

Monday 8 August 2011

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

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Interventions and Management

1. Dev Med Child Neurol. 2011 Sep;53(9):775. doi: 10.1111/j.1469-8749.2011.04076.x.

The torch.

Dutkowsky JP.

1st Vice President of the American Academy for Cerebral Palsy and Developmental Medicine.

PMID: 21810093 [PubMed - in process]

Publication Types: Editorial

2. Orthop Rev (Pavia). 2009 Oct 10;1(2):e20.

Noninvasive diagnostic methods for perceptual and motor disabilities in children with cerebral palsy.

Lampe R, Mitternacht J.

Renée Lampe, Center for Cerebral Palsy, and Orthopädische Abteilung des Klinikums rechts der Isar der Technischen Universität;

The field of neuroorthopedics centers on chronic diseases demanding close clinical monitoring. We shall use several examples to show how the various noninvasive diagnostic instruments can be used to obtain insight into the central nervous system as well as into the musculoskeletal system and its morphology. The choice of the most appropriate method depends on the problem; that is, whether the method is to be applied for clinical use or for basic research. In this report we introduce various technical examination methods that are being used successfully in the fields of pediatrics, orthopedics, and neurology. The major examination instrument in pediatric diagnostics is sonography, which is being used in this report as a research instrument for the biomechanics of the musculoskeletal system, but which also gives insight into neurofunctional sequences. In orthopedics, pedography is used for diagnosing deformities of the feet. In neuroorthopedics for children pedography acts as a functional monitor for apraxia and thus allows, for example, a classification of the degree of neurological malfunctions in the lower extremities. The 3D bodyscan is used to minimize x-raying in patients with neurogenic scoliosis. This report introduces examples of the application of MRI and fMRI for basic research. The biometric measuring methods introduced provide precise data in the areas of diagnostics and monitoring and are highly valuable for further neuroorthopedic basic research. In future we expect the ever-evolving technical measuring methods to enable a

deeper understanding of the primary neurological causes of and the implications for patients with cerebral palsy and other neuroorthopedic conditions. This may allow the development of new forms of therapy not necessarily predictable today.

PMID: 21808682 [PubMed - in process]

3. Res Dev Disabil. 2011 Jul 30. [Epub ahead of print]

Probabilistic gait classification in children with cerebral palsy: A Bayesian approach.

Van Gestel L, De Laet T, Di Lello E, Bruyninckx H, Molenaers G, Van Campenhout A, Aertbeliën E, Schwartz M, Wambacq H, De Cock P, Desloovere K.

Department of Rehabilitation Sciences, Faculty of Kinesiology and Rehabilitation Sciences (FaBeR), Katholieke Universiteit Leuven, Tervuursevest 101, 3001 Heverlee, Belgium.

Three-dimensional gait analysis (3DGA) generates a wealth of highly variable data. Gait classifications help to reduce, simplify and interpret this vast amount of 3DGA data and thereby assist and facilitate clinical decision making in the treatment of CP. CP gait is often a mix of several clinically accepted distinct gait patterns. Therefore, there is a need for a classification which characterizes each CP gait by different degrees of membership for several gait patterns, which are considered by clinical experts to be highly relevant. In this respect, this paper introduces Bayesian networks (BN) as a new approach for classification of 3DGA data of the ankle and knee in children with CP. A BN is a probabilistic graphical model that represents a set of random variables and their conditional dependencies via a directed acyclic graph. Furthermore, they provide an explicit way of introducing clinical expertise as prior knowledge to guide the BN in its analysis of the data and the underlying clinically relevant relationships. BNs also enable to classify gait on a continuum of patterns, as their outcome consists of a set of probabilistic membership values for different clinically accepted patterns. A group of 139 patients with CP was recruited and divided into a training- (n=80% of all patients) and a validation-dataset (n=20% of all patients). An average classification accuracy of 88.4% was reached. The BN of this study achieved promising accuracy rates and was found to be successful for classifying ankle and knee joint motion on a continuum of different clinically relevant gait patterns.

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PMID: 21807478 [PubMed - as supplied by publisher]

4. J Child Orthop. 2010 Aug;4(4):331-41. Epub 2010 May 8.

Intra- and interobserver reliability analysis of digital radiographic measurements for pediatric orthopedic parameters using a novel PACS integrated computer software program.

Segev E, Hemo Y, Wientroub S, Ovadia D, Fishkin M, Steinberg DM, Hayek S.

