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CP Research News

Monday 7 October 2008

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1: Exp Brain Res. 2008 Oct 2. [Epub ahead of print]

Eye hand coordination in children with cerebral palsy.

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Reaching to grasp an object of interest requires complex sensorimotor coordination involving eye, head, hand and trunk. While numerous studies have demonstrated deficits in each of these systems individually, little is known about how children with cerebral palsy (CP) coordinate multiple motor systems for functional tasks. Here we used kinematics, remote eye tracking and a trunk support device to examine the functional coupling of the eye, head and hand and the extent to which it was constrained by trunk postural control in 10 children with CP (6-16 years). Eye movements in children with CP were similar to typically developing (TD) peers, while hand movements were significantly slower. Postural support influenced initiation of hand movements in the youngest children (TD & CP) and execution of hand movements in children with CP differentially depending on diagnosis. Across all diagnostic categories, the most robust distinction between TD children and children with CP was in their ability to isolate eye, head and hand movements. Results of this study suggest that deficits in motor coordination for accurate reaching in children with CP may reflect coupled eye, head, and hand movements. We have previously suggested that coupled activation of effectors may be the default output for the CNS during early development.

PMID: 18830589 [PubMed - as supplied by publisher]



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2: J Matern Fetal Neonatal Med. 2008 Sep;21(9):663-70.**Amniotic fluid concentration of surfactant proteins in intra-amniotic infection.**

Chaiworapongsa T, Hong JS, Hull WM, Romero R, Whitsett JA.

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OBJECTIVE: Pulmonary surfactant is a complex molecule of lipids and proteins synthesized and secreted by type II alveolar cells into the alveolar epithelial lining. Both lipid and protein components are essential for lung function in postnatal life. Infection is a well-established cause of preterm delivery, and several inflammatory cytokines play a role in the mechanisms of preterm parturition. An increased concentration of inflammatory cytokines in amniotic fluid or fetal plasma has been linked to the onset of preterm parturition and fetal/neonatal injury, including cerebral palsy and chronic lung disease. Experimental evidence indicates that inflammatory mediators also regulate surfactant protein synthesis, and histologic chorioamnionitis is associated with a decreased incidence of hyaline membrane disease in neonates. This study was conducted to determine if amniotic fluid concentrations of surfactant protein (SP)-A, SP-B, and SP-D change in patients with and without intra-amniotic infection (IAI). **MATERIALS AND METHODS:** A case-control study was conducted to determine amniotic fluid concentrations of SP-A, SP-B, SP-D, and total protein in patients who had an amniocentesis performed between 18 and 34 weeks of gestation for the detection of IAI in patients with spontaneous preterm labor with intact membranes (n = 42) and cervical insufficiency prior to the application of cerclage (n = 6). Amniotic fluid samples were selected from a bank of biological specimens and included patients with (n = 16) and without (n = 32) IAI matched for gestational age at amniocentesis. Intra-amniotic infection was defined as a positive amniotic fluid culture for microorganisms. Each group was further subdivided according to a history of corticosteroid administration within 7 days prior to amniocentesis into the following subgroups: (1) patients without IAI who had received antenatal corticosteroids (n = 21), (2) patients with IAI who had received antenatal corticosteroids (n = 9), (3) patients without IAI who had not received antenatal corticosteroids (n = 11), and (4) patients with IAI who had not received antenatal corticosteroids (n = 7). Amniotic fluid was obtained by transabdominal amniocentesis. SP-A, SP-B, and SP-D concentrations in amniotic fluid were determined by enzyme-linked immunosorbent assay (ELISA). Non-parametric statistics were used for analysis. **RESULTS:** Women with IAI had a higher median amniotic fluid concentration of SP-B and of SP-B/total protein, but not other SPs, than those without IAI (both p = 0.03). Among patients who had received antenatal corticosteroids, the median amniotic fluid concentration of SP-B and of SP-B/total protein was significantly higher in patients with IAI than in those without IAI (SP-B, IAI: median 148 ng/mL, range 37.3-809 ng/mL vs. without IAI: median 7.2 ng/mL, range 0-1035 ng/mL; p = 0.005 and SP-B/total protein, IAI: median 14.1 ng/mg, range 4.3-237.5 ng/mg vs. without IAI: median 1.45 ng/mg, range 0-79.5 ng/mg; p = 0.003). Among women who had not received antenatal corticosteroids, the median amniotic fluid concentrations of SP-B and of SP-B/total protein were not significantly different between patients with and without IAI (SP-B, IAI: median 4 ng/mL, range 0-31.4 ng/mL vs. without IAI: median 3.4 ng/mL, range 0-37 ng/mL; p = 0.8 and SP-B/total protein, IAI: median 0.55 ng/mg, range 0-6.96 ng/mg vs. without IAI: median 0.59 ng/mg, range 0-3.28 ng/mg; p = 0.9). The median amniotic fluid concentrations of SP-A, SP-A/total protein, SP-D, and SP-D/total protein were not significantly different between patients with and without IAI whether they received antenatal corticosteroids or not (all p > 0.05). **CONCLUSIONS:** IAI was associated with an increased amniotic fluid concentration of SP-B in patients who received antenatal corticosteroids within 7 days prior to amniocentesis.

