Cerebral Palsy ALLIANCE

NEWS
Cerebral Palsy Research

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Interventions and Management

1. Scand J Occup Ther. 2013 Dec 11. [Epub ahead of print]

Effect of constraint-induced therapy on upper limb functions: A randomized control trial.

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Aims: Children with congenital hemiparesis have unilateral upper extremity involvement, limiting their ability in unilateral or bilateral manual tasks, thus negatively influencing their articipation in daily activities. Constraint-induced movement therapy (CIMT) has been shown to be promising for improving upper-limb functions in children with cerebral palsy. Clinical assessments may be needed to quantify and qualify changes in children's performance following its application. Methods: This study investigated the effectiveness of a child-friendly form of CIMT to improve upper extremity functional performance. Thirty congenitally hemiparetic children aged 4-8 years were randomly assigned to receive either a CIMT program (study group) or a conventional non-structured therapy program (control group). The programs were applied for both groups for six hours daily, five days weekly for four successive weeks. The Pediatric Arm Function Test, Quality of Upper Extremity Skills Test, and isokinetic muscular performances of shoulder flexors, extensors, and abductors expressed as peak torque were used to evaluate immediate and long-lasting efficacy of CIMT. Results: The results showed improvement in the involved upper extremity performances in different evaluated tasks immediately post-CIMT program application compared with the control group. These improvements continued three months later. Conclusion: Pediatric CIMT with shaping produced considerable and sustained improvement in the involved upper extremity movements and functions in children with congenital hemiparesis.

PMID: 24325594 [PubMed - as supplied by publisher]

2. Bone. 2013 Dec 4. pii: S8756-3282(13)00484-5. doi: 10.1016/j.bone.2013.11.022. [Epub ahead of print]

Disease severity and functional factors associated with walking performance in polyostotic fibrous dysplasia.

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The purpose of this study was to determine the association between measures of disease severity, impairment, and ambulation ability in persons with polyostotic fibrous dysplasia (PFD). A cross-sectional sample of 81 patients (ages 5-57) with polyostotic fibrous dysplasia was evaluated as part of an ongoing study. Subjects were scored on the Skeletal Disease Burden Score (SDBS), completed a 9-minute walk test (9MW), manual muscle testing (MMT), and measurements of range of motion (ROM). Correlations between continuous variables were calculated using the Pearson correlation coefficient and ordinal variables by Spearman correlation coefficient. It was found that subjects with more severe disease walked slower than those with less skeletal disease, with the exception of the youngest subjects. Walking velocity was faster in subjects with better hip strength and range of motion and slower in those with bilateral coxa vara. Those subjects with more severe disease had a less range of motion, were weaker at the hips, and more likely to have leg length discrepancy. Skeletal disease severity is associated with hip weakness, leg length discrepancy, and loss of range of motion. In most cases, findings did not differ in the presence or absence of associated endocrinopathies. Skeletal disease severity, MMT and ROM each has an impact on walking efficiency in persons with PFD. These findings suggest that treatment focused on strategies to improve or, at least, maintain hip strength and range of motion and correct leg length discrepancies and hip malalignment may help preserve ambulation ability in persons with PFD and that treatment should begin at a young age.

PMID: 24316419 [PubMed - as supplied by publisher]

3. Neural Plast. 2013;2013:593271. Epub 2013 Nov 12.

Molecular Mechanisms of Treadmill Therapy on Neuromuscular Atrophy Induced via Botulinum Toxin A.

Tsai SW, Chen HL, Chang YC, Chen CM.

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Botulinum toxin A (BoNT-A) is a bacterial zinc-dependent endopeptidase that acts specifically on neuromuscular junctions. BoNT-A blocks the release of acetylcholine, thereby decreasing the ability of a spastic muscle to generate forceful contraction, which results in a temporal local weakness and the atrophy of targeted muscles. BoNT-A-induced temporal muscle weakness has been used to manage skeletal muscle spasticity, such as poststroke spasticity, cerebral palsy, and cervical dystonia. However, the combined effect of treadmill exercise and BoNT-A treatment is not well understood. We previously demonstrated that for rats, following BoNT-A injection in the gastrocnemius muscle, treadmill running improved the recovery of the sciatic functional index (SFI), muscle contraction strength, and compound muscle action potential (CMAP) amplitude and area. Treadmill training had no influence on gastrocnemius mass that received BoNT-A injection, but it improved the maximal contraction force of the gastrocnemius, and upregulation of GAP-43, IGF-1, Myo-D, Myf-5, myogenin, and acetylcholine receptor (AChR) subunits α and β was found following treadmill training. Taken together, these results suggest that the upregulation of genes associated with neurite and AChR regeneration following treadmill training may contribute to enhanced gastrocnemius strength recovery following BoNT-A injection.

