthing and blinking how can you explain the relation between these facial expressions?
- 9- How does the fetal state as sleep or awake affects fetal behavior or facial expressions?
- 10- Do you think animal fetuses have same expressions as smiling?
- 11- We want to know the definition of smiling in uterus? How can we differentiate between social movements as smiling and movements, which are essential in life as in cases of mouthing, and blinking?

本論文は4D ultrasound study of fetal facial expressions in the third trimester of pregnancyに関する研究であり、胎児の表情は胎児脳の成熟、発達を示唆する可能性を指摘したもので結果に対する十分な考察もなされている。学術的価値が高く、委員会の合議により、本論文は博士(医学)の学位論文に十分値するものと判断した。

掲 載 誌 名	The Journal of Maternal-Fetal & Neonatal Medicine 第 卷, 第 号		
(公表予定) 掲 載 年 月	2017年 5 月 掲載受理	出版社(等)名	Informa Healthcare

(備考) 要旨は、1, 500字以内にまとめてください。