Publication Types:

Research Support, N.I.H., Intramural

PMID: 18828060 [PubMed - in process]

3: Spine. 2008 Oct 1;33(21):2300-4.**Antibiotic-loaded allograft decreases the rate of acute deep wound infection after spinal fusion in cerebral palsy.**

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Department of Orthopedics, Alfred I duPont Hospital for Children, Nemours Children's Clinic, Wilmington, DE 19803, USA.

STUDY DESIGN: A retrospective matched cohort study with control group. **OBJECTIVE:** To compare the infection rate after posterior spinal fusion with unit rod instrumentation with or without gentamicin-impregnated allograft bone in children with cerebral palsy (CP). **SUMMARY OF BACKGROUND DATA:** Previous studies evaluating wound infection rates after spinal fusion surgery in children with CP report an 8.7% to 10% wound infection rate. The concept of using antibiotic-loaded bone graft (AbBGF) to provide local antibiotics has been explored in high risk patients, such as those with osteomyelitis or infected joint arthroplasty. There have been no reports of using AbBGF prophylactically in spine surgery. **METHODS:** After IRB approval, the medical records of 220 children with CP who underwent spinal fusion with unit rod instrumentation for a primary spinal deformity between January 2000 through December 2006 at a single institution were retrospectively reviewed. We evaluated the incidence of postoperative wound infection in patients with AbBGF and those without bone graft (BGF). **RESULTS:** One hundred fifty-four patients received AbBGF during spinal fusion surgery and 6 patients (3.9%) developed a deep wound infection. Ten (15.2%) of the 66 patients without AbBGF developed a deep wound infection. The difference between groups was statistically different ($P = 0.003$). The mean age at surgery, preoperative Cobb angle, correction rate, operative time, and estimated blood loss were not statistically different between the 2 groups ($P > 0.05$). The length of hospital stay was decreased in the AbBGF group ($P < 0.05$). **CONCLUSION:** The incidence of deep wound infection after spinal fusion in 220 children with CP scoliosis decreased from 15% to 4% with the use of prophylactic antibiotics in the corticocancellous allograft bone.

