Revisited pathophysiology of equinus gait in children with cerebral palsy

C. Beyaert[a,*], S. Caudron[b], C. Billon[a], M.-A. Haldric[a], J. Paysant[a]

[a] *Institut Régional de Réadaptation Nancy, Nancy cedex, France*

[b] *UFR STAPS, EA3450, Nancy, France*

*Corresponding author.

Keywords: Locomotion; Equinus; Kinetics; Adaptation; Motor control; Cerebral palsy

Introduction.– Children with cerebral palsy (CP) usually land their foot on the ground, flat or by forefoot, in equinus when walking. The associated early braking of ankle dorsiflexion might be an adaptive function instead of being imposed by triceps surae dysfunction. Thus, wearing negative heel shoes (NHS), allowing in dorsiflexion flat landing and braking, would induce quick adaptation decreasing equinus at initial contact.

Methods.– Eleven children with CP (8.5 ± 2.5 years of age, 5 diplegics and 3 hemiplegics) with spastic triceps that were not or a bit contracted and walking without aids underwent tridimensional gait analysis when walking barefoot, with standard shoes and with NHS of 10°.

Results.– Within 2 to 5 gait cycles, the NHS touched the ground roughly as the barefoot did (flat or by the forefoot) but in dorsiflexion ($7° \pm 6°$) and not in plantar flexion ($-6° \pm 6°$), without alteration of knee flexion and walking speed and with maintained elevated early braking of dorsiflexion.

Discussion.– The early deceleration of dorsiflexion might play a functional role such as contributing to dynamic balance control during gait. Thus it might be a primary regulated biomechanical variable explaining the quick adaptation of foot kinematics according to the shoe design.

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Sagittal radiological analysis of spine in walking children with cerebral palsy

J.-C. Bernard*, J. Deceuninck, E. Chaléat-Valayer, E. Loustalet, E. Morel, S. Leroy-Coudeville, J. Sutton, A. Combey

Croix Rouge française, CMCR des Massues, Lyon cedex 05, France

*Corresponding author.

Keywords: Spine; Cerebral palsy; Child

Introduction.– We have performed a radiological evaluation of static data of spine-pelvis-femur complex in walking children with cerebral palsy (CP). The data are discussed about GMFCS and after about radiological data in asymptomatic subjects.

Material and method.– The CP population is comprised of 119 children and the asymptomatic population of 652 children.

Results.– There is no significant difference concerning the form parameter (pelvic incidence = PI), on the other hand there is a significant difference on position parameters (pelvic tilt = PT and sacral slope = SS). There is a correlation between GMFCS and PI ($P = 0.013$) and between GMFCS and PT ($P = 0.021$).

Discussion.– The PC population is not structurally different than the asymptomatic population. It will be the growth, in pathologic context, which disturbs parameters. A lumbar lordosis which is not correlated with PI has to be considered like a result of the disease (postural troubles, neuro-motor disorders related with growth. . .) and requires a specific and early evaluation and treatment.

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Is gait kinematics in children with cerebral palsy correlated with their lower limbs' bone deformities?

L. Houx[b], B. Fenoll[a], S. Brochard[b]

[a] *CHRU Brest, Service de chirurgie pédiatrique, Brest, France*

[b] *CHRU Brest, Service de médecine physique et réadaptation, Brest, France*

*Corresponding author.

Keywords: Kinematics; Gait; Bone deformities; Cerebral palsy; Correlations

Introduction.– Children with cerebral palsy (CP) develop abnormal walking patterns and bone deformities of the lower limbs. It is important to establish whether any relationship exists between these troubles, in order to better understand the evolution of these children.

Patients and methods.– Fifteen 3D bone morphological parameters and 58 spatiotemporal and kinematic 3D parameters were collected respectively with the EOS system and an optoelectronic system in 38 CP children. Correlations between bone morphology and walking characteristics of each limb were studied by calculating the Pearson correlation coefficients and multiple regression analysis.

Results.– Height and weight development were the main determinants of bone morphology, and were more correlated with gait parameters (0.57).

Discussion.– In general, correlations between structural bone deformities and kinematics in CP children were low to moderate (Carriero et al., 2009). The flexum and varus/valgus of the knee were the deformities that most affected the walking patterns of these children. These original data are relevant for therapeutic decision in CP children.

