

## Swallowing disorders and feeding problems in children and teenagers with cerebral palsy

Mustapha Mouilly<sup>1,2</sup>, Noureddine Faiz<sup>1,3</sup>, Ahmed Omar Tohami Ahami<sup>1</sup>,  
Youssef Abousalah<sup>1</sup>

<sup>1</sup>Department of Biology, Neurosciences and Nutritional Health/ Ibn Tofail University, Morocco

<sup>2</sup>Mohammed Diouri Health center, Kenitra, Morocco

<sup>3</sup>SMBA Health Center, Mohammadia, Morocco

**Abstract:** The present study is designed to investigate the disorders of swallowing and feeding in children and teenagers suffering from cerebral palsy (CP). These disorders can have vital consequences dependent on the pneumonia generated by the false roads. This descriptive study was undertaken on a sample of 65 child and teenager suffering from CP between 2 and 17 years old, in the North-West of Morocco. For that we used the Gross Motor function Classification System, Expanded and Revised (GMFCS- E & R) and a questionnaire of evaluation of the feeding and swallowing. Thus 10,8% of the patients were classified on level I of the GMFCS, 7,7% on the level II, 10,8% on the level III, 33,6% on level IV and 35,6% on the level V. 36,6% of children and 45,8% of teenagers presented frequent bronchial superinfections and that 51,2% of children and 54,2% of teenagers suffer from disorder of the transit, - standard constipation without laxative treatment -. 85,4% of children and 50% of teenagers need a third person to be fed, 70,7% of children and 54,2% of teenagers present false roads while drinking as 31,7% of children have orofacial malformations against 16,7% of teenagers. The retraction of the upper lip was observed at 73,2% of children against 29,2% of teenagers. Labial gripping during the feeding remains impossible at 82,9% from the total of children and 70,8% of the teenagers. Our study with also highlighted the existence of correlations between the GMFCS and which has occurred of false roads while eating and while drinking respectively with  $r=0,47$  and  $r=0,77$ . It is necessary to bring to this population of children and teenagers the adapted and effective care, so that they will test a better quality of life.

**Keywords:** Cerebral palsy, children, feeding, teenagers, swallowing.

### I. Introduction

The Cerebral palsy (CP) is a group of disorders of the development of movement and posture causing activity limitations that are attributed to non-progressive disturbances that occur in the developing fetal or infant brain. Cerebral palsy movement disorders are often accompanied by sensitive damage, sensory, communication, prehensions and / or behavior<sup>[1]</sup>. The neuromotor disorders on the level of the oral sphere are responsible for pathologies of ingestion (function of the digestive system relating to the catch and the handling of solids or liquids penetrating in the body by the mouth)<sup>[2]</sup>. The dysfunctions of the oral steps of ingestion (suction, bite, chewing, work of food in the mouth, salivation, swallowing) disturb the nutrition and often imply the installation of a modified feeding. In addition, they have real effects on health dental oral. Thus the intensity of these disorders can go until prohibiting the verbal communication and making the feeding very difficult, which makes the contribution energy insufficient, even a state of dehydration. In such cases the false roads are frequent. They are often at the origin of pneumonia featuring life-threatening<sup>[3]</sup>. Few studies focusing on feeding and swallowing in children suffering from cerebral palsy, for these reasons, our global study, of exploratory nature, aims to study the feeding and swallowing in children and teenagers with cerebral palsy and to compare the results between children and teenagers.

### II. Material and methods

The participants consisted of children with CP. They were recruited from 2 rehabilitation centers in the city of Kenitra North-West of Morocco between October 2015 and June 2016. Children were included if: (i) they were aged between 24 months and 17years; (ii) their primary caregivers gave informed consent; (iii) and to be diagnosed carrying cerebral palsy. Fig1. Sixty-five children with CP were eligible to participate in the study. The demographic information, subtype of CP, and severity of the motor function defined by the Gross Motor Function Classification System (GMFCS)<sup>[4]</sup>, of the 65 children with CP are shown in Table I.

