Disclosure Information
AACPDM 67th Annual Meeting October 16-19, 2013

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Disclosure of Relevant Financial Relationships
I have no financial relationships to disclose.

Disclosure of Off-Label and/or investigative uses:
I will not discuss off label use and/or investigational use in my presentation

How to record and assess General Movements (GMs)

- On-line assessment of GMs
- Off-line assessment of GMs


On-line assessment of GMs

Observation of GMs, interpretation and classification
Off-line assessment of GMs

Video recording for later observation of GMs

Equipment for video recordings

- Digital cameras are preferable
- Avoid blinking light if possible

Procedure

- Always use a tripod!
- Place camera high above the infant
- Place infant in supine position

Example of standardized video recording set-up for research use
Computerized movement assessment
Review of current research

GMA and Gestalt perception

- Gestalt perception of normal versus abnormal GMs is one of the most reliable and accurate approaches for assessment of the young nervous system
- The GMA is non-intrusive and cost effective

Criticism of GMA
- Requires well-trained and experienced observers, therefore not always available
- Current studies include important sources of bias; 1) samples selected retrospectively, 2) outcome measures are rarely standardized, 3) outcome conducted at a very early age, 4) assessors rarely blinded to the infants' medical history

Computer-based assessment of GMs
- The reliability and accuracy of the GMA are strong, but there is a lack of clinical use world-wide.
- Computer-based movement assessment tools have been developed to perform quantitative analysis of GMs
Kinematic Assessment of Stereotypy in Spontaneous Movements in Term Infants (Karch, D., K. Wochner, et al. 2010)


- Electromagnetic tracking system (ETS)
- Development of a complexity score (interactions of lower and upper limbs)
- 53 infants at gaitage's age (12 weeks post term age)
- The complexity score was able to quantify movement complexity in regard of the understanding of physicians

Stereotype Analysis

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Electromagnetic tracking (ETS) and variability, complexity and fluency


- Electromagnetic tracking system (ETS)
- Analysis of upper and lower limb positions
- Development of a stereotype score (decreased degrees of freedom)
- 54 high-risk and 21 normal infants at gaitage's age (12 weeks post term age)
- Stereotype score of upper limbs identified CP (N=10) (at 24 months age) with a sensitivity of 90% and a specificity of 96%

Kanemaru, N., H. Watanabe, et al. (2013)

Specific characteristics of spontaneous movements in preterm infants at term age are associated with developmental delays at age 3 years. Developmental Medicine and Child Neurology 55(8): 713-721

- Six movement indices (markers) on term infant, video recordings
- 124 preterm infants assessed at term age [36-44 postmenstrual age]
- Normal, borderline or delayed development at 3 years of age
- Less limb activity was associated with delayed development (Kyoto Scale of Psychological Development (Kyoto Scale)
These results are promising, however, ..... 

- Dependent on instrumentation of the infant
- Advanced analysis
- Laboratory settings
- Small samples containing few children with CP

The “dancing infant” (FM) and the integrity of the brain

Variability
Complexity
Fluency

Extraction of movement information from video recordings without any markers


Software using frame differencing

Calculating pixel values between frames in the video

Creating a motion image
Computer-based video analysis

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Playback of video
Calculating the motion image and exportation of movement variables

Visual representation of video-based movement variables

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• Using video recordings and CIMA software
• 137 preterm and term infants assessed at FM age
• Sensitivity of 81.5% and specificity of 70% for the detection of FMs

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Adde L, Helbostad JL, Jensenius AR, Taraldsen G, Stoen R.


• Using video recordings and CIMA software
• 30 high-risk preterm and term infants assessed at FM age
• Sensitivity of 85% and specificity of 88% for the prediction of CP

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- Using two video recordings and CIMA software
- 52 preterm and term infants assessed at FM age
- CP status at 2 years age (n= 10)
- Using two video recording and CIMA software was more accurate than using one recording and identified all children diagnosed with CP at 2 years age

Further validation of the CIMA concept

Ongoing multisite studies

Thank you for your attention!