PMID: 18827695 [PubMed - in process]

4: J Bone Joint Surg Br. 2008 Oct;90(10):1372-9.**Proximal femoral geometry in cerebral palsy: a population-based cross-sectional study.**

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There is much debate about the nature and extent of deformities in the proximal femur in children with cerebral palsy. Most authorities accept that increased femoral anteversion is common, but its incidence, severity and clinical significance are less clear. Coxa valga is more controversial and many authorities state that it is a radiological artefact rather than a true deformity. We measured femoral anteversion clinically and the neck-shaft angle radiologically in 292 children with cerebral palsy. This represented 78% of a large, population-based cohort of children with cerebral palsy which included all motor types, topographical distributions and functional levels as determined by the gross motor function classification system. The mean femoral neck anteversion was 36.5 degrees (11 degrees to 67.5 degrees) and the mean neck-shaft angle 147.5 degrees (130 degrees to 178 degrees). These were both increased compared with values in normally developing children. The mean femoral neck anteversion was 30.4 degrees (11 degrees to 50 degrees) at gross motor function classification system level I, 35.5 degrees (8 degrees to 65 degrees) at level II and then plateaued at approximately 40.0 degrees (25 degrees to 67.5 degrees) at levels III, IV and V. The mean neck-shaft angle increased in a step-wise manner from 135.9 degrees (130 degrees to 145 degrees) at gross motor function classification system level I to 163.0 degrees (151 degrees to 178 degrees) at level V. The migration percentage increased in a similar pattern and was

closely related to femoral deformity. Based on these findings we believe that displacement of the hip in patients with cerebral palsy can be explained mainly by the abnormal shape of the proximal femur, as a result of delayed walking, limited walking or inability to walk. This has clinical implications for the management of hip displacement in children with cerebral palsy.

PMID: 18827250 [PubMed - in process]

5: J Pediatr Endocrinol Metab. 2008 Aug;21(8):805-10.

Non-islet-cell tumor hypoglycemia and lactic acidosis in a child with congenital HIV and Burkitt's lymphoma.

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BACKGROUND: Non-islet-cell tumor hypoglycemia (NICTH) is a rare cause of hypoglycemia associated with tumors of mesenchymal, epithelial, or hematopoietic origin. Lactic acidosis is likewise an uncommon complication of hematological malignancy associated mainly with leukemia and lymphoma. Most cases of NICTH and lactic acidosis have been described in the adult population. We report a child with congenital HIV and AIDS who developed Burkitt's lymphoma, lactic acidosis and NICTH. **PATIENT:** An 11 year-old boy with AIDS, cerebral palsy and seizure disorder presented with intractable hypoglycemia 12 days after diagnosis of Burkitt's lymphoma. He had persistent hypoglycemia (serum glucose 20-40 mg/dl; 1.1-2.2 mmol/l) despite glucose infusion rate of 6 mg/kg/minute and trial of diazoxide treatment. Critical sample obtained at time of hypoglycemia showed insulin at 1.78 microU/ml (normal <5 microU/ml), pro-insulin 5.6 pmol/l (<18.8 pmol/l), IGF-I <25 ng/ml (80-723 ng/ml), IGF-II 422 ng/ml (610-1,217 ng/ml), lactate 15.6 mmol/l (normal: 0.5-2.2 mmol/l), cortisol 21 microg/dl (580 nmol/l; normal >10 microg/dl; 276 nmol/l), and negative insulin antibodies. He remained alert and seizure free despite profound hypoglycemia. A 1 mg glucagon stimulation test showed a rise in serum glucose of 29 mg/dl (>1.6 mmol/l). Continuous glucagon infusion at 0.15-0.3 mg/h maintained euglycemia until the time of his demise (1 month after admission) due to complications of his underlying illness. **CONCLUSION:** We present a case of lactic acidosis and NICTH in an 11 year-old boy with AIDS and Burkitt's lymphoma. We review the mechanism of hyperlactacidemia in supporting cerebral function during profound hypoglycemia. NICTH and lactic acidosis in association with malignancy carries a poor prognosis. In this patient, continuous glucagon infusion was a successful alternative to corticosteroid treatment in maintaining euglycemia.

PMID: 18825882 [PubMed - in process]

6: Ann Neurol. 2008 Sep 29;64(3):266-273. [Epub ahead of print]

Human parechovirus causes encephalitis with white matter injury in neonates.

Verboon-Macielek MA, Groenendaal F, Hahn CD, Hellmann J, van Loon AM, Boivin G, de Vries LS.