The data were collected starting from the medical and ancillary medical file, the transverse investigation proceeded using a questionnaire, after prior agreement obtained of the directors of the centers but also with the free consent of the parents and their children under the supervision of the persons in charge for the centers. The evaluation of feeding and swallowing questionnaire was prepared based on the work of C.Senez<sup>[5]</sup>.

The GMFCS [4] is a system with 5 levels offering a standardized classification of motor disability patterns for children with cerebral palsy from birth to 18 years. Distinctions between 5 levels, ranging from level I (least limiting) at V (greater limitation), is based on the limitations of motor function and needs for mobility devices into four ages. The GMFCS has a good reliability and validity [5,6] Fig.2.

All the statistical analyses were carried out using the software of statistics for social sciences (SPSS, version 20.0). The normality of the distribution of the variables was tested by the test of Kolmogorov-Smirnov. The test of correlation of Spearman was used, the values of p lower than 0.05 were considered statistically significant.

Upon arrival for the visit, parents were presented with consent, forms explaining the study, the questionnaire, and the measurements. Families were given the opportunity to refuse to participate at that time.

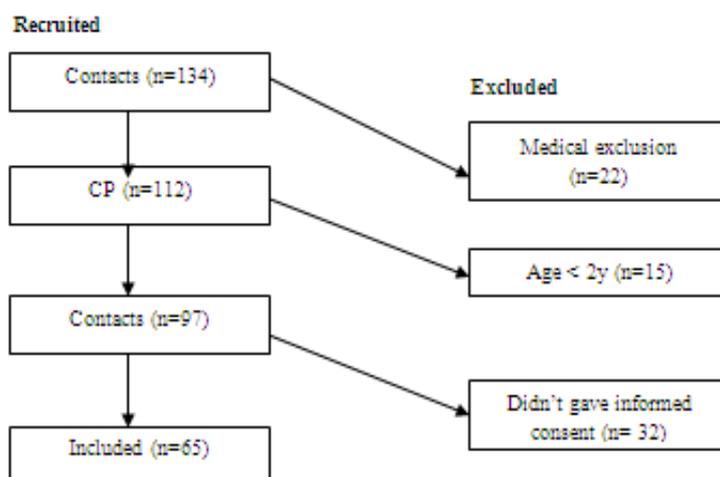


Fig.1. flow diagram to illustrate selection of study group



Fig.2. gross motor function classification system

### III. Results

The studied population comprised 41 children and 24 teenagers with average 108 ( $\pm$  29,6) months, 31/65 were quadriplegic, 24/65 were diplegic, 3/65 were hemiplegic, whereas 2/65 were triplegic, 2/65 were dyskinetic, 1/65 were hypotonic and 2/65 were mixed. The GMFCS is an invaluable tool which enabled us to classify our population thus; 10,8% of the patients were classified on level I of the GMFCS, 7,7% on the level II, 10,8% on the level III, 33,8% on the level IV and 36,9% on the level V. Among the patients 39% of the children and 16,7% of the teenagers were epileptics, 32,3% of the population had a neuroleptic treatment, 72.3% of the population needed third person to be fed and less than 20% had false roads while eating whereas 64,6% had while drinking, but at the time of the meal nearly 7% of the population were installed lying, 80% of the population had bad teeth and 74% had orofacial malformations. Nearly a third of the population used movements of suction swallowing during feeding. Labial gripping was impossible at almost 80% of our population. With regard to the drooling, it was noted that 40% of the population dribbled. This study also highlighted the existence of statistically significant differences of the disorders of swallowing and feeding in the children against those of the teenagers of our population. Table II