PMID: 24327926 [PubMed - as supplied by publisher] Free PMC Article

4. Gait Posture. 2013 Nov 2. pii: S0966-6362(13)00654-1. doi: 10.1016/j.gaitpost.2013.10.020. [Epub ahead of print]

Crouch gait changes after planovalgus foot deformity correction in ambulatory children with cerebral palsy.

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Ambulatory children with cerebral palsy (CP) may present with several gait patterns due to muscular spasticity, commonly with crouch gait. Several factors may contribute to continuous knee flexion during gait, including hamstring and gastrocnemius contracture. In planovalgus foot deformity, the combination of heel equinus, talonavicular joint dislocation, midfoot break and external tibial torsion also contribute to crouch gait as part of lever arm dysfunction. In this retrospective cohort study, we assessed 21 children with CP (34 feet) who underwent planovalgus foot correction as a single level surgery. Fifteen feet underwent subtalar fusion and 19 feet had lateral calcaneal lengthening. Patients who underwent knee, hip or pelvis surgeries were excluded from the study. The aim was to examine the changes in gait pattern and the correlation between the changes of knee flexion at stance phase with the other kinematic and kinetic parameters after foot surgery. Post surgery change of Maximum knee extension at stance (MKE-dif) was the outcome of interest. The magnitude of change in MKE after surgery increased (less crouch after surgery) in patients who had milder preoperative planovalgus feet and higher preoperative ankle maximum dorsiflexion at stance and ankle power. The gain of knee extension after surgery correlated with correction of ankle hyperdorsiflexion and with increase of knee extension at initial contact and knee power. Patients with high preoperative ankle maximum dorsiflexion may benefit from surgical foot deformity correction to achieve decreased ankle dorsiflexion with no knee surgical intervention.

PMID: 24316233 [PubMed - as supplied by publisher]

5. Front Comput Neurosci. 2013 Nov 22;7:168.

Increased motor cortex excitability during motor imagery in brain-computer interface trained subjects.

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Background: Motor imagery (MI) is the mental performance of movement without muscle activity. It is generally accepted that MI and motor performance have similar physiological mechanisms. Purpose: To investigate the activity and excitability of cortical motor areas during MI in subjects who were previously trained with an MI-based brain-computer interface (BCI). Subjects and Methods: Eleven healthy volunteers without neurological impairments (mean age, 36 years; range: 24-68 years) were either trained with an MI-based BCI (BCI-trained, n = 5) or received no BCI training (n = 6, controls). Subjects imagined grasping in a blocked paradigm task with alternating rest and task periods. For evaluating the activity and excitability of cortical motor areas we used functional MRI and navigated transcranial magnetic stimulation (nTMS). Results: fMRI revealed activation in Brodmann areas 3 and 6, the cerebellum, and the thalamus during MI in all subjects. The primary motor cortex was activated only in BCI-trained subjects. The associative zones of activation were larger in non-trained subjects. During MI, motor evoked potentials recorded from two of the three targeted muscles were significantly higher only in BCI-trained subjects. The motor threshold decreased (median = 17%) during MI, which was also observed only in BCI-trained subjects. Conclusion: Previous BCI training increased motor cortex excitability during MI. These data may help to improve BCI applications, including rehabilitation of patients with cerebral palsy.

