Cerebral Palsy ALLIANCE

NEWS
Cerebral Palsy Research

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Interventions and Management

1. Aust Occup Ther J. 2014 Aug 29. doi: 10.1111/1440-1630.12150. [Epub ahead of print]

The Neurological Hand Deformity Classification for children with cerebral palsy.

Georgiades M1, Elliott C, Wilton J, Blair E, Blackmore M, Garbellini S.

BACKGROUND/AIM: The purpose of this study was to evaluate the reliability of the Neurological Hand Deformity Classification and use it to describe changes in hand deformity over time in children with cerebral palsy. METHODS: We identified 114 video clips of 26 children with cerebral palsy, aged 1-18 years (mean = 8.4, SD = 4.2), performing upper-limb tasks at multiple time points (n = 3-8) at least 6 months apart. Using the Neurological Hand Deformity Classification, three observers classified hand deformity in the video clips. Inter- and intra-observer reliabilities were estimated using Fleiss and Cohen's kappa (κ) and the temporal changes in classification of hand deformity were investigated. RESULTS: Inter- and intra-observer reliability respectively were κ = 0.87 and κ = 0.91. Hand deformity was identified in all children at all time points, even before the age of 2 years. Ten children did not change hand classification, wrist flexion increased in eight, and eight showed changes from wrist flexion to extension or vice versa. CONCLUSIONS: The Neurological Hand Deformity Classification is a reliable tool to classify hand deformity in children with cerebral palsy. For more than one-third of children hand deformity classification did not change. For the remaining children, two patterns of change in hand deformity over time were identified. It is recommended that children with cerebral palsy involving their upper limbs be monitored regularly. SIGNIFICANCE OF THE STUDY: This is the first study to document longitudinal changes in hand deformity in children with cerebral palsy.

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PMID: 25169815 [PubMed - as supplied by publisher]

2. Neurorehabil Neural Repair. 2014 Aug 26. pii: 1545968314546134. [Epub ahead of print]

Reflections on Mirror Therapy: A Systematic Review of the Effect of Mirror Visual Feedback on the Brain.

Deconinck FJ1, Smorenburg AR2, Benham A3, Ledebt A4, Feltham MG5, Savelsbergh GJ4.

Background. Mirror visual feedback (MVF), a phenomenon where movement of one limb is perceived as movement of the other limb, has the capacity to alleviate phantom limb pain or promote motor recovery of the upper limbs after stroke. The tool has received great interest from health professionals; however, a clear

understanding of the mechanisms underlying the neural recovery owing to MVF is lacking. Objective. We performed a systematic review to assess the effect of MVF on brain activation during a motor task. Methods. We searched PubMed, CINAHL, and EMBASE databases for neuroimaging studies investigating the effect of MVF on the brain. Key details for each study regarding participants, imaging methods, and results were extracted. Results. The database search yielded 347 article, of which we identified 33 suitable for inclusion. Compared with a control condition, MVF increases neural activity in areas involved with allocation of attention and cognitive control (dorsolateral prefrontal cortex, posterior cingulate cortex, S1 and S2, precuneus). Apart from activation in the superior temporal gyrus and premotor cortex, there is little evidence that MVF activates the mirror neuron system. MVF increases the excitability of the ipsilateral primary motor cortex (M1) that projects to the "untrained" hand/arm. There is also evidence for ipsilateral projections from the contralateral M1 to the untrained/affected hand as a consequence of training with MVF. Conclusion. MVF can exert a strong influence on the motor network, mainly through increased cognitive penetration in action control, though the variance in methodology and the lack of studies that shed light on the functional connectivity between areas still limit insight into the actual underlying mechanisms.

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PMID: 25160567 [PubMed - as supplied by publisher]

3. J Pediatr. 2014 Aug 20. pii: S0022-3476(14)00651-9. doi: 10.1016/j.jpeds.2014.07.027. [Epub ahead of print]

Muscle Activation and Energy-Requirements for Varying Postures in Children and Adolescents with Cerebral Palsy.

Verschuren O1, Peterson MD2, Leferink S3, Darrah J4.