**Table I:** Characteristics of the children and teenagers with cerebral palsy (n=65)

Characteristics	Frequency
Age, months, mean (SD)	108 (29,6)
Gender, male/ female, n	
Children ,n (41)	20/21
Teenagers ,n (24)	13/11
Type of cerebral palsy, n(%)	
Spastic	
Quadriplegia	31 (47,7)
Triplegia	2 (3,1)
Diplegia	24 (36,9)
Hemiplegia	3 (4,6)
Dyskinetic	2 (3,1)
Hypotonic	1 (1,5)
Mixed	2 (3,1)
GMFCS, n(%)	
I	7 (10,8)
II	5 (7,7)
III	7 (10,8)
IV	22 (33,8)
V	24 (36,9)

SD: standard deviation; GMFCS: Gross Motor Function Classification System

The correlational analyses showed the existence of bonds between the GMFCS and occurred of false roads while eating and while drinking respectively with  $r=0,47$  and  $r=0,77$ . Another correlation was recorded in connection with the GMFCS and oral malformations and the frequency of the annual broncho-pneumonia respectively with  $r=0,5$  and  $r=0,28$ .

**Table II.** Outcome measures in the group with CP (children and teenagers)

	Children (n=41)		P valeur	Teenagers (n=24)		P valeur
	Oui (%)	Non (%)		Oui (%)	Non (%)	
Epilepsy	39	61	<0,001	16,7	83,3	<0,001
Traitement anti epileptic	36,6	63,4	<0,001	12,5	87,5	<0,001
Traitement neuroleptic	34,1	65,9	<0,001	29,2	70,8	<0,001
Frequent bronchial superinfection	36,6	63,4	<0,001	45,8	54,2	<0,05
Pneumonia >2/an	97,5	2,5	<0,001	70,8	29,2	<0,001
Desorders of transit	68,3	31,7	<0,001	54,2	45,8	<0,05
Laxative traitement	0	100	<0,001	4,2	95,8	<0,001
Gastroesophageal reflux	7,3	92,7	<0,001	8,3	91,7	<0,001
anti-ulcer treatment	2,4	97,6	<0,001	0	100	<0,001
Autonomy meal	85,4	14,6	<0,001	50	50	0,11
Verbal Communication	22	78	<0,001	54,2	45,8	<0,05
Comprehension	87,8	12,2	<0,001	95,8	4,2	<0,001
hearing	100	0	<0,001	100	0	<0,001
vision	97,6	2,4	<0,001	100	0	<0,001
Gelled water hydration	9,8	90,2	<0,001	100	0	<0,001
Wrong eating	17,1	82,9	<0,001	16,7	83,3	<0,001
Wrong by drinking	70,7	29,3	<0,001	54,2	45,8	<0,05
state teeth /Correct	22	78	<0,001	83,3	16,7	<0,001
Gingival bleeding	87,8	12,2	<0,001	95,8	4,2	<0,001
Oral facial malformation	68,3	31,7	<0,001	83,3	16,7	<0,001

Lip gripper/meal	17,1	82,9	<0,001	29,2	70,8	<0,001
Drooling	36,6	63,4	<0,001	45,8	54,2	<0,05
Retracted upper lip	73,2	26,8	<0,001	70,8	29,2	<0,001
suction swallowing/food	31,7	68,3	<0,001	8,3	91,7	<0,001

**Table III.** Correlation between false roads, oral malformations, bronchial infections and Gross Motor Functional Classification System

	GMFCS	False road in drinking	False road in eating	Frequente infections	Oral malformation
GMFCS	1,00	0,77**	0,47**	0,25*	0,50**
FR in drinking	0,77**	1,00	0,33**	0,41**	0,29*
FR eating	0,47**	0,33**	1,00	0,47**	0,57**
Frequente infections	0,25*	0,41**	0,47**	1,00	0,51**
Oral malformation	0,50**	0,29*	0,57**	0,51**	1,00

\*Signification in 0.05 ; \*\*Signification in 0.01 ; \*\*\* Signification in 0.001.

