Relationship between Brain Lesion Severity and Oropharyngeal Dysphagia in Young Children with Cerebral Palsy

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BACKGROUND & AIMS:

Background: While severity of oropharyngeal dysphagia (OPD) is known to be strongly related to gross motor functional severity, there is a paucity of information on the relationship between brain structure and OPD in children with cerebral palsy (CP).

Aims: This study examined the relationship between brain lesion pattern and severity on structural magnetic resonance imaging (sMRI) and clinically assessed oropharyngeal dysphagia (OPD) in preschool-aged children with cerebral palsy (CP).

STUDY DESIGN & PARTICIPANTS:

Study Design:

- Cross sectional prospective population based cohort study.

Study Participants & Setting:

- 84 children with CP (50 male, 34 born at term), mean (sd) age at sMRI of 20.4 (±14.9) months were recruited from the community.
- GMFCS levels were: I=41, II=15, III=13, IV=9, V=17.
- Motor type included (n, %) bilateral spasticity (47, 56%), unilateral spasticity (23, 27%), athetosis (3, 4%), hypotonia (5, 6%) and ataxia (2, 2%).

METHODS:

Measures:

- sMRI neuroimaging (T1, T2, Flair) was scored by a trained child neurologist using i) Krägeloh-Mann (KM) quantitative classification of brain lesion pattern; and ii) a novel, semi-quantitative scale (Fiori 2013; possible range 0 to 40).
- KM classification included 5 groups: periventricular white matter lesions (PWM) (n=51), cortical and deep grey matter (CDGM) (n=16), brain maldevelopment (BM) (n=5), miscellaneous lesions (M) (n=6) or normal (n=6).
- Clinical feeding evaluations were conducted between 18-36 months of age. OPD was assessed using the Dysphagia Disorders Survey-Part 2 (DDS raw score, range 0 to 22; item subscores for chewable, non-chewable, liquid) and Schedule for Oral Motor Assessment (SOMA) including 7 oral motor challenge categories (OMCC; raw scores for bottle, spout cup, cup, puree, semisolid, solid, cracker).
- Data was analysed using regression models. Significance was set at p<0.05.

RESULTS:

sMRI Lesion Severity & Food / Fluid Textures:

- Severity of brain lesion (GS) was positively related to children’s performance (OPD) on specific fluid textures (DDS) (all p<.001):

  - Non-chewable: GS (β=0.11, 0.04-0.17) & Liquids: GS (β=0.13, 0.06-0.19)
  - Chewable: GS (β=0.14, 0.65-0.22)
  - Cup drinking thin fluids: GS (β=0.17, 0.08-0.26 p=0.001) and eating purees (β=0.113, 0.01-0.22, p=0.34).

Pattern of Brain Lesion (KM) & OPD:

- While the pattern of brain lesion was not related to OPD (DDS raw score) overall, significant differences existed between KM classifications, F=3.581 (p=0.011).
- Children with CDGM had greater OPD than those with PMV (mean difference -7.4, -1.07, p=0.008). Brain lesion severity was related to OPD and feeding performance on specific texture/fluids.

- Further investigation into the ability of this semi-quantitative sMRI scale to predict OPD and secondary health effects is warranted.

CONCLUSIONS:

- These results provide novel data about the relationship between pattern/severity of brain lesion with OPD in young children with CP.
- Children with PWM lesions had better feeding and swallowing function than those with CDGM. Brain lesion severity was related to OPD and feeding performance on specific texture/fluids.

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