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Modulation of muscle activity of typically developing children changing direction during walking

R. Gross[a,*], F. Leboeuf[a], B. Perrouin-Verbe[a], O. Remy-Neris[b], S. Brochard[b], M. Lempereur[b], S. Vieilledent[b]

[a] *CHU de Nantes, Service de MPR Neurologique, Nantes, France*

[b] *LaTIM Inserm U650, CHRU de Brest, I3S, 5, avenue Foch, 29609 Brest, France*

*Corresponding author.

Objective.– The aim of this study was to investigate the modulation of lower limb muscle activity during turning in typically developing (TD) children.

Patients and methods.– Fourteen TD children performed gait analysis with dynamic EMG recordings of 5 muscles in each lower limb. Participants had to walk straightforward and to perform a curved walking by changing their direction angles of 45°, 90°, 135°, and 180°, either to the right or to the left.

Results.– EMG changes occurred during curved walking with respect to straight walking. Changes varied according to the muscle, the position of the limb relative to the turn (inner or outer) and the direction of the turn (towards the left or right). No difference was found between the different angles. Asymmetry was found between the right and left limbs, with changes being more pronounced in the right limb.

Discussion.– Our findings differ in part from those in adults. This indicates that maturity of this motor behaviour could be achieved only late during childhood. Moreover, turning was not symmetrical in our population of TD children. Therefore, including turning tasks in gait analysis protocols in children is challenging despite the relevance of curved walking to community and in-home ambulation.

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Analysis of the medical causes of death in cerebral palsy

A. Duruflé[a,*], P. Gallien[a], B. Nicolas[a], A. Colin[b]

[a] *Centre MPR Saint-Hélier, Rennes, France*

[b] *Réseau Breizh PC, France*

*Corresponding author.

Keywords: Cerebral palsy; Mortality; Epidemiology
Objective.– To investigate causes of death and age at death in cerebral palsy (CP) subjects compared with the general population.
Method.– Analysis of data supplied by the Centre of Epidemiology on the Medical Causes of Death was conducted. Three thousand and thirty-one death certificates indicating a diagnosis of CP were reported between 2000 and 2008.
Results.– Median age at death was between 45–54 years and principal cause comprised the category 'Symptoms, signs, and abnormal results of clinical and laboratory tests, not classified elsewhere'. Of these, 66% were related to the circulatory and respiratory systems. 'Diseases of the respiratory system' was the second most common cause of death. The third most common cause was 'Diseases of the circulatory system'. The tumour pathologies were only the fourth cause of death.
Discussion.– These results concur with other published data, i.e. subjects with CP die younger than the French general population, and the principal causes of death are respiratory and circulatory problems.
Further reading
Hemming, et al. Long-term survival for a cohort of adults with cerebral palsy. Dev Med Child Neurol 2006;48:90–5.

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Etiologies, comorbidities and causes of death in a population of 133 polyhandicapped patients cared for at specialist rehabilitation centres

M.-C. Rousseau [a,*], S. Mathieu [b], C. Brisse [b], M. Motawaj [c], E. Grimont [a], P. Auquier [d], T. Billette de Villemeur [e]
[a] *Fédération des Hôpitaux de Polyhandicap et Multihandicap, Hôpital San Salvadour, Assistance publique–Hôpitaux de Paris, Hyères cedex, France*
[b] *Fédération des Hôpitaux de Polyhandicap et Multihandicap, Hôpital La Roche Guyon, Assistance publique–Hôpitaux de Paris, France*
[c] *Hôpital La Roche Guyon, Assistance publique–Hôpitaux de Paris, France*
[d] *EA 3279 Santé Publique, Maladies Chroniques et Qualité de Vie, Faculté de Médecine de La Timone, Marseille, France*
[e] *Fédération des Hôpitaux de Polyhandicap et Multihandicap, Hôpital Trousseau, Assistance publique–Hôpitaux de Paris, France*
*Corresponding author.