#### IV. Discussion

Figure The neurological damage of the suffering children of cerebral palsy generates disorders of gross motor and more especially those of the orofacial function which is translated by swallowing, the feeding, phonation and breathing. The failure of the loop motricity and sensory was well described by Thierry Rofidal: " This sensorimotor loop is usually imperfectly functional: sensory perceptions are impoverished or slowed down, the driving answers are slow, awkward and explosive "<sup>[7]</sup>. These disorders can have annoying consequences expressed by the oral malformations or the pneumonia generated by false roads where the vital forecast will be brought into play. Studies proved a strong correlation between the driving dysfunction of the oral sphere and the malnutrition <sup>[8]</sup>. Thus Campanozzi <sup>[9]</sup> showed that the gastro-intestinal malnutrition and disorders (constipation and backward flow gastro-esophageal) are frequent in the children carrying cerebral palsy. With dimensions of the disorders of driving coordination, the crises of epilepsy of which 45,7 % of our population suffer from it, are often responsible for falls during which the dento-alveolar dysmorphism predisposes with the attack of the former block jawbone <sup>[10]</sup>. The antiepileptic ones (such as the phenytoin (Dihydral)) can be responsible for the phenomenon "of gingival hyperplasia" which can worsen the difficulties of chewing <sup>[11]</sup>. Thus certain nerve sedatives managed with the long course are responsible for a reduction in salivary secretion <sup>[12]</sup>. We found in our study that the false roads, in children and teenagers suffering from CP, occur more while drinking than in eating, this was proven in McPherson <sup>[13]</sup> and Rempel <sup>[14]</sup> studies, showing that the deficit of coordination is noticed between swallowing and breathing, particularly when the bolus is liquid <sup>[14]</sup>. Our study also highlighted the persistence of the antiquated movements of suction-swallowing at a considerable number of our patients this can be explained by the lingual hyperactivity what supports consequently projection in front of the dento-alveolar maxilla and lip gap.

Actually, the frequency of the disorders of suction-swallowing in the suffering children of cerebral palsy, increase the risk of false-road and are partly responsible for the salivary escapes that more than 40% of our population suffer from it.

Beyond the permanent neurological disorders, the instability of the mandibular posture during swallowing sometimes related on the dental malposition and the orofacial deformations, with the type of food, the environmental stress, and the obstruction nasal are factors contributing to the mechanism of false road which constitutes the first cause of mortality in the multiple disabilities population. This is why it appears significant to consider the type of food, postural and social comfort in such a project of remediation and early education.

In the correlational perspective, the disorders of swallowing in the children of level 4 and 5 of GMFCS are respectively 60 and 100 % of the cases. This result does not seem surprising to the extent that the same motor disorders observed in the limbs exist in swallowing muscles: the motor control deficits and sensory integration oral areas, laryngeal, pharyngeal, head and neck are the cause of swallowing disorders

Weakness of the manpower of the studied population (65 members), statistically speaking this number is not enough consequent to be significant, moreover than in the level of GMFCS II there are only 5 children. However, the observation of certain characteristics of these children made it possible to highlight tendencies and opens the prospect for a broader study. There is also some skew in the quotation of the GMFCS which it is necessary to know well, it always does not reflect the potential capacities of the child (training of the electric wheel chair in progress, taken weight invalidating, etc.).

#### V. Conclusion

The children and the teenagers carrying cerebral palsy seem to us all equal In front of the disorders of swallowing and feeding. Our work enabled us to testify to the importance of the disorders of swallowing and feeding including the risks of false roads, which constitute the first cause of mortality in the multiple disabilities

population. These disorders of swallowing and feeding and their consequences raised in our work will have to be studied within the framework of a study of prospective troop in order to trace the large axes of a coherent therapeutic project while taking into account the levels of the GMFCS of the patients. Thus, these disorders at the child and the suffering teenager of cerebral palsy can be particularly invalidating, involve maintenances or returns in hospitalization. Their consequences are heavy as well on the physical level as psychological. A very early catch of load, elaborate in interdisciplinarity, can truly modify the become of the child and improve his quality of life including the nutritional component. It is thus significant to develop these practices and to inform the professionals of any structure concerned and its importance.

