

Monday 24 May 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. *Pediatr Phys Ther. 2010 Summer;22(2):234-40.*

#### **Sport-specific fitness testing and intervention for an adolescent with cerebral palsy: a case report.**

Kenyon LK, Sleeper MD, Tovin MM.

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**BACKGROUND AND PURPOSE:** This case report describes the development, implementation, and outcomes of a fitness-related intervention program that addressed the sport-specific goals of an adolescent with cerebral palsy. **CASE DESCRIPTION:** The participant in this case was a 16-year-old African American male with spastic diplegia. The participant joined his high school wrestling team and asked to focus his physical therapy on interventions that would improve his wrestling performance. An examination was performed using the muscle power sprint test, the 10 x 5-m sprint test, strength tests, the 10-m shuttle run test, and the Gross Motor Function Measure. The intervention consisted of interval training, which focused on the demands of wrestling. **OUTCOMES:** Scores on all tests and measures were higher after the intervention. **DISCUSSION:** The outcomes of this case report seem to support the use of a fitness-related intervention program for addressing the sport-specific goals of an adolescent with cerebral palsy.

PMID: 20473110 [PubMed - in process]

### 2. *Pediatr Phys Ther. 2010 Summer;22(2):222-33.*

#### **The pathophysiological basis of weakness in children with cerebral palsy.**

Mockford M, Caulton JM.

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**PURPOSE:** To examine the evidence concerning the neurologic and muscular pathophysiology that contributes to clinically observed weakness in children and young people with cerebral palsy (CP). **METHOD:** Literature concerning the neural or muscular changes in subjects with CP was found by searching 6 databases plus supplementary searching. **RESULTS:** A final set of 51 articles was identified by 2 independent reviewers. **SUMMARY OF KEY POINTS:** Muscle weakness is due to reduced central drive, possible abnormal neural maturation, insufficient and disorganized motor recruitment, impaired voluntary control, impaired reciprocal inhibition, altered setting of muscle spindles, and reinforcement of abnormal neural circuits. Muscle tissue is altered, with selective atrophy of fast fibers and altered myosin expression, changes in fiber length and cross-sectional area, changes in the length-tension curve, reduced elasticity, and impoverished muscle tissue development. **CONCLUSION:** Children with CP

are weak because of both neurologic and muscular changes.

PMID: 20473109 [PubMed - in process]

### **3. *Pediatr Phys Ther.* 2010 Summer;22(2):207-13.**

#### **Parent and therapist perceptions of an intense model of physical therapy.**

Christy JB, Saleem N, Turner PH, Wilson J.

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**PURPOSE:** The purpose of this study was to determine parent and therapist perceptions regarding the effect of an intense model of physical therapy for children with cerebral palsy. **METHODS:** Informants included 5 parents, 5 therapists, and 5 children with cerebral palsy who previously participated in an intense program (ie, strengthening and functional activities 4 hours/day, 5 days/week for 3 weeks). Parents and therapists were interviewed, and children were observed. Data were collected and analyzed using qualitative methodology. **RESULTS:** Five common themes emerged, based on perceptions: (1) improvement in motor function, (2) improvement in confidence and independence, (3) stress during the program but a time of no therapy between sessions, (4) increased participation in the community, and (5) fatigue during the program but perceived rapid attainment of goals. **CONCLUSIONS:** The constructs identified should be considered by clinicians in program development and by researchers for further study.

PMID: 20473106 [PubMed - in process]

### **4. *Pediatr Phys Ther.* 2010 Summer;22(2):199-206.**

#### **Functional electrical stimulation to lower limb muscles after botox in children with cerebral palsy.**

Seifart A, Unger M, Burger M.

Department of Physiotherapy, Faculty of Health Sciences, University of Stellenbosch, Cape Town, South Africa.  
anjaseifart@webmail.co.za

**PURPOSE:** This study examined the effect of lower limb functional electrical stimulation (FES) after botulinum toxin injection in children with cerebral palsy on self-selected walking speed, plantar flexor and dorsiflexor muscle strength, and an optimal time frame for initiating FES after the injection. **METHODS:** Five subjects participated in a single-subject design. All subjects received a single botulinum toxin injection into the calf muscle, followed by a 4-week FES home program. Three subjects followed the protocol as prescribed; 2 subjects received no FES. **RESULTS:** FES after botulinum toxin increased isometric plantar flexor muscle strength, but did not produce changes in self-selected walking speeds or isometric dorsiflexor strength. A 32-day interval between botulinum toxin and the start of FES was most effective. **CONCLUSIONS AND RECOMMENDATIONS FOR CLINICAL PRACTICE:** FES after botulinum toxin seems to be effective in improving some gait variables, although further research is needed for substantiation.

PMID: 20473105 [PubMed - in process]

### **5. *Pediatr Phys Ther.* 2010 Summer;22(2):189-97.**

#### **Development of a quantitative tool to assess the content of physical therapy for infants.**

Blauw-Hospers CH, Dirks T, Hulshof LJ, Hadders-Algra M.

Department of Pediatrics-Developmental Neurology, University Medical Center Groningen, Groningen, the Netherlands.

Comment in:

Pediatr Phys Ther. 2010 Summer;22(2):198.

**PURPOSE:** The study aim was to describe and quantify physical therapy interventions for infants at high risk for developmental disorders. **METHODS:** An observation protocol was developed based on knowledge about infant physical therapy and analysis of directly observable physiotherapeutic (PT) actions. The protocol's psychometric quality was assessed. Videos of 42 infant physical therapy sessions at 4 or 6 months of corrected age were analyzed. **RESULTS:** The observation protocol classified PT actions into 8 mutually exclusive categories. Virtually all PT actions during treatment could be classified. Inter- and intrarater agreements were satisfactory (intraclass correlations, 0.68-1.00). Approximately 40% of treatment time was spent challenging the infant to produce motor behavior by themselves, whereas approximately 30% of time facilitation techniques were applied. Tradition-based sessions could be differentiated from function-oriented ones. **CONCLUSIONS:** It is possible to document PT actions during physical therapy treatment of infants at high risk for cerebral palsy in a systematic, standardized, and reliable way.