PMID: 24319425 [PubMed - as supplied by publisher] PMCID: PMC3837244 Free PMC Article

6. No To Hattatsu. 2013 Nov;45(6):440-4.

Treatment with ramelteon for sleep disturbance in severely disabled children and young adults [Article in Japanese]

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OBJECTIVE: The aim of this study was to determine the efficacy and safety of ramelteon for severely disabled children and young adults who had already been treated for sleep disturbance with melatonin at a dose of 3 mg. METHODS: Eleven patients, who were aged between 3-25 years and included 4 patients with cerebral palsy, -took 3-8 mg of ramelteon at bedtime, after a one-week of washout period. Sleep states were evaluated using sleep diaries recorded by caregivers or using actigraphs. RESULTS: Ramelteon was effective in 8 out of the 11 patients. Ramelteon was tolerated well except for mild daytime sleepiness in three patients. CONCLUSIONS: This preliminary study showed the efficacy and safety of ramelteon for sleep disturbance in severely disabled children and young adults. Further trials are necessary to determine optimal dosage and safety of ramelteon in children.

PMID: 24313003 [PubMed - in process]

Prevention and Cure

7. Brain Dev. 2013 Dec 3. pii: S0387-7604(13)00305-7. doi: 10.1016/j.braindev.2013.11.002. [Epub ahead of print]

Short-term effects of erythropoietin on neurodevelopment in infants with cerebral palsy: A pilot study.

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Objective: Cerebral palsy (CP) is a disabling condition characterized by the motor impairment, which is difficult to be ameliorated. In the brain of infants with CP, there are persistent pathomechanisms including accentuated neuroinflammation. Since erythropoietin was demonstrated to have neuroprotective effect via anti-inflammatory and anti-apoptotic properties, we hypothesized that the administration of recombinant human EPO (rhEPO) could help children with CP, especially young infants. Materials and method: We investigated the therapeutic efficacy of rhEPO for infants with CP, who had been undergoing active rehabilitation in hospitalized setting to eliminate treatment bias. Twenty infants with CP were randomly divided into EPO or control group equally. We compared the changes in the Gross Motor Function Measure (GMFM) and the Bayley Scales of Infant Development-II (BSID-II) scores during one month of hospitalization between two groups. Results: The improvements after 1month on the GMFM A and GMFM total scores differed significantly between the groups (p=0.003, p=0.04, respectively). However, the changes after 6months were not different between the two groups. The scores of BSID-II did not show any differences at 1-month and 6-months post-treatment. Conclusion: These results indicated that rhEPO could have therapeutic efficacy for infants with CP during the active rehabilitation and anti-inflammation was suggested to be one of its therapeutic mechanisms.

PMID: 24314853 [PubMed - as supplied by publisher]

8. BMC Med Genet. 2013 Dec 7;14(1):126. [Epub ahead of print]

Sequencing of the IL6 gene in a case--control study of cerebral palsy in children.

Khankhanian P, Baranzini SE, Johnson BA, Madireddy L, Nickles D, Croen LA, Wu YW.

BACKGROUND: Cerebral palsy (CP) is a group of nonprogressive disorders of movement and posture caused by abnormal development of, or damage to, motor control centers of the brain. A single nucleotide polymorphism (SNP), rs1800795, in the promoter region of the interleukin-6 (IL6) gene has been implicated in the pathogenesis of CP by mediating IL-6 protein levels in amniotic fluid and cord plasma and within brain lesions. This SNP has been associated with other neurological, vascular, and malignant processes as well, often as part of a haplotype block. METHODS: To refine the regional genetic association with CP, we sequenced (Sanger) the IL6 gene and part of the promoter region in 250 infants with CP and 305 controls. RESULTS: We identified a haplotype of 7 SNPs that includes rs1800795. In a recessive model of inheritance, the variant haplotype conferred greater risk (OR = 4.3, CI = [2.0-10.1], p = 0.00007) than did the lone variant at rs1800795 (OR = 2.5, CI = [1.4-4.6], p = 0.002). The risk haplotype contains one SNP (rs2069845, CI = [1.2-4.3], OR = 2.3, p = 0.009) that disrupts a methylation site. CONCLUSIONS: The risk haplotype identified in this study overlaps with previously identified haplotypes that include additional promoter SNPs. A risk haplotype at the IL6 gene likely confers risk to CP, and perhaps other diseases, via a multi-factorial mechanism.

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9. BMC Res Notes. 2013 Dec 6;6(1):517. [Epub ahead of print]

Blunt abdominal trauma to a pregnant woman resulting in a child with hemiplegic spastic cerebral palsy and permanent eye damage.

Taha E, Nasralla K, Khalid A, Ali AA.