OBJECTIVE: To determine energy expenditure and muscle activity among children and adolescents with cerebral palsy (CP), across several conditions that approximate sedentary behavior, and standing. STUDY DESIGN: Subjects with spastic CP (n = 19; 4-20 years of age; Gross Motor Function Classification System Expanded and Revised [GMFCS-E&R] levels I-V) participated in this cohort study. Energy-expenditure and muscle activity were measured during lying supine, sitting with support, sitting without support, and standing. Energy-expenditure was measured using indirect calorimetry and expressed in metabolic equivalents (METs). Muscle activation was recorded using surface electromyography. The recorded values were calculated for every child and then averaged per posture. RESULTS: Mean energy expenditure was >1.5 METs during standing for all GMFCS-E&R levels. There was a nonsignificant trend for greater muscle activation for all postures with less support. Only for children classified at GMFCS-E&R level III did standing result in significantly greater muscle activation ($P < .05$) compared with rest. CONCLUSIONS: Across all GMFCS-E&R levels, children and adolescents with CP had elevated energy expenditure during standing that exceeded the sedentary threshold of 1.5 METs. Our findings suggest that changing a child's position to standing may contribute to the accumulation of light activity and reduction of long intervals of sedentary behavior.

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4. Clin Rehabil. 2014 Aug 21. pii: 0269215514544984. [Epub ahead of print]

A randomized, single-blind cross-over design evaluating the effectiveness of an individually defined, targeted physical therapy approach in treatment of children with cerebral palsy.

Franki I1, Van den Broeck C2, De Cat J3, Tijhuis W4, Molenaers G3, Vanderstraeten G2, Desloovere K5.

OBJECTIVE: A pilot study to compare the effectiveness of an individual therapy program with the effects of a general physical therapy program. DESIGN: A randomized, single-blind cross-over design. PARTICIPANTS: Ten ambulant children with bilateral spastic cerebral palsy, age four to nine years. INTERVENTION: Participants were randomly assigned into a ten-week individually defined, targeted or a general program, followed by a cross-over. MAIN OUTCOME MEASURES: Evaluation was performed using the Gross Motor Function Measure-88 and three-dimensional gait analysis. General outcome parameters were Gross Motor Function Measure-88 scores, time and

distance parameters, gait profile score and movement analysis profiles. Individual goal achievement was evaluated using z-scores for gait parameters and Goal Attainment Scale for gross motor function. RESULTS: No significant changes were observed regarding gross motor function. Only after individualized therapy, step- and stride-length increased significantly (p = 0.022; p = 0.017). Change in step-length was higher after the individualized program (p = 0.045). Within-group effects were found for the pelvis in transversal plane after the individualized program (p = 0.047) and in coronal plane after the general program (p = 0.047). Between-program differences were found for changes in the knee in sagittal plane, in the advantage of the individual program (p = 0.047). A median difference in z-score of 0.279 and 0.419 was measured after the general and individualized program, respectively. Functional goal attainment was higher after the individual therapy program compared with the general program (48 to 43.5). CONCLUSION: The results indicate slightly favorable effects towards the individualized program. To detect clinically significant changes, future studies require a minimal sample size of 72 to 90 participants.

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PMID: 25147350 [PubMed - as supplied by publisher]

5. Gait Posture. 2014 Aug 8. pii: S0966-6362(14)00661-4. doi: 10.1016/j.gaitpost.2014.07.025. [Epub ahead of print]

Automatic initial contact detection during overground walking for clinical use.

Sharenkov A1, Agres AN2, Funk JF3, Duda GN4, Boeth H5.

The division of gait into cycles is crucial for identifying deficits in locomotion, particularly to monitor disease progression or rehabilitative recovery. Initial contact (IC) events are often used to separate movement into repetitive cycles yet automatic methods for IC identification in pathological gait are limited in both number and capacity. The aim of this work was to develop a more precise algorithm in IC detection. A projected heel markers distance (PHMD) algorithm is presented here and compared for accuracy to the high pass algorithm (HPA) in IC identification. Kinematic gait data from two clinical cohorts were analyzed and processed automatically for IC detection: (1) unilateral total hip arthroplasty (THA) patients (n=27) and (2) cerebral palsy pediatric (CPP) patients (n=20). IC events determined by the two algorithms were benchmarked against the IC events detected manually and from force plates. The PHMD method detected 96.6% IC events in THA patients and 99.1% in CPP patients with an average error of 5.3ms and 18.4ms. The HPA method detected 99.1% IC events in THA patients and 97.3% IC events in CPP patients, with an average error of 57.5ms and 10.2ms. PHMD identified no superfluous IC events, whereas 51.5% of all THA IC and 47.6% of CPP IC were superfluous events requiring manual deletion with HPA. With the superior comparison against the current gold standard, the PHMD algorithm appears valid for a wide spectrum of clinical data sets and allows for precise, fully automatic processing of kinematic gait data without additional sensors, triggers, or force plates.

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PMID: 25161008 [PubMed - as supplied by publisher]

6. J Pediatr Orthop. 2014 Aug 28. [Epub ahead of print]

Knee Pain and Patellofemoral Symptoms in Patients With Cerebral Palsy.