PMID: 20473103 [PubMed - in process]

## 6. **Pediatr Phys Ther. 2010 Summer;22(2):188.**

**Clinical bottom line. Description of exercise participation of adolescents with cerebral palsy across a 4-year period.**

Takken T, Helders P.

Faculty of Medicine, Division of Pediatrics, Utrecht University, Child Development and Exercise Center, University Medical Center and Children's Hospital, Utrecht, The Netherlands.

Comment on:

Pediatr Phys Ther. 2010 Summer;22(2):180-7.

PMID: 20473102 [PubMed - in process]

## 7. **Pediatr Phys Ther. 2010 Summer;22(2):180-7.**

**Description of exercise participation of adolescents with cerebral palsy across a 4-year period.**

Brunton LK, Bartlett DJ.

School of Physical Therapy, Faculty of Health Sciences, The University of Western Ontario, London, Ontario, Canada.

Comment in:

Pediatr Phys Ther. 2010 Summer;22(2):188.

**PURPOSE:** The purposes of this study were to describe (1) the types of exercise participation of adolescents with cerebral palsy; (2) the weekly duration of stretching, strengthening, and cardiovascular exercise; (3) how the level of activity compares with national health guidelines; and (4) the change in participation over 4 years. **METHODS:** Participants included 126 males and 104 females (mean age = 14.7 years, SD = 1.7 years) who reported physical activities in the previous week. Analyses included frequency counts and proportions, stacked bar graphs, and 2-way analyses of variance of exercise participation by Gross Motor Function Classification System (GMFCS) and sex. **RESULTS:** A significant main effect of GMFCS level was detected for light and moderate exercise. A significant interaction of GMFCS level and sex was found for stretching; females stretched more. An average of 9.4% and 11.4% of our sample participated in weekly levels of moderate and vigorous exercise, respectively. **CONCLUSIONS:** Pediatric physical therapists should promote increased exercise participation rates among youths with cerebral palsy.

PMID: 20473101 [PubMed - in process]

#### **8. *Pediatr Phys Ther.* 2010 Summer;22(2):160.**

**Clinical bottom line. Intensive motor skills training program combining group and individual sessions for children with cerebral palsy.**

Knight S, Fetters L.

Rehabilitation Services, Children's Hospital of Los Angeles, Los Angeles, CA, USA.

Comment on:

*Pediatr Phys Ther.* 2010 Summer;22(2):150-9.

PMID: 20473098 [PubMed - in process]

#### **9. *Pediatr Phys Ther.* 2010 Summer;22(2):150-9.**

**Intensive motor skills training program combining group and individual sessions for children with cerebral palsy.**

Størvold GV, Jahnsen R.

Nord-Trøndelag Habilitation Department, Levanger, Norway. Gunfrid.Storvold@hnt.no

Comment in:

*Pediatr Phys Ther.* 2010 Summer;22(2):160.

**PURPOSE:** To describe and evaluate a local program of intensive goal-directed motor skills training for a small number of children with cerebral palsy. **METHODS:** Multiple single-subject (ABA) design over a period of 18 weeks consisting of A1: 6 weeks of assessment and goal setting; B: 6 weeks of intensive goal-directed functional training combining group and individual sessions; and A2: 6 weeks of follow-up. Six children, 3 to 11 years old, Gross Motor Function Classification System levels I, II, and IV participated in this study. Outcome measures were Gross Motor Function Measure-66, functional hand grips, pediatric evaluation of disability inventory, fine motor speed, Assisting Hand Assessment, and Goal Attainment Scale. **RESULTS:** On completion of the described program, 29 of 35 individual goals were reached. Gross Motor Function Measure-66, functional hand grips, and self-care and mobility scores of Pediatric Evaluation of Disability Inventory showed significant gains. **CONCLUSIONS:** An intensive program combining group and individual sessions resulted in a high rate of goal attainment and positive changes in relevant outcome measures even if the children had different age, goal areas, and functional levels.

PMID: 20473097 [PubMed - in process]

#### **10. *J Adolesc.* 2010 May 18. [Epub ahead of print]**

**Brief report: An online support intervention: Perceptions of adolescents with physical disabilities.**

Stewart M, Barnfather A, Magill-Evans J, Ray L, Letourneau N.

Faculty of Nursing and School of Public Health, 700 University Terrace, University of Alberta, Edmonton, Alberta T6G 2T4, Canada.

Adolescents with cerebral palsy and spina bifida report restricted interactions with peers and gaps in social support. A pilot online support intervention offered interactions with peers. Five mentors with cerebral palsy or spina bifida and 22 adolescents with the same disabilities met weekly online for 25 group sessions over six months. Participants

completed quantitative measures of loneliness, sense of community, self-perceptions, coping, and social support prior to intervention, post-intervention, and delayed post-intervention. Semi-structured qualitative interviews elicited perceptions of the intervention's impacts. Participants reported more contact with teens with disabilities, decreased loneliness, and increased social acceptance and confidence. A significant increase in sense of community was reported from post-intervention to delayed post-intervention. Encouraging qualitative findings were supported by trends in the quantitative measures. This pilot study can guide a future community-based intervention trial. Copyright © 2010 The Association for Professionals in Services for Adolescents. Published by Elsevier Ltd. All rights reserved.