### **Acknowledgements & conflicts of interest**

We thank the children's caregivers, children and teenagers for their participation. We also thank directors and occupational therapists working in the centers of rehabilitation for their assistance with data collection; the project would not have been possible without their contributions. We are also sincerely grateful to Professor Ahami Ahmed Omar Touhami for his valuable comments on the manuscript.

Present study is self funded by author & her institution, no conflict of interest.

### **References**

- [1]. Bax m, Goldstein m, Rosenbaum p. Proposed definition and classification of cerebral palsy. *Dev Med Child Neurol* 2005; 47 (8); 571-6
- [2]. Maria Sangermano, Roberta D'Aniello, Grazia Massa, Raffaele Albano, Pasquale Pisano, Mauro Budetta, Goffredo Scuccimarra, Enrico Papa, Giangennaro Coppola and Pietro Vajro. Nutritional problems in children with neuromotor disabilities: an Italian case series *Italian Journal of Pediatrics* 2014, 40:61 doi:10.1186/1824-7288-40-61
- [3]. M. Le Métayer. Identification et évaluation des troubles buccofaciaux en infirmité motrice cérébrale. *Modalités de l'éducation thérapeutique Motricité cérébrale* 29 (2008) 117–120
- [4]. Robert Palisano, Peter Rosenbaum, Doreen Bartlett, Michael Livingston, Gross Motor Function Classification System Expanded and Revised. CanChild Centre for Childhood Disability Research, McMaster University. 2007
- [5]. Catherine Senez, rééducation des troubles de l'alimentation, et de déglutition dans les pathologies d'origine congénitale et les encéphalopathies acquises Edition Solal, 111, rue Saint-Cécile 13005Marseille, 2002
- [6]. Palisano R, Rosenbaum P, Walter S, Russell D, Wood E, Galuppi B. Le système de classification de la fonction motrice globale de la paralysie cérébrale. *Dev Med Child Neurol* 1997;39:214–23 [Traduit par : Koclas L, Toupin F.].
- [7]. Rofidal T. Les aspects médicaux de l'alimentation chez la personne polyhandicapée – La déglutition; 2004;9–12.
- [8]. Stallings VA, Cronk CE, Zemel BS, Charney EB. Body composition in children with spastic quadriplegic cerebral palsy. *J Pediatr* 1995;126:833–9
- [9]. Campanozzi A, Capano G, Miele E, Romano A, Scuccimarra G, Del Giudice E, et al. Impact of malnutrition on gastrointestinal disorders and gross motor abilities in children with cerebral palsy. *Brain Dev* 2007;29:25–9.
- [10]. Droz D. Infirmité motrice cérébrale, polyhandicap et santé buccale. In: *Prendre en charge la cavité buccale de l'enfant handicapé*. Paris: Elsevier Masson SAS, Archives de pédiatrie; 2008. pp. 849-851
- [11]. Sixou JL. Prise en charge des troubles gingivaux liés à l'épilepsie. *Motr cerebr* 2003;24:109–15
- [12]. Hennequin M, Faulks D, Collado V, et al. Besoins spécifiques chez les personnes présentant des troubles neuromoteurs et cognitifs. *Real clin* 2004;15:307–86
- [13]. McPherson KA, Kenny DJ, Koheil R, Bablich K, Sochaniwskyj A, Milner M. Ventilation and swallowing interactions of normal children and children with cerebral palsy. *Dev Med Chil Neurol* 1992;34(7):577–88.
- [14]. Rempel G, Moussavi Z. The effect of viscosity on the breath-swallow pattern of young people with cerebral palsy, department of Pediatrics and Child Health, University of Manitoba, Winni-peg, Manitoba, Canada. *Dysphagia* 2005;20(2):108–12