BACKGROUND: In today's life trauma is a common and important complication of pregnancy and remains one of the major contributors to maternal and fetal morbidity and mortality. CASE PRESENTATION: The authors reported a case of 4 years old child with hemiplegic spastic cerebral palsy and permanent left eye damage due to antenatal trauma. He was an offspring to a 33 years old woman gravida 6 para 5 from western Sudan, who sustained a domestic blunt abdominal trauma during her routine daily activities. The abdominal trauma occurred during the third trimester at 36th week gestation of the pregnancy when the mother hit herself by the woody part of an axe non intentionally. CONCLUSIONS: The findings from this case conclude that relatively minor trauma can have significant adverse effects on the fetus and can be devastating.

PMID: 24314440 [PubMed - as supplied by publisher] Free full text

10. Cell Biochem Biophys. 2013 Dec 11. [Epub ahead of print]

Systemic Evaluation of Hypoxic-Ischemic Brain Injury in Neonatal Rats.

Zhu AH, Hu YR, Liu W, Gao F, Li JX, Zhao LH, Chen G.

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The objective of the study was to evaluate the systematically rat model of neonatal hypoxic-ischemic brain damage. The right carotid arteries of 7-day-old healthy Wistar rats were ligated, and then, the rats were subjected to an environment with 8 % of oxygen. Four weeks after the birth, neurobehavioral test, water maze test, and motor-evoked potential and neuropathologic examinations were performed. The footprint analysis showed significantly larger and instable paces in the hypoxic-ischemic group ($P < 0.05$); the time that rats crossed the balance beam in the hypoxic-ischemic group was longer than the control group ($P < 0.05$). The water maze test showed that the escape latency of hypoxic-ischemic group was significantly longer than that of control group ($P < 0.05$). The hindlimb quadriceps compound muscle-evoked potential CMEP of rats in hypoxic-ischemic group showed that the wave amplitude was lower than that of control group ($P < 0.05$). HE staining showed visible periventricular leukomalacia in hypoxic-ischemic groups; disrupted nuclear membrane was detected in the IH group with

transelectronmicroscopy; Immunohistochemistry: compared with control group, MBP-positive neurocytes decreased, glial fibrillary acidic protein positive neurocytes increased in the periventricular zone ($P < 0.05$). Carotid artery ligation combining the hypoxic chamber created a reliable and stable rat model of neonatal hypoxic-ischemic brain damage and can be used for experimental research related to management of cerebral palsy.

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11. Pediatr Res. 2013 Dec 9. doi: 10.1038/pr.2013.235. [Epub ahead of print]

Apolipoprotein E (APOE) Genotype and Outcome in Infants with Hypoxic-Ischemic Encephalopathy (HIE).

Cotten CM, Goldstein RF, McDonald SA, Goldberg RN, Salhab WA, Carlo WA, Tyson JE, Finer NN, Walsh MC, Ehrenkranz RA, Laptook AR, Guillet R, Schibler K, Van Meurs KP, Poindexter BB, Stoll BJ, O'Shea TM, Duara S, Das A, Higgins RD, Shankaran S.

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Background: Adults with the apolipoprotein E gene (APOE) alleles e4 and e2 are at high risk of poor neurologic outcome after brain injury. The e4 allele has been associated with cerebral palsy and the e2 allele has been associated with worse neurologic outcome with congenital heart disease. This study was done to test the hypothesis that APOE genotype is associated with outcome among neonates who survive after hypoxic-ischemic encephalopathy (HIE). Methods: We conducted a cohort study of infants who survived HIE and had 18 - 22 month standardized neurodevelopmental evaluations to assess associations between disability and APOE genotypes e3/e3, e4/-, and e2/-.Results:139 survivors were genotyped. 86 (62%) were e3/e3, 41 (29%) were e4/-, and 14 (10%) were e2/-. 129 infants had genotype and follow-up data; 26% had moderate or severe disabilities. Disability prevalence was 30% and 19% among those with and without e3/e3 genotype, 25% and 26% among those with and without the e2 allele, and 18% and 29% among those with and without the e4 allele. None of the differences were statistically significant. Cerebral palsy prevalence was also similar among genotype groups. Conclusion: Disability was not associated with APOE genotype in this cohort of HIE survivors.Pediatric Research (2013); doi:10.1038/pr.2013.235.

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