PMID: 20488511 [PubMed - as supplied by publisher]

#### **11. J Electromyogr Kinesiol. 2010 May 14. [Epub ahead of print]**

##### **Trunk and hip muscle activity in early walkers with and without cerebral palsy - A frequency analysis.**

Prosser LA, Lee SC, Barbe MF, Vansant AF, Lauer RT.

Rehabilitation Medicine Department, National Institutes of Health, Bethesda, MD, United States.

Poor control of postural muscles is a primary impairment in cerebral palsy (CP), yet core trunk and hip muscle activity has not been thoroughly investigated. Frequency analysis of electromyographic (EMG) signals provides insight about the intensity and pattern of muscle activation, correlates with functional measures in CP, and is sensitive to change after intervention. The objective of this study was to investigate differences in trunk and hip muscle activation frequency in children with CP compared to children with similar amounts of walking experience and typical development (TD). EMG data from 31 children (15 with CP, 16 with TD) were recorded from 16 trunk and hip muscles bilaterally. A time-frequency pattern was generated using the continuous wavelet transform and instantaneous mean frequency (IMNF) was calculated at each interval of the gait cycle. Functional principal component analysis (PCA) revealed that IMNF was significantly higher in the CP group throughout the gait cycle for all muscles. Additionally, stride-to-stride variability was higher in the CP group. This evidence demonstrated altered patterns of trunk and hip muscle activation in CP, including increased rates of motor unit firing, increased number of recruited motor units, and/or decreased synchrony of motor units. These altered muscle activation patterns likely contribute to muscle fatigue and decreased biomechanical efficiency in children with CP. Published by Elsevier Ltd.

PMID: 20472460 [PubMed - as supplied by publisher]

#### **12. Rev Neurol (Paris). 2010 May 14. [Epub ahead of print]**

##### **Characteristics of the children with epilepsy followed in the Marrakech University Hospital. [Article in French]**

Bourrous M, Elibrahimi I, Draiss G, Safini F, Amine M, Bouskraoui M.

Service de pédiatrie A, faculté de médecine et de pharmacie de Marrakech, CHU Mohamed VI, BP 7010, Sidi-Abbad, 40000 Marrakech, Maroc.

**INTRODUCTION:** Epilepsy is one of the most frequent neurological diseases in the pediatric population. Many epidemiological studies have been published, but with rather discordant results, because of methodological differences. In our context, epilepsy constitutes a public health problem. National epidemiological data are scarce. **OBJECTIVES:** To describe the characteristics of children with epilepsy, to analyze the risk factors and to assess the impact of the disease on schooling. **METHODS:** This was a retrospective study concerning 592 children attending the Mohammed VI university hospital center pediatric unit A outpatient clinic for epilepsy from August 2003 to December 2007. **RESULTS:** Epileptic syndromes were classified according to the criteria of the International League Against Epilepsy of 1989. Prevalence of epilepsy was 8.5%. Average age was 6 years 7 months. Age of seizure onset ranged from 2 months to 14 years. Male gender predominated. Antecedents were dominated by peri- and neonatal complications. Parental consanguinity and a family history of epilepsy were found in 19.2 and 11.6% of cases, respectively. Schooling was perturbed in more than one-third of the school-age children. Generalized seizures were most common (70.5%). Association with cerebral palsy was present in 18.6% of cases, with mental retardation in 4.7%. The epilepsy was idiopathic for 41% of the children, symptomatic for 39% and cryptogenic for

20%. Generalized epileptic syndromes were the most frequent, epilepsy absence (12%), Lennox-Gastaut syndrome (6%), West syndrome (5.5%) and myoclonic epilepsy (4%). The most common partial epileptic idiopathic syndrome was benign childhood epilepsy with centrotemporal spikes. Single-drug therapy was the rule for first intention treatment (96.8%). Sodium valproate was the antiepileptic drug most widely used (82%). Treatment led to resolution of the seizures in 76% of the children. **CONCLUSION:** Preventive measures should be reinforced in our context with a considerable proportion of children presenting neonatal risk factors. Efforts should be made to improve schooling for children with epilepsy. Copyright © 2010 Elsevier Masson SAS. All rights reserved.

PMID: 20472261 [PubMed - as supplied by publisher]

### 13. Orthop Traumatol Surg Res. 2010 May 12. [Epub ahead of print]

#### Complications of the Luque-Galveston scoliosis correction technique in paediatric cerebral palsy.

Nectoux E, Giacomelli MC, Karger C, Herbaux B, Clavert JM.

Department of Paediatric Surgery and Orthopaedics, Jeanne de Flandre Hospital, Lille University Regional Hospital Center, Eugène Avinée Avenue, 59037 Lille cedex, France.