Rethlefsen SA1, Nguyen DT, Wren TA, Milewski MD, Kay RM.

BACKGROUND: Knee pain in cerebral palsy (CP) is associated with increased patellofemoral forces present when walking with flexed knees. In typically developing children, knee pain and patellofemoral dysfunction are associated with obesity, genu valgum, femoral anteversion, and external tibial torsion. These problems are also common in CP, and may contribute to knee problems in this population. The purposes of this study were to define the prevalence of knee pain and patellofemoral dysfunction in children with CP, and to identify physical and gait characteristics (using 3-dimensional gait analysis data) that predispose them to such problems. METHODS: Retrospective review of 121 children with CP, Gross Motor Function Classification System level I to IV, who underwent computerized gait analysis testing. Demographics, range of motion, body mass index and hip, knee, and ankle kinematics were compared between subjects with and without knee pain. RESULTS: Twenty-five of 121

subjects (21%) reported knee pain at the time of testing. Three of 121 subjects (2%) had a history of patellar subluxation/dislocation. Age and sex were significantly related to presence of knee pain. The likelihood of knee pain was almost 5 times higher in females (odds ratio=4.9, [95% confidence interval, 1.8-13.3], P=0.002), with a prevalence of 40% (17/42) in females versus 10% (8/79) in males. The likelihood of knee pain increased with age by approximately 13% per year (odds ratio=1.13, [95% confidence interval, 1.00-1.28], P=0.058). Malignant malalignment syndrome showed a potential relationship to more severe knee pain (P=0.05), which warrants further investigation. Body mass index, pes valgus, and degree of stance knee flexion showed no statistically significant relationships to knee pain (P>0.16). CONCLUSIONS: The prevalence of knee pain in ambulatory patients with CP is approximately 21%. Patellar subluxation (2%) and dislocation are rare in these patients. Knee pain is not always related to crouch, femoral anteversion, external tibial torsion, genu valgum, or pes valgus. Knee pain in these patients is more prevalent in females, and increases with increasing age.

LEVEL OF EVIDENCE: Level III-case-control study.

PMID: 25171680 [PubMed - as supplied by publisher]

7. J Foot Ankle Surg. 2014 Aug 21. pii: S1067-2516(14)00310-X. doi: 10.1053/j.jfas.2014.06.023. [Epub ahead of print]

Surgical Treatment Guidelines for Digital Deformity Associated with Intrinsic Muscle Spasticity (Intrinsic Plus Foot) in Adults with Cerebral Palsy.

Boffeli TJ1, Collier RC2.

Intrinsic plus foot deformity has primarily been associated with cerebral palsy and involves spastic contracture of the intrinsic musculature with resultant toe deformities. Digital deformity is caused by a dynamic imbalance between the intrinsic muscles in the foot and extrinsic muscles in the lower leg. Spastic contracture of the toes frequently involves curling under of the lesser digits or contracture of the hallux into valgus or plantar flexion deformity. Patients often present with associated pressure ulcers, deformed toenails, shoe or brace fitting challenges, and pain with ambulation or transfers. Four different patterns of intrinsic plus foot deformity have been observed by the authors that likely relate to the different patterns of muscle involvement. Case examples are provided of the 4 patterns of intrinsic plus foot deformity observed, including global intrinsic plus lesser toe deformity, isolated intrinsic plus lesser toe deformity, intrinsic plus hallux valgus deformity, and intrinsic plus hallux flexus deformity. These case examples are presented to demonstrate each type of deformity and our approach for surgical management according to the contracture pattern. The surgical approach has typically involved tenotomy, capsulotomy, or isolated joint fusion. The main goals of surgical treatment are to relieve pain and reduce pressure points through digital realignment in an effort to decrease the risk of pressure sores and allow more effective bracing to ultimately improve the patient's mobility.

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8. J Pediatr Orthop B. 2014 Aug 28. [Epub ahead of print]

Use of botulinum toxin in the treatment of ankle plantar flexor spasticity in children with cerebral palsy.

Mirska A1, Cybula K, Okurowska-Zawada B, Kułak W, Dmitruk E, Okulczyk K, Kalinowska AK.

The aim of this study was to assess the effects of botulinum on spasticity of gastrocnemius and soleus muscles. Forty-one children with spastic cerebral palsy were assessed (muscle tone, range of motion of ankle joint extension with straightened and bent knee, and gait pattern using the Physician Rating Scale) before administration and 2, 6, and 13 weeks after. Changes on Physician Rating Scale and dorsiflexion with extended knee were significant after 2, 6, and 13 weeks. Differences in the remaining parameters were significant after the first two check-ups. Over 90% of the changes were positive. This research confirms the effectiveness of botulinum in reducing spasticity, increasing the range of motion, and improving the gait pattern.

