

Monday 7 June 2010

This free weekly bulletin lists the latest research on cerebral palsy (CP), as indexed in the NCBI, PubMed (Medline) and Entrez (GenBank) databases. These articles were identified by a search using the key term "cerebral palsy".

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## Interventions

### 1. *J Musculoskelet Neuronal Interact.* 2010 Jun;10(2):151-8.

#### **Effect of a new physiotherapy concept on bone mineral density, muscle force and gross motor function in children with bilateral cerebral palsy.**

Stark C, Nikopoulou-Smyrni P, Stabrey A, Semler O, Schoenau E.

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**Objective:** The purpose of this study was to determine the effect of a new physiotherapy concept on bone density, muscle force and motor function in bilateral spastic cerebral palsy children. **Methods:** In a retrospective data analysis 78 children were analysed. The concept included whole body vibration, physiotherapy, resistance training and treadmill training. The concept is structured in two in-patient stays and two periods of three months home-based vibration training. Outcome measures were dual-energy x-ray absorption (DXA), Leonardo Tilt Table and a modified Gross Motor Function Measure before and after six months of training. **Results:** Percent changes were highly significant for bone mineral density, -content, muscle mass and significant for angle of verticalisation, muscle force and modified Gross Motor Function Measure after six months training. **Conclusions:** The new physiotherapy concept had a significant effect on bone mineral density, muscle force and gross motor function in bilateral spastic cerebral palsy children. This implicates an amelioration in all International Classification of Functioning, Disability and Health levels. The study serves as a basis for future research on evidence based paediatric physiotherapy taking into account developmental implications.

PMID: 20516632 [PubMed - in process]

### 2. *Acta Orthop Traumatol Turc.* 2010;44(1):63-9.

#### **Investigation of interobserver reliability of the Gillette Functional Assessment Questionnaire in children with spastic diparetic cerebral palsy.**

Günel MK, Tarsuslu T, Mutlu A, Livanelioğlu A.

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**OBJECTIVES:** Information obtained from families is of particular importance in the evaluation of functional mobility skills of children with cerebral palsy (CP) after orthopedic interventions and long-term rehabilitation applications. This study was designed to evaluate the interobserver reliability of the Gillette Functional Assessment Questionnaire (FAQ) which was administered to the mothers and the physiotherapist for children with CP. **METHODS:** The study included 52 spastic diparetic children with CP (22 girls, 30 boys; mean age 7.8+/-4.4 years; range 4 to 12 years) and their mothers. According to the Gross Motor Function Classification System (GMFCS), all the children

were in level 1 to 3. The Gillette FAQ was administered to the mother and physiotherapist to determine the functional walking level of the child and the interobserver reliability of the FAQ was calculated. In addition, gross motor performance was evaluated by the standing and walking-running-jumping dimensions of the Gross Motor Performance Measure (GMPM), and functional independence level was evaluated by the transfer and locomotion dimensions of the Functional Independence Measure for Children (WeeFIM). Correlations were sought between the FAQ results of the physiotherapist and mothers and the GMFCS, GMPM, and WeeFIM. RESULTS: The intraclass correlation coefficient for interobserver reliability of the Gillette FAQ was 0.94 (95% CI 0.898-0.966). A highly significant correlation was found between the responses of the mother and physiotherapist to the Gillette FAQ ( $r=0.882$ ,  $p<0.01$ ). The responses of the mother and physiotherapist to the Gillette FAQ showed a negative correlation with the GMFCS level, and positive correlations with the dimensions of the GMPM and WeeFIM studied ( $p<0.01$ ). CONCLUSION: The Gillette FAQ can be used by the physiotherapists to determine the functional changes in spastic diparetic children with CP and can help clinicians derive important information from the families about functional walking of their children.

PMID: 20513993 [PubMed - in process]

### 3. Int J Rehabil Res. 2010 May 27. [Epub ahead of print]

#### The importance of motor functional levels from the activity limitation perspective of ICF in children with cerebral palsy.