**PURPOSE OF THE STUDY:** Severe scoliosis is a very frequent condition in cerebral palsy children (CP). It is surgically managed, with unit rod instrumentation being the gold standard in English-speaking countries. The purpose of this work was to report on a small, homogeneous series of non-ambulatory, quadriplegic, spastic patients treated by the Luque-Galveston technique in Strasbourg, France. We present the radiographic outcome of the technique along with a full description of any post-operative complications encountered. **MATERIALS AND METHODS:** Twenty-eight children were operated on according to the Luque-Galveston technique between January 1997 and January 2006. This instrumentation, with fusion, included the whole spine from the sacrum to level T2. All procedures were performed as a one-stage posterior arthrodesis. The spinal deformities were single thoraco-lumbar curvatures, except in one patient. Both curve magnitude and pelvic obliquity were measured by X-ray pre-operatively, post-operatively and after longest follow-up (over 24 months). Our study focused on the rate of complications of this treatment. Only 16 patients out of 28 were tracked since the remaining 12 were lost to follow-up. **RESULTS:** Mean curve magnitude was corrected from 80 degrees to 34.8 degrees (mean correction, 56.5%), and pelvic obliquity, from 20.9 degrees to 4.2 degrees (mean correction, 79.6%). Loss of correction at average 3.46-year follow-up was 3.9 degrees of curve magnitude and 2.7 degrees of pelvic obliquity. Mean operating time was 301.5 minutes, and average blood loss was 861.9 ml. Patients were discharged from hospital after an average 19.5-day stay, including mean 8.4-day intensive care unit stay. A single major complication, monocular blindness, occurred during the procedure, probably resulting from air embolism. Post-operative complications (totaling 57.1% of our 28 patients) were: one death, three pneumothoraxes, six segmental atelectasias, seven pneumonias and one superficial wound infection. Late-onset complications (totaling 56.2% of our 16 patients at latest follow-up) were: seven broken sublaminar wires, one iliac perforation by the rod, one skin irritation from extreme malnutrition needing hardware removal, and three superficial sacral decubitus ulcers. **DISCUSSION:** Our correction rate in children affected by CP and manifesting severe scoliosis is similar to that reported in the literature by different surgical teams. Moreover, we did not observe any deep wound infection, haematoma, septicaemia, neurological and digestive complications. Late-onset complications mainly involved asymptomatic sublaminar wire breakage at the two uppermost levels, but no major complication was due to hardware failure, and vertebral fracture did not occur. There was no need for re-intervention because of the hardware, except for one case in which extreme malnutrition provoked skin conflict with the rod. We encountered 10 "windshield wiper" effects in the iliac bone, but we believe they cannot be considered as complications since they seemed to disappear after fusion was fully obtained. Last but not least, unit rod instrumentation is not very expensive compared to more modern techniques. **CONCLUSION:** Correction of scoliosis and pelvic obliquity, attributed to CP in non-ambulatory children, by the Luque-Galveston technique is both an effective and safe choice in such an indication. Moreover, it is far less expensive than most other techniques, an aspect which should be taken into consideration. Level of evidence: Level IV retrospective therapeutic study. Copyright © 2010 Elsevier Masson SAS. All rights reserved.

PMID: 20471343 [PubMed - as supplied by publisher]

**14. J Neurophysiol. 2010 May;103(5):2833-45.****Diversification of intrinsic motoneuron electrical properties during normal development and botulinum toxin-induced muscle paralysis in early postnatal mice.**

Nakanishi ST, Whelan PJ.

Hotchkiss Brain Institute, University of Calgary, Calgary, Alberta, Canada.

During early postnatal development, between birth and postnatal days 8-11, mice start to achieve weight-bearing locomotion. In association with the progression of weight-bearing locomotion there are presumed developmental changes in the intrinsic electrical properties of spinal motoneurons. However, these developmental changes in the properties of motoneuron properties have not been systematically explored in mice. Here, data are presented documenting the developmental changes of selected intrinsic motoneuron electrical properties, including statistically significant changes in action potential half-width, intrinsic excitability and diversity (quantified as coefficient of variation) of rheobase current, afterhyperpolarization half-decay time, and input resistance. In various adult mammalian preparations, the maintenance of intrinsic motoneuron electrical properties is dependent on activity and/or transmission-sensitive motoneuron-muscle interactions. In this study, we show that botulinum toxin-induced muscle paralysis led to statistically significant changes in the normal development of intrinsic motoneuron electrical properties in the postnatal mouse. This suggests that muscle activity during early neonatal life contributes to the development of normal motoneuron electrical properties.

PMID: 20457856 [PubMed - in process]

**15. Dev Med Child Neurol. 2010 Apr 30. [Epub ahead of print]****Visual field function in school-aged children with spastic unilateral cerebral palsy related to different patterns of brain damage.**

Jacobson L, Rydberg A, Eliasson AC, Kits A, Flodmark O.

Clinical Neuroscience, Ophthalmology and Vision, Karolinska Institutet, Stockholm, Sweden.

**Aim:** To relate visual field function to brain morphology in children with unilateral cerebral palsy (CP). **Method:** Visual field function was assessed using the confrontation technique and Goldmann perimetry in 29 children (15 males, 14 females; age range 7-17y, median age 11y) with unilateral CP classified at Gross Motor Function Classification System (GMFCS) level I and Manual Ability Classification System levels I to III. The type and extent of brain lesions were determined using cerebral imaging. **Results:** Eighteen children had subnormal visual field function. The visual fields were severely restricted in six. The underlying brain lesions were malformation (n=7), white matter damage of immaturity (WMDI; n=13), and cortical-subcortical lesions (n=9). Visual field function could be correlated with the pattern of brain damage in children with cortical-subcortical lesions or extensive lesions caused by malformation or WMDI. Total homonymous hemianopia was common in the cortical-subcortical group but rare in children with malformation or WMDI. Five children had normal visual field function despite having malformation or WMDI involving parts of the brain usually encompassing the visual system. **Interpretation:** Visual field function may be preserved by plasticity of the immature brain in children with malformation and WMDI. Severely restricted visual fields were more often associated with lesions occurring later in the developing brain. All children with severely restricted visual fields were identified by the confrontation technique. Goldmann perimetry was a suitable method to identify relative visual field defects.

PMID: 20477841 [PubMed - as supplied by publisher]

**16. Dev Med Child Neurol. 2010 Apr 30. [Epub ahead of print]****Functioning and health-related quality of life of adolescents with cerebral palsy: self versus parent perspectives.**

Gates P, Otsuka N, Sanders J, McGee-Brown J.

Shriners Hospital for Children, Shreveport, LA, USA.