Keywords: Polyhandicap; Death; Comorbidities
Objective.– This study addresses the questions of the aetiologies, comorbidities, and causes of death in a population of severely poly-handicapped (PLH) patients.
Methods.– Based on the medical files of all deceased PLH patients, who were cared for between 2006 and 2012. Data collected: etiological diagnosis of the poly-handicap, duration and type of hospitalisation, age, place and cause of death, comorbidities: chronic respiratory insufficiency, recurrent attacks of pulmonary infections, urinary infections, active epilepsy, scoliosis, chronic digestive disorders, and behavioural problems.
Results.– Hundred and thirty-three patients died, 70 children and 63 adults. The sex-ratio was 84 men to 49 women. The average stay in these institutions was 10 years. The average age at the time of death was 21 years, in 60% of cases the place of death was in the specialist rehabilitation centres. The causes of death in decreasing order were: pulmonary infections (63.2%), sudden death (18%), status epilepticus (6.8%); 79.7% of patients suffered from chronic respiratory insufficiency, 60.2% suffered from serious scoliosis, 66.9% drug-resistant epilepsy, 78.9% had digestive disorders. The main aetiologies of the poly-handicap were: pre- and perinatal encephalopathies (31.6%), metabolic encephalopathies (18%), convulsive encephalopathies (11.3%).
Conclusion.– The main comorbidity and main cause of death in patients with severe PLH is respiratory failure.

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Cognitive disorders in adults with cerebral palsy

R. Leroux [a,*], M. Gruson [a], A. Durufle [a], B. Nicolas [a], P. Coignard [b], A. Lassalle [c], A. Colin [a], P. Gallien [a], P. Groupe [a], F. Chapelain [a]
[a] *Pôle Saint-Helier, Rennes, France*
[b] *CRF Kerpape, France*
[c] *CRF Trestel, France*
*Corresponding author.

Keywords: Cerebral palsy; Cognitive disorders
Just a few data have been published on the cognitive functioning of adults with cerebral palsy. Given this situation, the Breizh Network dedicated to Cerebral Palsy conducted a pilot study with the objective to establish the cognitive profile of this population and to identify the most sensitive assessment tests.
Method.– Nineteen patients with a mean age of 27.61 [18–51], were recruited into the study [level from college to Bac +2]. All expressed moderate cognitive complaints. They spent the following neuropsychological tests: WAIS -III, RL -RI 16 items, Stroop, TMT, Rey Figure, PASAT, 6 elements. Emotional and depressive status was also assessed.
Results and discussion.– According to the results, the cognitive profile of PCI adult patients is characterized by a sharp slowdown in processing speed, and visuoconstructional ability and working memory impairment. In addition, a correlation was observed between processing speed and educational level. The Processing Speed Index (IVT) may be a predictor test for educational orientation. Added to this is a significant weakening of the Performance Intelligence Quotient (PIQ) relative to verbal IQ (VIQ) was noticed and this regardless of grade level.

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The qualitative assessment of general movements in preterm infants with small for gestational age or abnormal echo image: Pilot study

Y.C. Ko [a,*], Y.C. Lin [b], M.P. Rau [a], B.J. Hsue [a]
[a] *Department of Physical Therapy, National Cheng Kung University, Tainan City, Taiwan*
[b] *Department of Pediatrics, National Cheng Kung University Hospital, Taiwan*
*Corresponding author.

Keywords: Preterm; Small for gestational age; Brain echo; General movement
Introduction.– Identifying neurological deficits accompanying with the preterm infants is important but remains a challenging task. The purpose of this study was to examine the relationships of a relatively new method, the assessment of general movements (GMs), with two risk factors, abnormal brain echo findings and small for gestational age (SGA).
Material and methods.– Twenty-one preterm infants were included: five were SGA, five with abnormal brain echo, and one with both diagnoses. Video recordings were taken once before 38 weeks of gestational age and once at writhing period. Correlation between GMs and abnormal brain echo and SGA were determined using Spearman's correlation coefficient.
Results.– In preterm and writhing period, half of the preterm infants without SGA or abnormal echo had abnormal GMs. One and 4 out of 6 infants with SGA had abnormal GMs in preterm period and writhing periods, respectively. Four and 3 out of the infants with abnormal US had abnormal GMs in preterm and writhing periods, respectively.
Discussion.– Abnormal GMs were not necessarily related to brain echo and SGA. Some studies considered that early abnormal GMs might be caused by transient abnormalities, which explained why the preterm infants without abnormal echo or SGA demonstrated abnormal GMs.

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