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Our purpose in this study was to evaluate performance and capacity as defined by Gross Motor Function Classification System (GMFCS) and Manual Ability Classification System (MACS) from the 'activity limitation' perspective of International Classification of Functioning, Disability, and Health (ICF) and to investigate the relationship between the two classification systems in different subtypes of cerebral palsy (CP). This prospective cross-sectional study was performed on 448 children with CP ranging from 4 to 15 years of age. Activity limitations were studied with the GMFCS for gross motor function and MACS for manual ability. The Spearman's correlation coefficient, contingency coefficient, and Cramer's V coefficient were used to assess the strength and significance of the association between GMFCS and MACS. The overall agreement between GMFCS and MACS was found to be 41%. The agreement was 42% in spastic children, 40% in dyskinetic children, 50% in ataxic children, and 28% in mixed type children. The overall kappa value was  $\kappa=0.235$  ( $P<0.001$ ). The kappa coefficient was 0.252 in spastic children, 0.245 in dyskinetic children, 0.318 in ataxic children, and 0.023 in mixed type children. All the kappa coefficients except the value for the mixed type were found to be significant. The usage of two different classification systems, GMFCS and MACS, to describe the capacity and performance in children with CP as defined by the ICF provides an easy and quick classification tool for indicating 'activity limitations' of ICF in children with CP. The next step in research should be to highlight the other domains such as participation restrictions in these children.

PMID: 20512043 [PubMed - as supplied by publisher]

### 4. Zhongguo Zhen Jiu. 2010 May;30(5):359-63.

#### Clinical observation on plum-blossom needle on Governor Vessel and point Jiaji (EX-B 2) for treatment of cerebral palsy of involuntary movement [Article in Chinese]

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OBJECTIVE: To probe into an effective therapy for treatment of cerebral palsy of involuntary movement. METHODS: Sixty cases were randomly divided into two groups, the control group was treated with routine rehabilitation method (Bobath + Tuina + scalp acupuncture), while the observation group was treated with plum-blossom needle

on Governor Vessel and point Jiaji (EX-B 2) on the basis of routine rehabilitation method. After 3 months of treatment, therapeutic effect, total percentage of Gross Motor Function Measurement (GMFM), incurvation reflex and muscular tension fluctuation were compared. RESULTS: The obvious effective rate of 53.3% (16/30) in the observation group was superior to that of 20.0% (6/30) in the control group ( $P < 0.05$ ); the total percentage of GMFM increased, incurvation reflex disappeared, muscular tension fluctuation relieved in both groups after treatment ( $P < 0.05$ ,  $P < 0.01$ ), but the indices above all improved more significantly in the observation group than those in the control group ( $P < 0.05$ ,  $P < 0.01$ ). CONCLUSION: Plum-blossom needle on Governor Vessel and point Jiaji (EX-B 2) on the basis of routine rehabilitation method for treatment of cerebral palsy of involuntary movement can enhance the gross motor function, make the incurvation reflex disappear effectively, relieve the muscular tension fluctuation.

PMID: 20518168 [PubMed - in process]

## 5. Ann Neurol. 2010 Jun;67(6):809-16.

### Brain-computer interfacing based on cognitive control.

Vansteensel MJ, Hermes D, Aarnoutse EJ, Bleichner MG, Schalk G, van Rijen PC, Leijten FS, Ramsey NF.

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OBJECTIVE: Brain-computer interfaces (BCIs) translate deliberate intentions and associated changes in brain activity into action, thereby offering patients with severe paralysis an alternative means of communication with and control over their environment. Such systems are not available yet, partly due to the high performance standard that is required. A major challenge in the development of implantable BCIs is to identify cortical regions and related functions that an individual can reliably and consciously manipulate. Research predominantly focuses on the sensorimotor cortex, which can be activated by imagining motor actions. However, because this region may not provide an optimal solution to all patients, other neuronal networks need to be examined. Therefore, we investigated whether the cognitive control network can be used for BCI purposes. We also determined the feasibility of using functional magnetic resonance imaging (fMRI) for noninvasive localization of the cognitive control network. METHODS: Three patients with intractable epilepsy, who were temporarily implanted with subdural grid electrodes for diagnostic purposes, attempted to gain BCI control using the electrocorticographic (ECoG) signal of the left dorso-lateral prefrontal cortex (DLPFC). RESULTS: All subjects quickly gained accurate BCI control by modulation of gamma-power of the left DLPFC. Prelocalization of the relevant region was performed with fMRI and was confirmed using the ECoG signals obtained during mental calculation localizer tasks. INTERPRETATION: The results indicate that the cognitive control network is a suitable source of signals for BCI applications. They also demonstrate the feasibility of translating understanding about cognitive networks derived from functional neuroimaging into clinical applications.