**Aim:** To determine whether there is a difference between perspectives of functioning and health-related quality of life (HRQL) of parents and ambulatory adolescents with spastic cerebral palsy (CP). **Method:** A total of 139 parent patient pairs (73 females, 66 males; median age 14y 6mo, age range 11-18y, Gross Motor Function Classification System [GMFCS] levels I-III, with hemiplegia [n=23], diplegia [n=103], triplegia [n=9], and quadriplegia [n=4]) were recruited from outpatient CP clinics at three pediatric orthopaedic hospitals, between 2000 and 2006, from whom Pediatric Outcomes Data Collection Instrument (PODCI) responses were collected. **Results:** Cross-sectional data, calculated with intraclass correlation coefficients [ICC], showed parents and adolescents agreed more on functioning (ICC=0.488-0.748) than HRQL (ICC=0.242-0.568; PODCI). Parents and adolescents both recognized significant comorbidities (ICC=0.502-0.713), but adolescents saw themselves as less limited (ICC=0.330) than parents. The greatest differences between parents and adolescents were in HRQL scales for male adolescents, with only a small part explained by GMFCS level difference between sexes (effect size 0.002-0.143). Age, parent well-being, and parent sex had little effect and comorbidities had no effect. GMFCS level was the most common predictor. **Interpretation:** Most scales on health conditions, function, and HRQL agreed between parents and adolescents aged 11 to 18 years. Parent proxy is reasonable when necessary, but assessing both parents and adolescents gives additional insight. Adolescents do not consider themselves as limited by health conditions as parents do; parents have greater satisfaction with current level of symptoms than adolescents, and findings vary on expectations for treatment.

PMID: 20477836 [PubMed - as supplied by publisher]

#### **17. Dev Med Child Neurol. 2010 Apr 30. [Epub ahead of print]**

##### **Gross muscle morphology and structure in spastic cerebral palsy: a systematic review.**

Barrett RS, Lichtwark GA.

School of Physiotherapy and Exercise Science, Griffith Health, Griffith University, Queensland, Australia.

**Aim:** This systematic review and critical evaluation of the literature was conducted to determine how gross muscle morphology and structure are altered in individuals with spastic cerebral palsy (CP). **Method:** Electronic databases were searched for articles describing studies of muscle morphological and structural properties in individuals with spastic CP. Data describing muscle fascicle length, belly length, fascicle angle, cross-sectional area, volume, and thickness were extracted and effect sizes were computed for comparisons between individuals with spastic CP and typically developed individuals, between the paretic and non-paretic side in individuals with hemiplegia for all muscles examined, and across the full spectrum of gross motor function in individuals with spastic CP. **Results:** The final yield consisted of 15 articles that met the inclusion criteria. The main finding of the review was the consistent evidence for reduced muscle belly length, muscle volume, cross-sectional area, and muscle thickness in the comparisons between paretic and typically developed muscle and the paretic and non-paretic muscle across a range of muscles. **Interpretation:** Given the importance of muscle morphology and structure for generating muscle force, it is likely that the observed alterations that occur secondary to the neural lesion in individuals with spastic CP contribute to muscle weakness and the attendant loss of motor function in spastic CP.

PMID: 20477832 [PubMed - as supplied by publisher]

#### **18. Clin Podiatr Med Surg. 2010 Apr;27(2):335-43.**

##### **Selective percutaneous myofascial lengthening of the lower extremities in children with spastic cerebral palsy.**

Mitsiokapa EA, Mavrogenis AF, Skouteli H, Vrettos SG, Tzanos G, Kanellopoulos AD, Korres DS, Papagelopoulos PJ.

Department of Physical Medicine and Rehabilitation, Thriasio Hospital, 19018 Elefsina, Greece.

Children with spastic cerebral palsy commonly acquire lower extremity musculoskeletal deformities that at some point may need surgical correction. The authors present 58 children with spastic cerebral palsy who underwent se-

lective percutaneous myofascial lengthening of the hip adductor group and the medial or the lateral hamstrings. All the patients were spastic diplegic, hemiplegic, or quadriplegic. The indications for surgery were a primary contracture that interfered with the patients' walking or sitting ability or joint subluxation. Gross motor ability and gross motor function of the children were evaluated using the gross motor function classification system (GMFCS) and the gross motor function measure (GMFM), respectively. The mean time of the surgical procedure was 14 minutes (range, 1 to 27 minutes). All patients were discharged from the hospital setting the same day after the operation. There were no infections, overlengthening, nerve palsies, or vascular complications. Three patients required repeat procedures for relapsed hamstring and adductor contractures at 8, 14, and 16 months postoperatively. At 2 years after the initial operation, all the children improved on their previous functional level; 34 children improved by one GMFCS level, and 5 children improved by two GMFCS levels. The overall improvement in mean GMFM scores was from 71.19 to 83.19. Copyright (c) 2010 Elsevier Inc. All rights reserved.

PMID: 20470962 [PubMed - in process]

#### 19. J Rehabil Med. 2010 Apr;42(4):332-8.

##### **Effect of addition of botulinum toxin-A to standardized therapy for dynamic manual skills measured with kinematic aiming tasks in children with spastic hemiplegia.**

Rameckers EA, Duysens J, Speth LA, Vles HJ, Smits-Engelsman BC.

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**OBJECTIVE:** To measure the effect of intensive therapy and the lasting effect of a standardized functional training programme with vs. without the addition of chemodernervation of the muscles of the forearm and hand. **PATIENTS AND METHODS:** Twenty children with spastic hemiplegia, aged 4-16 years, were matched for baseline characteristics and randomized to standardized task-oriented therapy for 6 months with or without botulinum toxin injections. Dynamic kinematic outcome measures were: speed, accuracy, end-point spread and performance. Measurements of active and passive range of motion, stretch-restricted angle of the elbow and wrist, Ashworth scores and Melbourne Assessment of Unilateral Upper Limb Function were made. All measures were performed at baseline, 2 weeks after injection of botulinum toxin and after 6 months (at the end of therapy), and 3 months after end of the therapy. **RESULTS:** Clinical measures showed improvement in both groups. However, no significant differences emerged between groups on functional measures. Directly after the botulinum toxin injection all kinematic outcome measures showed a decrease, but baseline values were re-established during the therapy period. After botulinum toxin injections a temporarily significant greater increase in speed and performance was found. These results illustrate the need for further quantitative research into the effects of botulinum toxin.