PMID: 25171568 [PubMed - as supplied by publisher]

9. Neuromodulation. 2014 Aug 21. doi: 10.1111/ner.12220. [Epub ahead of print]

Medical Cost Impact of Intrathecal Baclofen Therapy for Severe Spasticity.

Saulino M1, Guillemette S, Leier J, Hinnenthal J.

OBJECTIVES: To evaluate the economic effects of intrathecal baclofen (ITB) for patients with severe spasticity based on costs of care before and after implantation of an intrathecal drug delivery system. MATERIALS AND METHODS: An actuarial projection of post-implant experience in the absence of ITB intervention was used to simulate a continued conventional medical management protocol (ITB-free) by assuming a reasonable trend rate based on health-care industry standards. Cost projections were developed over a 30-year time horizon at various reimplantation rates. The model was informed by retrospective analysis of commercial administrative claims data from 409 pediatric and adult spasticity patients who received a pump implant (ITB-experienced) within a 3-year service period (January 2006 to January 2009). Common indications associated with pump implant included multiple sclerosis (N = 124), cerebral palsy (N = 131), and spinal cord injury (N = 40). RESULTS: ITB was less costly than the conventional protocol over our baseline implantation cycle. Costs in the month of implant and in the year following were cumulatively $26,375 more than with the conventional protocol. However, ITB financial break-even occurs between the second and third years post-implant. The lifetime analysis indicates that savings for ITB are $8009 per patient per year compared with conventional therapy. Most of the savings are derived from reductions in inpatient admissions, physician office visits, and outpatient physiotherapy. CONCLUSIONS: The results suggest that spasticity patients receiving ITB would expect to experience a reduction in cumulative future medical costs relative to anticipated costs in the absence of a pump implant. This finding complements the existing literature on the cost-effectiveness of ITB.

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PMID: 25145312 [PubMed - as supplied by publisher]

10. No To Hattatsu. 2014 Jul;46(4):307-10.

Cervical myelopathy associated with os odontoideum after botulinum toxin treatment in a patient with cerebral palsy [Article in Japanese]

Yoshimura A, Kibe T, Yokochi K.

Os odontoideum is a separate ossicle from the odontoid process from the body of the axis by a variable transverse gap. A boy with cerebral palsy probably due to prematurity and kernicterus, was treated with botulinum toxin for continuous dystonic movements at the age of 3.5 years. Although botulinum toxin appeared to be remarkably effective for relaxing hypertonia, abnormal frequent anterior flexion of the neck remained. Because of feeding difficulty and frequent aspiration episodes, additional botulinum toxin therapy was discontinued. His condition seemed to be stable and he could walk with support at age 7. However, at age 8, he presented with decreased movement of the extremities and bilateral ankle clonus. Radiographic examination of the cervical spine revealed cystic lesion and os odontoideum. With cervical posterior fixation, the patient made a good recovery. Although athetoid cerebral palsy displays an increased risk of cervical myelopathy, os odontoideum is rare in early childhood. The frequent dynamic stress of the neck due to an unbalanced, persistently contracted state and sudden collapse, possibly attributed to botulinum toxin therapy, might have led to atlantoaxial instability and os odontoideum.

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11. Dev Med Child Neurol. 2014 Aug 25. doi: 10.1111/dmcn.12564. [Epub ahead of print]

Patient-specific determinants of responsiveness to robot-enhanced treadmill therapy in children and adolescents with cerebral palsy.

Schroeder AS1, Von Kries R, Riedel C, Homburg M, Auffermann H, Blaschek A, Jahn K, Heinen F, Borggraefe I, Berweck S.

AIM: The aim of the study was to evaluate patient-specific determinants of responsiveness to robot-enhanced

repetitive treadmill therapy (ROBERT) in patients with early-developed movement disorders. METHOD: Patients were treated over 12 sessions during a 3-week period. Gross Motor Function Measure-66 (GMFM-66) scores 1 day before ROBERT were compared with scores recorded 1 day after ROBERT. The association of GMFM-66 baseline score, age, sex, aetiology, and add-on botulinum toxin therapy to response to treatment was assessed. RESULTS: Eighty-three patients aged between 4 and 18 years (48 males, 35 females; mean age 10y 8mo, SD 6y 1mo; Gross Motor Function Classification System level I [n=12], II [n=21], III [n=35], IV [n=10], and V [n=1]) were each treated for a total of 7.2 (SD 1.9) treadmill walking hours. Aetiology was bilateral spastic cerebral palsy (BS-CP; n=69), unilateral CP (n=3), ataxic CP (n=3), hereditary spastic paraparesis (n=6), and genetic syndrome including spasticity (n=2). Meaningful improvements were observed in GMFM-66 (+2.5; 95% CI 2.0-3.0), GMFM-D (+5.2; 95% CI 3.6-6.8), and GMFM-E (+4.0; 95% CI 2.8-5.3). There was a high inter-individual variability in treatment response. After multivariable adjustment, the improvements in GMFM-66 and GMFM-E scores were positively associated with the GMFM-66 baseline score. The effect on GMFM-D improvement was inversely associated with age. INTERPRETATION: Gross motor abilities at baseline and age were identified as relevant determinants for the high degree of interpersonal variability in response to ROBERT.