PMID: 20517943 [PubMed - in process]

## 6. Rev Neurol. 2010 Jun 1;50(11):685-99.

### Clinical practice guidelines for the treatment of spasticity with botulinum toxin [Article in Spanish]

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INTRODUCTION: Spasticity is an important medical and social problem with a high rate of incidence both in childhood, where it is mainly a result of infantile cerebral palsy, and in adults, where it is frequently brought about by a cerebrovascular accident, traumatic brain injury, spinal cord injury or multiple sclerosis, among other pathologies. It gives rise to important problems that have a significant effect on the quality of life of patients and their caregivers. Clinical practice guidelines (CPG) are instruments that help professionals, administrators and planners to make decisions that can improve clinical outcomes. DEVELOPMENT: Due to the complexity of spasticity, its evaluation and treatment should be carried out by specialised units using a multidisciplinary approach. One of the first-line treatment options is botulinum toxin type A (BTA). For this treatment to be successful and to be able to evaluate the pa-

tient's progress, it is advisable to have a work protocol that includes the knowledge and tools necessary to use BTA in the most suitable way and in agreement with the available scientific evidence. All these factors led the Spasticity Unit to consider the need to draw up a set of CPG. **CONCLUSIONS:** These CPG have been in use at the Hospital Universitari Mutua de Terrassa for 15 years, and are updated on a regular basis. This has enabled us to carry out a standardised selection of spastic patients and to establish a clear-cut set of treatment goals. It has also allowed us to implement a suitable plan regarding follow-up, the adjuvant therapies needed for each of the patients and an evaluation of results that is as objective as possible.

PMID: 20514641 [PubMed - in process]

## 7. Przegl Lek. 2010;67(1):80-2.

### **Can brain-machine interface improve quality of life of patients with chronic motor dysfunction? [Article in Polish]**

Skoczeń S, Gozdzik J, Krasowska-Kwiecień A, Wiecha O, Czogała W, Wedrychowicz A, Zygałło D.

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In departments of neurology, neurosurgery and hospice care there is a group of patients with complete motor function impairment having normal central nervous system function. Victims of spinal cord injury, cerebral palsy, cerebral stroke, loss of extremities, neuromuscular diseases, between others belong to them. Since two decades an intensive studies of use of brain waves to steer peripheral equipments has been performed. Brain Computer Interface and Brain-Machine Interface will allow in the near future for even partial restore of skills in permanently disabled patients. Recently new sets composed of games steered by brain waves have been introduced to the market. Exercises with such equipment will help to control an ability to concentrate and precise steer of the peripheral electronic equipments. The next phase will be use of the new skills to steer the wheelchairs and other computer programs with the brain signals to control own healthy organs or artificial machines.

PMID: 20509581 [PubMed - in process]

## Epidemiology / Aetiology / Diagnosis & Early Treatment

*Please note: This is not yet a comprehensive outline of cerebral palsy prevention literature. It is expected that more research will be included when the search terms are expanded to include key terms other than "cerebral palsy". It is a work-in-progress and it will be expanded in coming months.*

## 8. Brain. 2010 May 30. [Epub ahead of print]

### **Anti-GD1a antibodies activate complement and calpain to injure distal motor nodes of Ranvier in mice.**

McGonigal R, Rowan EG, Greenshields KN, Halstead SK, Humphreys PD, Rother RP, Furukawa K, Willison HJ.

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The motor axonal variant of Guillain-Barré syndrome is associated with anti-GD1a immunoglobulin antibodies, which are believed to be the pathogenic factor. In previous studies we have demonstrated the motor terminal to be a vulnerable site. Here we show both in vivo and ex vivo, that nodes of Ranvier in intramuscular motor nerve bundles are also targeted by anti-GD1a antibody in a gradient-dependent manner, with greatest vulnerability at distal nodes. Complement deposition is associated with prominent nodal injury as monitored with electrophysiological recordings and fluorescence microscopy. Complete loss of nodal protein staining, including voltage-gated sodium channels and ankyrin G, occurs and is completely protected by both complement and calpain inhibition, although the latter provides no protection against electrophysiological dysfunction. In ex vivo motor and sensory nerve trunk preparations, antibody deposits are only observed in experimentally desheathed nerves, which are thereby rendered susceptible to complement-dependent morphological disruption, nodal protein loss and reduced electrical

activity of the axon. These studies provide a detailed mechanism by which loss of axonal conduction can occur in a distal dominant pattern as observed in a proportion of patients with motor axonal Guillain-Barré syndrome, and also provide an explanation for the occurrence of rapid recovery from complete paralysis and electrophysiological inexcitability. The study also identifies therapeutic approaches in which nodal architecture can be preserved.