PMID: 20461335 [PubMed - indexed for MEDLINE]

#### 20. Zhongguo Gu Shang. 2010 Apr;23(4):291-3.

##### **Cervical perivascular sympathectomy for the treatment of athetoid cerebral palsy [Article in Chinese]**

Xu SG, Xu L, Cao X, Jiao Y.

Department of Orthopaedics, Dongzhimen Hospital, Beijing University of Chinese Medicine, Beijing 100700, China. dongzhimen700@sina.com

**OBJECTIVE:** To retrospectively review the results of cervical perivascular sympathectomy (CPVS) in treating athetoid cerebral palsy and discuss the possible mechanism of the surgery. **METHODS:** From 1998 to 2006, 560 patients with athetoid cerebral palsy were treated with cervical perivascular sympathectomy and all had periodical follow-up at 1 week, 6 months and 1 year postoperatively. Among the 560 patients, there were 391 boys and 169 girls. The age at operation was from 3 to 25 years old with an average of 10.7 years. **RESULTS:** At 1 year follow-up postoperatively, among the 560 cases, athetoid movement of the neck and head improved in 308 patients (55%), the movement of the hand and fingers improved in 403 patients (72%), standing and gait improved in 229 patients (41%), muscle tone reduced in 185 patients (33%), salivation reduction appeared in 252 patients (45%), eyeball movement improved in 174 patients (31%), speaking improved in 251 patients (45%); 310 patients (55%) agreed that the operation had curative effect for the patients. Short-term follow up results was better than long-term follow

up results. **CONCLUSION:** Primary results showed that CPVS had a curative effect on athetoid cerebral palsy, especially in improving athetoid movement of the neck and head, hand and fingers, standing and gait, speaking ability, eye-ball movement and so on. The possible mechanism of the CPVS in the treatment of athetoid cerebral palsy might be reducing the excitability of sympathetic nerve, improving microcirculation of the brain and eventually activating potential neurons. Long-term follow up is necessary.

PMID: 20486384 [PubMed - in process]

## **21. Neurologia. 2010 Mar;25(2):108-115.**

### **Scenes in movement. Movement disorders on film. [Article in English, Spanish]**

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**INTRODUCTION:** There are publications in which various neurological diseases are analysed on film. However, no references have been found on movement disorders in this medium. **Methodology and results:** A total of 104 documents were collected and reviewed using the internet movie data base (IMDb). The majority were associated with dystonia, Parkinson's and tics, were American commercial productions, and the most common genre was drama. **DISCUSSION:** The cinema usually depicts old men with developed Parkinson's disease. However, motor complications only appear in 19% and non-motor symptoms in 14%. The image of dystonia is generally that of a young man, with disabling dystonia secondary to childhood cerebral palsy. Tics appear associated with Tourette's syndrome, with the excessive use of obscene expressions and with very few references to other important aspects of this syndrome, such as mood and behavioural changes. The majority of tremors portrayed on film are associated with Parkinsonism and are not pathological. Myoclonus appears anecdotically and is normally symptomatic. **CONCLUSIONS:** Parkinson's disease is the type of movement disorder that the cinema portrays with greater neurological honesty and in a more dignified manner.

PMID: 20487711 [PubMed - as supplied by publisher]

## **22. J Pediatr Orthop. 2009 Oct-Nov;29(7):676-82.**

### **The Dega osteotomy: a versatile osteotomy in the treatment of developmental and neuromuscular hip pathology.**

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**BACKGROUND:** The purpose of this study is to evaluate the use of the Dega osteotomy in the treatment of hip pathology resulting from both developmental dysplasia (DDH) and neuromuscular disease (NM). **METHODS:** We retrospectively reviewed the results of one surgeon's operative experience with the Dega osteotomy for the treatment of DDH and NM. Forty-four patients (50 hips) with an average length of follow-up of 53 months were identified. The Dega was customized at the time of surgery to provide more anterior or posterior coverage depending on the needs of the individual hip. **RESULTS:** In all cases, there were no intraoperative complications and all hips were well reduced postoperatively. In the DDH group, there were 22 children (26 hips), who underwent surgery at a mean age of 3.1 years. Thirteen hips had a concomitant open reduction and 4 had a femoral osteotomy. There were 5 complications: 2 femoral head lateralizations, 2 avascular necroses (asymptomatic), and 1 traumatic dislocation. One patient (1 hip) had a reoperation. All patients had unlimited physical activity with no limp with an improvement in the acetabular index from 37 degrees preoperatively to 13 degrees at last follow-up. In the NM group, there were 22 children (24 hips), who underwent surgery at a mean age of 6.3 years. Twenty-three hips had concomitant procedures performed. At an average of 56 months postoperatively, all patients were pain-free. There were 5 complications: 1 graft dislodgement, 1 graft collapse, and 3 femoral head lateralizations. Three patients (3 hips) had a reoperation. Acetabular index improved from 36 degrees preoperatively to 14 degrees, and the migration percentage ranged from 84% to 14%. **CONCLUSIONS:** In this series of Dega osteotomies, one of the largest in the English literature, the osteotomy seems safe and effective in the treatment of both DDH and NM hip disease. The Dega osteotomy is utilitarian, as it may provide increased acetabular coverage anteriorly or posteriorly depending on

where it is hinged. LEVEL OF EVIDENCE: Therapeutic study, clinical case series: level IV.