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12. Dev Med Child Neurol. 2014 Aug 22. doi: 10.1111/dmcn.12560. [Epub ahead of print]

Characteristics associated with physical activity among independently ambulant children and adolescents with unilateral cerebral palsy.

Mitchell LE1, Ziviani J, Boyd RN.

AIM: This study aimed to quantify the contribution of physical, personal and environmental characteristics to physical activity among independently ambulant children with unilateral cerebral palsy (CP). METHOD: One-hundred and two children with unilateral CP (52 males, 50 females; 52 right hemiplegia; mean age 11y 3mo, range 8-17y [SD 2y 4mo]) classified at Gross Motor Function Classification System (GMFCS) levels I = 44 and II = 58 participated. Physical activity was measured over 4 days using ActiGraph accelerometers recording as activity counts. GMFCS, functional strength, 6-minute walk test (6MWT), mobility limitations (MobQues28), age, sex, Assessment of Life-Habits recreation domain, Participation and Environment Measure for Children and Youth (PEM-CY) and environmental characteristics were considered for selection in a linear regression model. These served as independent variables which were determined using a backwards selection procedure. RESULTS: Younger age, male sex, increased performance on the 6MWT, and increased participation in the home and community measured using the PEM-CY were significantly associated with activity counts ($p<0.001$). However, the model fit was somewhat weak ($R2 =0.32$), indicating that much of the variation was unexplained. Older age and reduced community participation were associated with high inactivity ($p<0.001$). INTERPRETATION: Physical activity interventions should primarily target adolescents and females. Walking endurance and participation in the home and community may represent modifiable characteristics to increase physical activity.

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13. PLoS One. 2014 Aug 29;9(8):e105777. doi: 10.1371/journal.pone.0105777. eCollection 2014.

Effect of Transcranial Direct-Current Stimulation Combined with Treadmill Training on Balance and Functional Performance in Children with Cerebral Palsy: A Double-Blind Randomized Controlled Trial.

Duarte ND1, Grecco LA2, Galli M3, Fregni F4, Oliveira CS5.

BACKGROUND: Cerebral palsy refers to permanent, mutable motor development disorders stemming from a primary brain lesion, causing secondary musculoskeletal problems and limitations in activities of daily living. The aim of the present study was to determine the effects of gait training combined with transcranial direct-current stimulation over the primary motor cortex on balance and functional performance in children with cerebral palsy. METHODS: A double-blind randomized controlled study was carried out with 24 children aged five to 12 years with

cerebral palsy randomly allocated to two intervention groups (blocks of six and stratified based on GMFCS level (levels I-II or level III).The experimental group (12 children) was submitted to treadmill training and anodal stimulation of the primary motor cortex. The control group (12 children) was submitted to treadmill training and placebo transcranial direct-current stimulation. Training was performed in five weekly sessions for 2 weeks. Evaluations consisted of stabilometric analysis as well as the administration of the Pediatric Balance Scale and Pediatric Evaluation of Disability Inventory one week before the intervention, one week after the completion of the intervention and one month after the completion of the intervention. All patients and two examiners were blinded to the allocation of the children to the different groups. RESULTS: The experimental group exhibited better results in comparison to the control group with regard to anteroposterior sway (eyes open and closed; $p<0.05$), mediolateral sway (eyes closed; $p<0.05$) and the Pediatric Balance Scale both one week and one month after the completion of the protocol. CONCLUSION: Gait training on a treadmill combined with anodal stimulation of the primary motor cortex led to improvements in static balance and functional performance in children with cerebral palsy.

TRIAL REGISTRATION: Ensaiosclinicos.gov.br/RBR-9B5DH7.

PMID: 25171216 [PubMed - as supplied by publisher]

14. Duodecim. 2014;130(14):1452-4.

Cannabinoid mouth spray brought help to a severely spastic young man [Article in Finnish]

Arvio M, Bjelogrlic-Laakso N, Salokivi T.