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OBJECTIVE: To assess the role of human parechoviruses (HPeVs) as a cause of neonatal cerebral infection and to report neuroimaging findings of newborn infants with encephalitis caused by HPeVs. **METHODS:** Clinical presentation, cranial ultrasonography, magnetic resonance imaging (MRI) findings, and neurodevelopmental outcome of 10 infants admitted to a neonatal intensive care unit and diagnosed with encephalitis caused by HPeVs are reported. **RESULTS:** Nine of 10 infants, with a gestational age of 29 to 41 weeks, presented at 36 to 41 weeks postmenstrual age with clinical seizures. Seven had a fever and six had a rash. Clinical presentation was similar to that of infants with enterovirus infection. Cranial ultrasonography showed increased echogenicity in the periventricular white matter in all infants. Neonatal MRI confirmed white matter changes in nine infants, which changed to gliosis on later MRI.

Outcome was variable with cerebral palsy in one, a suspect outcome at 18 months in one, learning disabilities at 7 years of age in one, epilepsy in one, and normal neurodevelopmental outcome in five children. Follow-up of one infant was only 9 months. INTERPRETATION: HPeVs should be added to the list of neurotropic viruses that may cause severe central nervous system infection in the neonatal period. White matter injury can be visualized with cranial ultrasonography, but more detailed information is obtained with MRI and especially diffusion-weighted imaging. Because clinical presentation of HPeV encephalitis is similar to that of enterovirus, real-time polymerase chain reaction for both viruses should be performed in atypical presentation of neonatal seizures. *Ann Neurol* 2008.

PMID: 18825694 [PubMed - as supplied by publisher]

7: World J Pediatr. 2008 Aug;4(3):192-6.

Hypercapnia and hypocapnia in neonates.

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BACKGROUND: The arterial partial pressure of carbon dioxide (PaCO₂) represents the balance between CO₂ production and consumption. Abnormal increase or decrease in PaCO₂ can affect the body's internal environment and function. Permissive hypercapnia has aroused more attention as a novel ventilatory therapy. The aim of this study was to elucidate the effects of hypercapnia and hypocapnia on the functions of such neonatal organs as the lung and brain. **DATA SOURCES:** The PubMed database was searched with the keywords "hypocapnia", "hypercapnia" and "newborn". **RESULTS:** Hypocapnia is a risk factor for potential damage to the central nervous system, such as periventricular leukomalacia, intraventricular hemorrhage, cerebral palsy, cognition developmental disorder, and auditory deficit. Hyperventilation can lessen pulmonary artery hypertension to certain extent, but hypocapnia can aggravate ischemia/reperfusion-induced acute lung injury. Severe hypercapnia can induce intracranial hemorrhage, even consciousness alterations, catapora, and hyperspasmia. Permissive hypercapnia can improve lung injury caused by diseases of the respiratory system, lessen mechanical ventilation-associated lung injury, reduce the incidence of bronchopulmonary dysplasia and protect against ventilation-induced brain injury. In addition, permissive hypercapnia plays a role in expanding cerebral vessels and increasing cerebral blood flow. **CONCLUSIONS:** Severe hypercapnia and hypocapnia can cause neonatal brain injury and lung injury. Permissive hypercapnia can increase the survival of neonates with brain injury or respiratory system disease, and lessen the brain injury and lung injury caused by mechanical ventilation. However, the mechanism of permissive hypercapnia needs further exploration to confirm its safety and therapeutic utility.

PMID: 18822927 [PubMed - in process]

8: Disabil Rehabil. 2008;30(17):1254-62.

Unmet needs and health care utilization in young adults with cerebral palsy.