PMID: 20104144 [PubMed - indexed for MEDLINE]

## 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.*

### 23. Brain. 2010 May 20. [Epub ahead of print]

#### **Neuroprotection in a rabbit model of intraventricular haemorrhage by cyclooxygenase-2, prostanoid receptor-1 or tumour necrosis factor-alpha inhibition.**

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Intraventricular haemorrhage is a major complication of prematurity that results in neurological dysfunctions, including cerebral palsy and cognitive deficits. No therapeutic options are currently available to limit the catastrophic brain damage initiated by the development of intraventricular haemorrhage. As intraventricular haemorrhage leads to an inflammatory response, we asked whether cyclooxygenase-2, its derivative prostaglandin E2, prostanoid receptors and pro-inflammatory cytokines were elevated in intraventricular haemorrhage; whether their suppression would confer neuroprotection; and determined how cyclooxygenase-2 and cytokines were mechanistically-linked. To this end, we used our rabbit model of intraventricular haemorrhage where premature pups, delivered by Caesarian section, were treated with intraperitoneal glycerol at 2 h of age to induce haemorrhage. Intraventricular haemorrhage was diagnosed by head ultrasound at 6 h of age. The pups with intraventricular haemorrhage were treated with inhibitors of cyclooxygenase-2, prostanoid receptor-1 or tumour necrosis factor-alpha; and cell-infiltration, cell-death and gliosis were compared between treated-pups and vehicle-treated controls during the first 3 days of life. Neuro-behavioural performance, myelination and gliosis were assessed in pups treated with cyclooxygenase-2 inhibitor compared to controls at Day 14. We found that both protein and messenger RNA expression of cyclooxygenase-2, prostaglandin E2, prostanoid receptor-1, tumour necrosis factor-alpha and interleukin-1beta were consistently higher in the forebrain of pups with intraventricular haemorrhage relative to pups without intraventricular haemorrhage. However, cyclooxygenase-1 and prostanoid receptor 2-4 levels were comparable in pups with and without intraventricular haemorrhage. Cyclooxygenase-2, prostanoid receptor-1 or tumour necrosis factor-alpha inhibition reduced inflammatory cell infiltration, apoptosis, neuronal degeneration and gliosis around the ventricles of pups with intraventricular haemorrhage. Importantly, cyclooxygenase-2 inhibition alleviated neurological impairment, improved myelination and reduced gliosis at 2 weeks of age. Cyclooxygenase-2 or prostanoid receptor-1 inhibition reduced tumour necrosis factor-alpha level, but not interleukin-1beta. Conversely, tumour necrosis factor-alpha antagonism did not affect cyclooxygenase-2 expression. Hence, prostanoid receptor-1 and tumour necrosis factor-alpha are downstream to cyclooxygenase-2 in the inflammatory cascade induced by intraventricular haemorrhage, and cyclooxygenase-2-inhibition or suppression of downstream molecules-prostanoid receptor-1 or tumour necrosis factor-alpha-might be a viable neuroprotective strategy for minimizing brain damage in premature infants with intraventricular haemorrhage.

PMID: 20488889 [PubMed - as supplied by publisher]

### 24. J Vis Exp. 2010 May 18;(39). pii: 1951. doi: 10.3791/1951.

#### **Mouse models of periventricular leukomalacia.**

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We describe a protocol for establishing mouse models of periventricular leukomalacia (PVL). PVL is the predominant form of brain injury in premature infants and the most common antecedent of cerebral palsy. PVL is characterized by periventricular white matter damage with prominent oligodendroglial injury. Hypoxia/ischemia with or without systemic infection/inflammation are the primary causes of PVL. We use P6 mice to create models of neonatal brain injury by the induction of hypoxia/ischemia with or without systemic infection/inflammation with unilateral carotid ligation followed by exposure to hypoxia with or without injection of the endotoxin lipopolysaccharide (LPS). Immunohistochemistry of myelin basic protein (MBP) or O1 and electron microscopic examination show prominent myelin loss in cerebral white matter with additional damage to the hippocampus and thalamus. Establishment of mouse models of PVL will greatly facilitate the study of disease pathogenesis using available transgenic mouse strains, conduction of drug trials in a relatively high throughput manner to identify candidate therapeutic agents, and testing of stem cell transplantation using immunodeficiency mouse strains.

PMID: 20485263 [PubMed - in process]

## 25. Eur J Pediatr. 2010 May 16. [Epub ahead of print]

### **Predictability of cerebral palsy and its characteristics through neonatal cranial ultrasound in a high-risk NICU population.**

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The aim of the study is to evaluate the predictive value of various types of brain injury detected by ultrasound in the neonatal period for the occurrence of cerebral palsy and its characteristics in a large cohort of high-risk infants. Thousand twenty-one consecutively NICU-admitted high-risk infants were assessed up to the corrected age of at least 2 years. Cerebral palsy (CP) was categorised into spastic or non-spastic, bilateral or unilateral and mild, moderate or severe CP. Different types of brain injury were identified by serial cranial ultrasound (US) during the NICU stay: white matter disease (WMD), haemorrhage, cerebral infarction, deep grey matter and parasagittal cerebral injury. There is a significant overall association between different types of brain injury and gestational age. Only 4% of the children with normal US develop CP. In the presence of any abnormal US image, the likeliness to develop CP is at least seven times higher. Within the group of infants with WMD and haemorrhage, the degree of brain involvement has a clear impact on the occurrence of CP. Concerning the characteristics of CP, deep grey matter lesion predict non-spastic CP versus spastic CP (OR = 31, P < 0.001). Cerebral infarction and haemorrhage grade IV are strong predictors of unilateral spastic CP versus bilateral spastic CP (OR = 49 and 24, respectively, P < 0.001). Deep grey matter lesion is a significant predictor for severe versus mild and moderate CP (OR = 6). In conclusion, neonatal cranial US is a useful tool in predicting CP and its characteristics.