Cannabinoid was licensed in 2012 for the treatment of spasticity associated with multiple sclerosis in Finland. Spasticity is one of the main symptoms in cerebral palsies and a risk factor of multiple painful anomalies of the skeletal network. We describe a 28-year-old man with severe cerebral palsy, whose quality of life improved and the need for help decreased by using two daily mouth sprays of cannabinoid.

PMID: 25158585 [PubMed - in process]

15. Percept Mot Skills. 2014 Aug;119(1):305-19. doi: 10.2466/03.25.PMS.119c14z1. Epub 2014 Jul 15.

Sensitivity to functional improvements of gmfm-88, gmfm-66, and pedi mobility scores in young children with cerebral palsy.

Ko J.

Summary.This study assessed the sensitivity to functional change of the total score on age- and severity-relevant dimensions (Goal Total score) of the Gross Motor Function Measure (GMFM)-88 compared with GMFM-88 Total, GMFM-66, and Pediatric Evaluation of Disability Inventory (PEDI) Mobility scores in children with cerebral palsy (CP). Correlations among the four parameters were calculated to assess how sensitivity may differ according to the severity of CP. 64 children with CP (M age = 43.8 mo., SD = 16.5, range = 21 to 84 mo.; 36 boys, 28 girls) were recruited. The GMFM and PEDI assessments were performed over an interval of 6 mo. The effect sizes for changes over time were large (0.88 to 1.26) for the selected GMFM-88 Goal Total scores. The minimally important differences of the GMFM-88 Goal Total scores were within the mean range of change, with CP severity categorized as GMFCS Levels I/II, Level III, and Levels IV/V. The selected GMFM-88 Goal Total scores showed from poor to good correlations with GMFM-88 Total, GMFM-66, and PEDI Mobility scores. The results indicated that age- and severity-relevant GMFM-88 Goal Total scores were the optimal parameter to detect meaningful change in children with CP for clinical and research use.

PMID: 25153757 [PubMed - in process]

16. Phys Occup Ther Pediatr. 2014 Aug 28. [Epub ahead of print]

Use of the Child Engagement in Daily Life and Ease of Caregiving for Children to Evaluate Change in Young Children with Cerebral Palsy.

Palisano RJ1, Chiarello LA, McCoy SW, Bartlett D, An M.

Aims: Participation in family and recreational activities, self-care, and parent ease of caregiving are important outcomes for young children with cerebral palsy (CP). The aim of this study was to examine use of the Child Engagement in Daily Life and the Ease of Caregiving for Children to measure change over time. Methods: A convenience sample of 387 parents of young children with CP (18 months to 5 years of age) completed the measures twice, a mean of 12.7 months apart. Results: For the Child Engagement in Daily Life, parents of children in Gross Motor Function Classification System level I and levels II-III reported more change for the Self-care domain (medium effect) than the Family and Recreational Activities domain (small effect) and the Ease of Caregiving for Children (small effect). The change reported by parents of children in levels IV-V on all three measures was less than the criterion for a small effect. Minimal detectable change for each measure varied from 12.1 to 14.1, out of a total possible score of 100. Conclusion: Further research is recommended to determine responsiveness to change following intervention.

PMID: 25166344 [PubMed - as supplied by publisher]

Prevention and Cure

17. AJNR Am J Neuroradiol. 2014 Aug 28. [Epub ahead of print]

Advanced Fiber Tracking in Early Acquired Brain Injury Causing Cerebral Palsy.

Lennartsson F1, Holmström L2, Eliasson AC2, Flodmark O2, Forssberg H2, Tournier JD2, Vollmer B2.

BACKGROUND AND PURPOSE: Diffusion-weighted MR imaging and fiber tractography can be used to investigate alterations in white matter tracts in patients with early acquired brain lesions and cerebral palsy. Most existing studies have used diffusion tensor tractography, which is limited in areas of complex fiber structures or pathologic processes. We explored a combined normalization and probabilistic fiber-tracking method for more realistic fiber tractography in this patient group. MATERIALS AND METHODS: This cross-sectional study included 17 children with unilateral cerebral palsy and 24 typically developing controls. DWI data were collected at 1.5T (45 directions, b=1000 s/mm2). Regions of interest were defined on a study-specific fractional anisotropy template and mapped onto subjects for fiber tracking. Probabilistic fiber tracking of the corticospinal tract and thalamic projections to the somatosensory cortex was performed by using constrained spherical deconvolution. Tracts were qualitatively assessed, and DTI parameters were extracted close to and distant from lesions and compared between groups. RESULTS: The corticospinal tract and thalamic projections to the somatosensory cortex were realistically reconstructed in both groups. Structural changes to tracts were seen in the cerebral palsy group and included splits, dislocations, compaction of the tracts, or failure to delineate the tract and were associated with underlying pathology seen on conventional MR imaging. Comparisons of DTI parameters indicated primary and secondary neurodegeneration along the corticospinal tract. Corticospinal tract and thalamic projections to the somatosensory cortex showed dissimilarities in both structural changes and DTI parameters. CONCLUSIONS: Our proposed method offers a sensitive means to explore alterations in WM tracts to further understand pathophysiologic changes following early acquired brain injury.