BACKGROUND: The between-observer reliability of repeated anatomic assessments in pediatric orthopedics relies on the precise definition of bony landmarks for measuring angles, indexes, and lengths of joints, limbs, and spine. We have analyzed intra- and interobserver reliability with a new digital measurement system (TraumaCad Wizard™). **METHODS:** Five pediatric orthopedic surgeons measured 50 digital radiographs on three separate days using the TraumaCad system. There were 10 anterior-posterior (AP) pelvic views from developmental dysplasia of the hip (DDH) patients, 10 AP pelvic views from cerebral palsy (CP) patients, 10 AP standing view of the lower limb radiographs from leg length discrepancy (LLD) patients, and 10 AP and 10 lateral spine X-rays from scoliosis patients. All standing view of the lower limb radiographs were calibrated by the software to allow for accurate length measurements, using as reference a 1-inch metal ball placed at the level of the bone. Each observer performed 540 measurements (totaling 2,700). We estimated intra- and interobserver standard deviations for measurements in all categories by specialists and nonspecialists. The intraclass correlation coefficient (ICC) summarized the overall accuracy and precision of the measurement process relative to subject variation. We examined whether the relative accuracy of a measurement is adversely affected by the number of bony landmarks required for making the measurement. **RESULTS:** The overall ICC was >0.74 for 13 out of 18 measurements. Accuracy of the acetabular index for DDH was greater than for CP and relatively low for the center-edge angle in CP. Accuracy for bone length

was better than for joint angulations in LLD and for the Cobb angle in AP views compared to lateral views for scoliosis. There were no clinically important biases, and most of the differences between specialists and nonspecialists were nonsignificant. The correlation between the results according to the number of bony landmarks that needed to be identified was also nonsignificant. **CONCLUSIONS:** Digital measurements with the TraumaCad system are reliable in terms of intra- and interobserver variability, making it a useful method for the analysis of pathology on radiographs in pediatric orthopedics.

PMID: 21804896 [PubMed - in process] PMCID: PMC2908339

5. J Child Orthop. 2010 Aug;4(4):277-90. Epub 2010 Jul 1.

Surgical correction of equinus deformity in children with cerebral palsy: a systematic review.

Shore BJ, White N, Kerr Graham H.

PURPOSE: Equinus is the most common deformity in cerebral palsy. However, despite the large volume of published studies, there are poor levels of evidence to support surgical intervention. This study was undertaken to examine the current evidence base for the surgical management of equinus deformity in cerebral palsy. **METHODS:** A systematic review of the literature using "equinus deformity", "cerebral palsy" and "orthopaedic surgery" generated 49 articles. After applying inclusion and exclusion criteria, 35 articles remained. The Oxford Centre for Evidence-Based Medicine (CEBM) levels of evidence and the Methodological Index for Non-Randomized Studies (MINORS) were used to grade the articles. **RESULTS:** Studies ranged in sample size from 9 to 156 subjects, with an average of 38 subjects. The mean age of subjects at index surgery ranged from 5 to 19 years. Nineteen studies used instrumented gait analysis, with an average follow-up of 2.8 years. Seven studies reported that a younger age at index surgery was associated with an increased risk of recurrent equinus. The average rate of calcaneus in hemiplegic children was 1% and it was 15% in those with spastic diplegia. Most studies were level 4 quality of evidence, leading to, at best, only grade C recommendation. **CONCLUSIONS:** Cerebral palsy subtype (hemiplegia versus diplegia) and age at index surgery were the two most important variables for determining the outcome of surgery for equinus deformity in cerebral palsy. Despite the great emphasis on differences in surgical procedures, there was less evidence to support the type of operation in relation to outcome.

PMID: 21804889 [PubMed - in process] PMCID: PMC2908346

6. No To Hattatsu. 2011 Jul;43(4):277-81.

Postoperative course of a patient undergoing selective dorsal rhizotomy for cerebral palsy [Article in Japanese]

Touyama M, Touyama J, Aguni A.

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Selective dorsal rhizotomy (SDR) is a surgical technique for reducing spasticity associated with cerebral palsy (CP). In the present study, we investigated the changes of clinical symptoms before and after SDR in a child with CP undergoing functional training at the Okinawa Child Development Center. Total score on the Gross Motor Function Measure significantly improved compared to preoperative values at approximately six months, one year, and two years postoperatively. The level of spasticity also significantly decreased postoperatively compared to preoperative levels according to evaluation using the Ashworth scale and the modified Ashworth scale. Based on these findings, SDR was considered effective for reducing spasticity associated with CP. In addition, orthopedic surgery was performed after SDR in 47% of patients, indicating the need to further investigate the timing of SDR.

PMID: 21800690 [PubMed - in process]

7. J Child Orthop. 2010 Aug;4(4):291-300. Epub 2010 Apr 21.**Correction versus bedding: wheelchair pressure distribution measurements in children with cerebral palsy.**

Lampe R, Mitternacht J.