PMID: 20473687 [PubMed - as supplied by publisher]

## 26. Neuroimage. 2010 May 12. [Epub ahead of print]

### **BOLD fMRI of visual and somatosensory-motor stimulations in baboons.**

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Baboon, with its large brain size and extensive cortical folding compared to other non-human primates, serves as a good model for neuroscience research. This study reports the implementation of a baboon model for blood-oxygenation-level-dependent (BOLD) fMRI studies (1.5x1.5x4mm resolution) on a clinical 3T-MRI scanner. BOLD fMRI responses to hypercapnic (5%CO<sub>2</sub>) challenge, 10Hz flicker visual, and vibrotactile somatosensory-motor stimulations were investigated in baboons anesthetized sequentially with isoflurane and ketamine. Hypercapnia evoked robust BOLD increases. Paralysis was determined to be necessary to achieve reproducible functional activations within and between subjects under our experimental conditions. With optimized anesthetic doses (0.8-1.0%

isoflurane or 6-8mg/kg/hr ketamine) and adequate paralysis (vecuronium, 0.2mg/kg), robust activations were detected in the visual (V), primary (S1) and secondary (S2) somatosensory, primary motor (M), supplementary motor area (SMA), lateral geniculate nucleus (LGN) and thalamus (Th). Data were tabulated for 11 trials under isoflurane and 10 trials under ketamine on 5 baboons. S1, S2, M, V activations were detected in essentially all trials (90-100% of the time, except 82% for S2 under isoflurane and 70% for M under ketamine). LGN activations were detected 64-70% of the time under both anesthetics. SMA and Th activations were detected 36-45% of the time under isoflurane and 60% of the time under ketamine. BOLD percent changes among different structures were slightly higher under ketamine than isoflurane (0.75% versus 0.58% averaging all structures), but none was statistically different ( $P>0.05$ ). This baboon model offers an opportunity to non-invasively image brain functions and dysfunctions in large non-human primates. Copyright © 2010. Published by Elsevier Inc.

PMID: 20471483 [PubMed - as supplied by publisher]

## 27. Ugeskr Laeger. 2010 May 10;172(19):1433-7.

### Total body cooling of infants born with hypoxic-ischaemic encephalopathy [Article in Danish]

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**INTRODUCTION:** Randomised studies have demonstrated the efficacy of hypothermia for the treatment of perinatal hypoxic-ischaemic encephalopathy (HIE) in term or late preterm infants. In August 2006, the Neonatology Department at Rigshospitalet, Copenhagen, introduced total body cooling for infants born at term with HIE. **MATERIAL AND METHODS:** This retrospective study comprises data from medical records of newborn children born with HIE during a period of 32 months. Relevant data for cooling were recorded. Structured neurological examinations were carried out on survivors when they were ten and or 18 months old. **RESULTS:** A total of 32 infants fulfilled the criteria for cooling, the incidence being 0.4/1000 births. Twenty infants were cooled for 72 hours. Eleven infants had cooling discontinued before 72 hours because of their grave prognosis. One infant had cooling discontinued because of pulmonary hypertension. Most infants were cooled before six hours of age (median four hours). The mortality rate was 41%. A total of 45% were cooled without being placed in a ventilator. The side effects were of no major concern. Eight children had a neurological follow-up. One child had developed cerebral palsy and two children suffered delayed development. **CONCLUSION:** Total body cooling was carried out before six hours of age in the vast majority of infants born with HIE. Side effects were of less concern. Respiratory support with a ventilator could be avoided in 45% of the infants cooled for 72 hours. The mortality rate was 41%.

PMID: 20470651 [PubMed - in process]

## 28. Brain. 2010 May;133(Pt 5):1451-9.

### Human disease caused by loss of fast Ila myosin heavy chain due to recessive MYH2 mutations.

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Striated muscle myosin heavy chain is a molecular motor protein that converts chemical energy into mechanical force. It is a major determinant of the physiological properties of each of the three muscle fibre types that make up the skeletal muscles. Heterozygous dominant missense mutations in myosin heavy chain genes cause various types of cardiomyopathy and skeletal myopathy, but the effects of myosin heavy chain null mutations in humans have not previously been reported. We have identified the first patients lacking fast type 2A muscle fibres, caused by total absence of fast myosin heavy chain Ila protein due to truncating mutations of the corresponding gene MYH2. Five adult patients, two males and three females, from three unrelated families in UK and Finland were clinically assessed and muscle biopsy was performed in one patient from each family. MYH2 was sequenced and the expression of the corresponding transcripts and protein was analysed in muscle tissue. The patients had early-onset symptoms characterized by mild generalized muscle weakness, extraocular muscle involvement and rela-

tively favourable prognosis. Muscle biopsy revealed myopathic changes including variability of fibre size, internalized nuclei, and increased interstitial connective and adipose tissue. No muscle fibres expressing type IIa myosin heavy chain were identified and the MYH2 transcripts were markedly reduced. All patients were compound heterozygous for truncating mutations in MYH2. The parents were unaffected, consistent with recessive mutations. Our findings show that null mutations in the fast myosin heavy chain IIa gene cause early onset myopathy and demonstrate that this isoform is necessary for normal muscle development and function. The relatively mild phenotype is interesting in relation to the more severe phenotypes generally seen in relation to recessive null mutations in sarcomeric proteins.

PMID: 20418530 [PubMed - indexed for MEDLINE]

**29. Dev Med Child Neurol. 2010 Apr 30. [Epub ahead of print]**

**Caesarean section does not prevent cerebral palsy in singleton term breech infants.**

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PMID: 20477840 [PubMed - as supplied by publisher]

**30. Dev Med Child Neurol. 2010 Apr 30. [Epub ahead of print]**

**Is breech presentation a risk factor for cerebral palsy?**

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PMID: 20477839 [PubMed - as supplied by publisher]