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18. Front Neurol. 2014 Aug 12;5:147. doi: 10.3389/fneur.2014.00147. eCollection 2014.

Stem cell therapy for neonatal hypoxic-ischemic encephalopathy.

Gonzales-Portillo GS, Reyes S, Aguirre D, Pabon MM, Borlongan CV.

Treatments for neonatal hypoxic-ischemic encephalopathy (HIE) have been limited. The aim of this paper is to offer translational research guidance on stem cell therapy for neonatal HIE by examining clinically relevant animal models, practical stem cell sources, safety and efficacy of endpoint assays, as well as a general understanding of modes of action of this cellular therapy. In order to do so, we discuss the clinical manifestations of HIE, highlighting its overlapping pathologies with stroke and providing insights on the potential of cell therapy currently investigated in stroke, for HIE. To this end, we draw guidance from recommendations outlined in stem cell therapeutics as an emerging paradigm for stroke or STEPS, which have been recently modified to Baby STEPS to cater for the "neonatal" symptoms of HIE. These guidelines recognized that neonatal HIE exhibit distinct disease symptoms from adult stroke in need of an innovative translational approach that facilitates the entry of cell therapy in the clinic. Finally, new information about recent clinical trials and insights into combination therapy are provided with the vision that stem cell therapy may benefit from available treatments, such as hypothermia, already being tested in children diagnosed with HIE.

PMID: 25161645 [PubMed] PMCID: PMC4130306 Free full text

19. J Pediatr Endocrinol Metab. 2014 Aug 19. pii: /j/jpem.ahead-of-print/jpem-2014-0024/jpem-2014-0024.xml. doi: 10.1515/jpem-2014-0024. [Epub ahead of print]

Effect of l-thyroxine supplementation on infants with transient hypothyroxinemia of prematurity at 18 months of corrected age: randomized clinical trial.

Uchiyama A, Kushima R, Watanabe T, Kusuda S.

Objective: Our objective was to evaluate effects of levothyroxine (l-T4) supplementation against neurodevelopmental outcomes at 18 months of corrected age in very-low-birth-weight (VLBW) infants with hypothyroxinemia but without elevated thyroid-stimulating hormone (TSH) concentration. Methods: VLBW infants who had plasma TSH concentrations <10 μU/mL and free thyroxine (FT4) concentrations <0.8 ng/dL between 2 and 4 weeks of age were enrolled. They were randomly assigned to either the Treated (n=25) or Untreated group (n=45). The Treated group received l-T4 at a dose of 5 μg/kg/day. We compared growth and neurodevelopmental outcomes at 18 months of corrected age in the two groups. Results: There were no significant differences in growth, the incidences of developmental delay, cerebral palsy, visual impairment, and hearing impairment in the two groups. Conclusions: In such infants, l-T4 supplementation at a dose of 5 μg/kg/day did not affect FT4 levels and showed no beneficial effect at 18 months of corrected age.

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20. Pediatr Neurol. 2014 Sep;51(3):461-4. doi: 10.1016/j.pediatrneurol.2014.05.008. Epub 2014 May 15.

Periventricular Nodular Heterotopia and Dystonia Due to an ARFGEF2 Mutation.

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BACKGROUND: Heterotopias are a neuronal migration disorder caused by extrinsic factors or by genetic mutations. When the location is periventricular, the most frequent genetic cause is the mutation in the "filamin A2 gene", which is X-linked. New genes for periventricular nodular heterotopia with an autosomal inheritance pattern have been recently discovered. PATIENTS: We describe two siblings. The girl, who was prenatally diagnosed ventriculomegaly, had delayed development. At 6 months, she had no head control and variable muscle tone, alternating low axial tone with jerking movements. She became microcephalic. Magnetic resonance imaging at 12 months of age revealed enlarged lateral ventricles, periventricular nodular heterotopia, thin corpus callosum, a T2-hyperintensity of the putamen and the thalamus, and a loss of volume of lenticular nucleus. At 18 months, she developed sporadic myoclonic seizures that were well controlled with valproic acid. Her younger brother also

