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Oropharyngeal dysphagia in preschool children with cerebral palsy: Oral phase impairments[☆]



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ABSTRACT

Purpose: This study aimed to document the prevalence and patterns of oral phase oropharyngeal dysphagia (OPD) in preschool children with cerebral palsy (CP), and its association with mealtime duration, frequency and efficiency.

Methods: Cross-sectional population-based cohort study of 130 children diagnosed with CP at 18–36 months ca (mean = 27.4 months, 81 males) and 40 children with typical development (mean = 26.2, 18 males). Functional abilities of children with CP were representative of a population sample (GMFCS I = 57, II = 15, III = 23, IV = 12, V = 23). Oral phase impairment was rated from video using the Dysphagia Disorders Survey, Schedule for Oral Motor Impairment, and Pre-Speech Assessment Scale. Parent-report was collected on a feeding questionnaire. Mealtime frequency, duration and efficiency were calculated from a three day weighed food record completed by parents. Gross motor function was classified using the Gross Motor Function Classification System (GMFCS).

Results: Overall, 93.8% of children had directly assessed oral phase impairments during eating or drinking, or in controlling saliva (78.5% with modified cut-points). Directly assessed oral phase impairments were associated with declining gross motor function, with children from GMFCS I having a 2-fold increased likelihood of oral phase impairment compared to the children with TD (OR = 2.0, $p = 0.18$), and all children from GMFCS II–V having oral phase impairments. Difficulty biting (70%), cleaning behaviours (70%) and chewing (65%) were the most common impairments on solids, and difficulty sipping from a cup (60%) for fluids. OPD severity and GMFCS were not related to mealtime frequency, duration or efficiency, although children on partial tube feeds had significantly reduced mealtime efficiency.

Conclusions: Oral phase impairments were common in preschool children with CP, with severity increasing stepwise with declining gross motor function. The prevalence and severity of oral phase impairments were significantly greater for most tasks when compared to children with typical development, even for those with mild CP. Children who were partially tube fed had significantly lower feeding efficiency, so this could be a useful

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early indicator of children needing supplementation to their nutrition (through increasing energy density of foods/fluids, or tube feeds).

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1. Introduction

Oropharyngeal dysphagia (OPD), or impaired feeding, has been frequently cited in the literature as an important factor influencing growth, nutritional status and respiratory health in children with cerebral palsy (CP) (Calis et al., 2008). Oropharyngeal dysphagia is common in approximately 85% of preschool children with CP (Benfer et al., 2013), largely related to the motor and sensory impairments associated with the diagnosis. Cerebral palsy is a group of non-progressive motor disabilities (Smithers-Sheedy et al., 2013) which can impact on the range, strength and coordination of motor control. The process of eating and drinking is commonly delineated into a number of interrelated phases, including the oral-preparatory, oral (propulsive), and/or pharyngeal phases (Matsuo & Palmer, 2008)

The oral-preparatory and oral propulsive phases (here-in described jointly as the 'oral phase') involve the child alerting to the bolus, receiving the bolus (through stripping a spoon, biting, or sipping from a bottle/cup), closure of the lips and nasopharynx to maintain the food/fluid in the mouth, moving the bolus in the mouth to prepare it for swallowing (including mastication), and propulsion of the bolus posteriorly for the initiation of the pharyngeal phase (Matsuo & Palmer, 2008). Impairments of the oral phase tend to receive the most emphasis in the feeding literature and in clinical assessments, in part due to the fact that they are more observable. The oral phase is important as it may impact on the efficiency of intake (e.g. increased anterior loss of food or fluids, increased oral transit time), which may lead to poor growth and nutrition. An impaired oral phase can also result in premature spillage of the bolus into the pharynx before the swallow has been initiated, piecemeal deglutition (the bolus being divided into multiple parts), and oral residue post-swallow, which can all impact on the safety of the mealtime.

A number of studies have explored oral phase impairments in children with CP, finding these impairments to be prevalent in between 68 and 95.4% of children (Field, Garland, & Williams, 2003; Gisel, Applegate-Ferrante, Benson, & Bosma, 1996; Gisel, Alphonse, & Ramsay, 2000; Kim, Han, Song, Oh, & Chung, 2013; Love, Hagerman, & Taimi, 1980; Mirrett, Riski, Glascott, & Johnson, 1994; Ortega, Ciamponi, Mendes, & Santos, 2009; Reilly & Skuse, 1992; Reilly, Skuse, & Poblete, 1996; Rogers, Arvedson, Buck, Smart, & Msall, 1994; Selley et al., 2001; Yilmaz, Basar, & Gisel, 2004; Yokochi, 1997). The variability in these estimates is related to participants' characteristics (in particular their age and gross motor severity), and the oral phase items/tasks assessed. Analysis of oral phase impairments in the literature has been based on a number of approaches; using a systems based approach (e.g. impairments to lips, tongue, jaw), analysis of ingestion functions (e.g. spoon feeding, biting, chewing, clearing), or documenting the specific oral sensorimotor impairments (e.g. prolonged oral transit time, impaired lip closure, use of extension-retraction tongue pattern). The most commonly cited impairments in individual studies included poor response to anticipation (Selley et al., 2001), difficulty stripping the spoon (Reilly & Skuse, 1992), poor lip closure (Ortega et al., 2009; Reilly & Skuse, 1992), difficulty drinking from a straw (Love et al., 1980; Ortega et al., 2009) and cup (Gisel et al., 2000), use of extension-retraction tongue patterns (Reilly & Skuse, 1992), difficulty chewing (Gisel et al., 1996, 2000; Ortega et al., 2009; Yilmaz et al., 2004), inadequate bolus formation (Kim et al., 2013), piecemeal deglutition (Kim et al., 2013) and oral residue (Kim et al., 2013). Many of the studies did not account for the gross motor function of the participants, therefore it is difficult to synthesise these data to characterise a picture of the patterns we would expect in the different functional levels.

The current study aimed to document the overall prevalence of oral phase OPD (overall and specific ingestion functions) in children with CP aged 18–36 months, as well as its association with mealtime frequency, duration and efficiency. Oral phase patterns were described with reference to a typically developing (TD) reference sample, and the child's gross motor function (on the Gross Motor Function Classification System, GMFCS), in order to understand how the specific oral phase impairments vary in children with this heterogeneous diagnosis. A better understanding of the range of functional impairments will assist in understanding which ingestion functions may be most important to consider for various health outcomes (such as growth and respiratory health), and which children may be most successfully targeted for therapy.

2. Materials and methods

This is a cross-sectional population-based study of preschool aged children with CP, conducted in Queensland, Australia between April 2009 and March 2013. It is part of two concurrent longitudinal studies exploring brain structure and motor function (National Health and Medical Research Council (NHMRC) 465128) and the relationship between growth, nutrition and physical activity (GNPA, NHMRC 569605) in children with CP. The design of the larger studies (Bell et al., 2010; Boyd et al., 2013) and current study (Benfer, Weir et al., 2012) have been described previously. Ethics approval has been gained through the University of Queensland Medical Research Ethics Committee (2008002260), the Children's Health Services District Ethics Committee (HREC/08/QRCH/112), and at other regional and organisational ethics committees (see protocol papers for full lists). All parents or guardians gave written informed consent to participate.

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