PMID: 20513658 [PubMed - as supplied by publisher]

### 9. *Pediatr Radiol.* 2010 May 29. [Epub ahead of print]

#### **MR imaging of term infants with hypoxic-ischaemic encephalopathy as a predictor of neurodevelopmental outcome and late MRI appearances.**

Twomey E, Twomey A, Ryan S, Murphy J, Donoghue VB.

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**BACKGROUND:** Morbidity attributable to hypoxic-ischaemic injury (HIE) in the perinatal period remains problematic, and timely and accurate assessment of the degree of injury is required for clinical management and prognosis. Conventional MR sequences typically appear normal in the first 48 h post HIE. While diffusion-weighted imaging (DWI) and apparent diffusion coefficient (ADC) maps register the injury earlier, perhaps within the first 24 h, it has been suggested that there may be a propensity at that early stage to underestimate the lesion severity or extent. **OBJECTIVE:** To assess whether MR imaging that included DWI, measured ADC values and T1- and T2-weighted sequences ultimately correlated with either neurodevelopmental outcome or with late MR imaging at 2 years of age. In addition, we wished to compare the performance of MR imaging with cranial US imaging. **MATERIALS AND METHODS:** All infants presenting with HIE who had an MRI within 10 days of life were eligible for enrollment and subsequently underwent a full neurodevelopmental assessment at 2 years of age. All children underwent repeat MRI at this time. All neonates had at least one cranial US study. The US findings were categorized as normal, abnormalities confined to the cerebral cortex and subcortical white matter, isolated central grey matter hyperechogenicity, and central hyperechogenicity combined with cerebral cortical/subcortical changes. All MRI studies were retrospectively reviewed by three radiologists. The patterns of injury on the early DWI and ADC maps and early T1- and T2-W studies were recorded as diffuse, central, watershed or atypical. The patterns of signal abnormality were assessed using a scoring system that yielded four separate scores [basal ganglia (BG), watershed (W), BG/W and summation (S)] for the three sets of images, a total of 12 scores in all. The appearance of the posterior limb of the internal capsule (PLIC) on T1-W inversion recovery sequences and of the corpus callosum on all sequences was also documented. After detailed neurodevelopmental assessment at 2 years of age, infants were classified into two groups according to whether they had a favourable or unfavourable outcome. **RESULTS:** Of the 26 infants, 6 infants died before formal assessment at the age of 2 years. A further 5 infants had moderate to severe cerebral palsy in addition to severe cognitive impairment. The remaining 15 infants were categorized in the favourable outcome group. The US appearance performed well in terms of predicting final outcome ( $P = 0.005$ ). The pattern of ischaemia seen on early MRI was a significant predictor of outcome ( $P < 0.0001$ ). The BG, BG/W and S scores of the diffusion imaging were significantly associated with outcome ( $P < 0.0001$ ,  $P < 0.0001$  and  $P = 0.0005$  respectively). DWI was predictive of outcome group ( $P < 0.0001$ ), as were the early T1- and T2-W sequences ( $P = 0.002$ ) and cranial US ( $P = 0.005$ ). Assessment of the PLIC in infants with watershed or atypical patterns of ischaemia was found to be less reliable in predicting outcome. The measured ADC value in the PLIC was significantly reduced in those children who had an unfavourable outcome ( $P = 0.03$ ). **CONCLUSION:** While early MRI performed better than cranial US, the sonography findings were useful. The pattern of ischaemia on early MRI was a good predictor of prognosis. All infants with watershed or atypical patterns had a favourable outcome. The majority of infants with central patterns of ischaemia had an unfavourable outcome and all infants with a diffuse pattern had an unfavourable outcome. DWI was predictive of outcome group, as were early T1- and T2-W sequences and cranial US.

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**10. Am J Obstet Gynecol. 2010 May;202(5):411-2.**

**Comments on American College of Obstetricians and Gynecologists Practice Bulletin no. 106.**

Freeman RK, Nageotte MP.

PMID: 20452481 [PubMed - indexed for MEDLINE]