developed progressive microcephaly and psychomotor delay by 6 months. He exhibited axial hypotonia with a prominent dystonic-athetoid component. Magnetic resonance imaging at 15 months of age revealed asymmetric ventriculomegaly plus diffuse nodules lining the temporal horns, a thin corpus callosum, and hyperintensity signal in putamens. He had no seizures. RESULTS: Because of the association of microcephaly, developmental delay with dystonic movements, the imaging results, and the probable autosomal recessive inheritance pattern, genetic analysis was requested. This detected a homozygous nonsense mutation in ARFGEF2 gene, at the DNA level c.388C>T in exon 4. CONCLUSIONS: The presence of dyskinetic movements in individuals with acquired microcephaly could be a manifestation of periventricular nodular heterotopia due to ARFGEF2 mutation.

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21. Semin Fetal Neonatal Med. 2014 Aug 20. pii: S1744-165X(14)00049-3. doi: 10.1016/j.siny.2014.07.001. [Epub ahead of print]

Examination of the placenta: Medico-legal implications.

Chang KT.

Formal examination of the placenta may provide valuable information to the clinicians, family, and court of law in cases of adverse pregnancy outcome when litigation is initiated. Placental examination contributes towards the identification of specific intrinsic or secondary placental lesions, and understanding the nature of the intrauterine environment. This article provides an update of important placental pathologies that may contribute towards neurologic injury of the newborn child, and describes the role of placental findings in the adjudication of cases of adverse neonatal outcome.

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22. Semin Fetal Neonatal Med. 2014 Aug 20. pii: S1744-165X(14)00056-0. doi: 10.1016/j.siny.2014.08.005. [Epub ahead of print]

Medico-legal implications of hypoxic-ischemic birth injury.

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Medical malpractice litigation in the USA and much of the developed world has reached near-epidemic proportions. Brain-damaged infants are among the most costly medical malpractice lawsuits, with the average indemnity for these cases being $524,047. Hypoxic-ischemic encephalopathy (HIE) is the most common birth injury claim, generally alleging that intrapartum asphyxia led to long-term neurologic sequelae, including cerebral palsy and/or developmental delay. Timing of injury is a key element in the legal arena. The plaintiff will try to prove that injury occurred in the intrapartum period, whereas the defense may argue that it occurred prenatally. A recent American Academy of Pediatrics/American College of Obstetricians and Gynecologists Task Force on Neonatal Encephalopathy developed a checklist that needs to be fulfilled in order to establish a reasonable causal link between an intrapartum asphyxial insult and subsequent long-term neurologic disability. Therapeutic hypothermia has been shown to benefit certain infants born with moderate to severe HIE by improving neurologic outcomes. Since the advent of hypothermic neuroprotection, new malpractice allegations have arisen, including the failure to refer a baby for cooling and failure to initiate cooling in a timely manner. In all cases, documentation of the status of the baby at birth, including a thorough neurologic exam, can be extremely helpful to the later defense of a malpractice claim, which might occur years later.

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23. Pediatr Neurol. 2014 Sep;51(3):414-6. doi: 10.1016/j.pediatrneurol.2014.05.004. Epub 2014 May 9.

Clinical course and images of four familial cases of allan-herndon-dudley syndrome with a novel monocarboxylate transporter 8 gene mutation.

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BACKGROUND: Allan-Herndon-Dudley syndrome, an X-linked condition characterized by severe intellectual disability, dysarthria, athetoid movements, muscle hypoplasia, and spastic paraplegia, is associated with defects in the monocarboxylate transporter 8 gene (MCT8). The long-term prognosis of Allan-Herndon-Dudley syndrome remains uncertain. PATIENTS: We describe the clinical features and course of four adults in a family with Allan-Herndon-Dudley syndrome with athetoid type cerebral palsy. RESULTS: We identified an MCT8 gene mutation in this family. Two of the four affected family members died at 32 and 24 years of age. CONCLUSIONS: Individuals with Allan-Herndon-Dudley syndrome are at increased risk for recurrent infection, such as aspiration pneumonia. These individuals require careful management with consideration for this increased risk of recurrent infection.

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24. Semin Pediatr Neurol. 2014 Jun;21(2):121-3. doi: 10.1016/j.spen.2014.04.017. Epub 2014 May 20.

A 4-year-old Nigerian boy with cerebral palsy?

Bodensteiner JB.

A four year old with a diagnosis of congenital infection leading to cerebral palsy is presented. The patient instead has a condition called Leukoencephalopathy with bilateral temporal lobe cysts which can be differentiated from congenital CMV by the clinical and MRI findings.

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