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Purpose. To gain insight into the unmet needs and utilization of health care of young adults with cerebral palsy (CP) and to explore relations between unmet needs, health care utilization and subject characteristics. **Method.** A cross-sectional study was performed in 29 young adults with CP without severe learning disabilities (IQ > 70). Subject characteristics such as age, gender, limb distribution, level of gross motor functioning, level of education and perceived participation and autonomy were measured. **Outcome measures** were the Southampton Needs Assessment Questionnaire, Impact on Participation and Auton-

omy and a questionnaire on health care utilization. Results. Young adults with CP reported unmet needs mostly on information (79%), mobility (66%) and health care (66%). About half of the participants visited a rehabilitation physician (52%) or a physical therapist (55%) in the past year. Participants with lower levels of gross motor functioning were found to have more unmet needs and visited various health care professionals more often than young adults with higher levels of gross motor functioning. However, participants with higher levels of gross motor functioning still reported several unmet needs. Conclusions. Although young adults with CP frequently receive treatment from health care professionals, they indicate unmet needs with respect to several areas such as information on diagnosis, functional mobility and formal health care. In the treatment of young adults with CP, attention should be paid to these aspects.

PMID: 18821192 [PubMed - in process]

9: Qual Life Res. 2008 Sep 27. [Epub ahead of print]

Reliability in the ratings of quality of life between parents and their children of school age with cerebral palsy.

Majnemer A, Shevell M, Law M, Poulin C, Rosenbaum P.

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BACKGROUND: Quality of life is recognized as an important outcome of health services. Ideally, the child's perspectives should be sought directly to define their quality of life; however, this may be limited by age and cognitive and language abilities. **PURPOSE:** In a sample of school-aged children with cerebral palsy (CP), we compared a parent's perspective of their child's quality of life with their child's own perspective, when feasible. **METHODS:** Forty-eight children completed the Pediatric Quality of Life Inventory (PedsQL) measure independently (n = 33/48, 69% Gross Motor Function Classification System (GMFCS) I; n = 6/48, 12% III-V). A parent completed the proxy version and the scores were compared. **RESULTS:** Intraclass correlation (ICC) coefficients were high for physical (ICC = 0.72, confidence interval [CI]: 0.55-0.83) and moderate for psychosocial (ICC = 0.54, CI: 0.30-0.71) well-being, with the weakest agreement on school functioning and the strongest agreement for ratings of physical health. Parental ratings were more often lower, especially for social functioning, although children rated themselves lower on emotional functioning. Factors associated with a closer agreement between parent-child pairs included older age, male gender, higher social competency, functional abilities, and fewer emotional symptoms (r (2) = 0.07-0.30). **CONCLUSION:** In children with CP, parents' ratings of their children's quality of life are generally comparable as a group to their child's self-report. Disparities do exist, particularly in psychosocial domains, and, therefore, the child's own perspective should be considered whenever feasible.

PMID: 18821030 [PubMed - as supplied by publisher]

10: Metabolism. 2008 Oct;57 Suppl 2:S2-5.

Brain development: anatomy, connectivity, adaptive plasticity, and toxicity.

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The developing brain is inherently more vulnerable to injury than the adult brain because brain development is extraordinarily complex, with periods of unique susceptibility. When brain developmental processes are suspended or delayed by any external influence, virtually no potential exists for subsequent regeneration and repair. This inevitably leads to long-lasting or permanent consequences. Recent genetic studies have contributed to a better understanding of the dynamic adaptive changes that occur in

the developing brain as a consequence of genetic and environmental processes. Many industrial and environmental chemicals such as lead, methyl-mercury, polychlorinated biphenyls, arsenic, and toluene are recognized causes of neurodevelopmental disorders that lead to clinical or subclinical brain dysfunction. A number of these developmental disabilities arise from interactions between environmental factors and individual gene susceptibility. In addition, neurodevelopmental disorders of unknown origin, such as mental retardation, attention deficit disorder, cerebral palsy, and autism are becoming increasingly prevalent, with costly consequences for the family and society. The aim of this review is examine brain developmental anatomy, connectivity, adaptive plasticity, and toxicity in the context of current knowledge and future trends.

PMID: 18803960 [PubMed - in process]



The CP Institute is
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