PURPOSE: Most children with cerebral palsy classification Levels IV and V in the Gross Motor Function Classification System (GMFCS) are unable to walk and, therefore, spend almost all day in a sitting position in their wheelchairs. As a result of the spastic muscle contraction, malpositions of joints or a scoliosis develop, which require a decision to be made on whether to correct the posture or simply find the best soft bedding position. **METHODS:** The distribution of pressure on the seat while sitting in a wheelchair was measured with a pressure distribution measuring mat. The different distribution patterns were analyzed. **RESULTS:** Pressure distribution measurement allows to find a compromise between posture correction and soft bedding. Additionally, pressure-reducing seats were examined on their effectiveness. We also focused our measurements and data analyses on recognizing the causes for pain. Sometimes, the origin of the problems and pain of children in wheelchairs is not clear. **CONCLUSIONS:** Using the above-mentioned measuring equipment, the causes of these problems can be detected much more easily than just by clinical examination. The pressure measuring mat can help to optimize the seating position for the spastically handicapped children and adapt technical aids. Examples demonstrate the most frequently occurring problems of these children in their wheelchairs which are typical for neuro-orthopedic diseases.

PMID: 21804890 [PubMed - in process] PMCID: PMC2908344

8. J Endourol. 2011 Aug 2. [Epub ahead of print]**Changing Composition of Renal Calculi in Patients with Musculoskeletal Anomalies.**

Gnessin E, Mandeville JA, Handa SE, Lingeman JE.

Department of Urology, Indiana University Health Physicians , Indianapolis, Indiana.

Background and Purpose: Calculi from patients with musculoskeletal (MS) anomalies who are largely immobile and prone to urinary infections have been traditionally composed primarily of struvite and carbonate apatite. Because of substantial improvements in the care of these patients in recent decades, stone etiology may have shifted from infectious to metabolic. We assessed the composition of renal calculi and metabolic characteristics in a contemporary cohort of patients with MS anomalies who underwent percutaneous nephrolithotomy (PCNL). **Patients and Methods:** Retrospective analysis of patients who underwent PCNL between April 1999 and June 2009 and had follow-up 24-hour urine studies was performed. Patients with MS anomalies included spinal cord injury, myelomeningocele, muscular dystrophy, multiple sclerosis, cerebral palsy, or other clinical syndromes causing kyphoscoliosis and contractures. **Results:** Our cohort included 33 patients with MS anomalies and 334 consecutive patients as a control group who underwent PCNL and had metabolic workup. Stones were infectious in etiology in 18.4% and 6.2% in MS and control groups, respectively. Thus, most patients harbored stones of metabolic origin. Metabolic stones in the MS group were composed of 52.7% hydroxyapatite, 10.5% calcium oxalate, 7.9% brushite, 2.6% uric acid, 0% cystine, and 7.9% other. Metabolic stones in the control group were 50.5% calcium oxalate, 16.4% hydroxyapatite, 11.5% brushite, 10.8% uric acid, 4.3% cystine, and 0.3% other. Mean 24-hour urine values for patients with metabolic stones in MS/control groups were volume 2.18/1.87 L/d, pH 6.78/6.05, calcium to creatinine ratio 220/151 mg/g, and oxalate 44.8/39.5 mg/d. **Conclusions:** Although patients with MS anomalies are traditionally thought to harbor infection-related calculi, most will be found to have calculi of metabolic etiology. The incidence of calcium phosphate stones is high in this group of patients, perhaps reflecting their high urinary pH.

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9. J Hand Surg Am. 2011 Aug 2. [Epub ahead of print]**Surgical Technique for Thumb-in-Palm Deformity in Cerebral Palsy.**

Van Heest AE.

University of Minnesota, Department of Orthopaedic Surgery, Minneapolis, MN; Shriner's Hospital for Children-Twin

Cities, MN; Gillette Children's Specialty Care, St. Paul, MN.

The most common surgical procedure is release of the adductor pollicis muscle from the middle metacarpal origin, with additional release of the thenar muscles or flexor pollicis longus, as indicated, to decrease the flexion adduction forces across the first ray. Tendon transfer to augment extension and abduction of the thumb metacarpal will help avoid recurrence, and it commonly includes rerouting of the extensor pollicis longus. Stabilization of the metacarpophalangeal joint might be necessary if hyperextension deformity exists. The assessment of the patient should occur over several visits to determine the correct combination of procedures that will best help the patient achieve a more functional upper extremity or improve hygiene. With appropriate planned procedure, meticulous surgical technique, and adherence to a postoperative rehabilitation, patients can obtain substantial improvement with thumb-in-palm surgical re-positioning.

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10. Dev Neurorehabil. 2011 Aug 2. [Epub ahead of print]

Comparison of problem behaviours in atypically developing infants and toddlers as assessed with the Baby and Infant Screen for Children with aUtism Traits (BISCUIT).

Sipes M, Rojahn J, Turygin N, Matson JL, Tureck K.

Psychology Department, Louisiana State University, Baton Rouge, LA, USA.

Objective: Compares infants and toddlers with intellectual and developmental conditions in regard to the presence of challenging behaviour. **Methods:** Parents and caregivers to 140 children ranging from 17-35 months with five different conditions (Down syndrome (n = 23), developmental delay (n = 18), prematurity (n = 56), Cerebral Palsy (n = 15) and Seizure disorder (n = 28)) were administered the BISCUIT-Part 3. An ANOVA on overall scores and a MANOVA on the sub-scale scores were conducted to determine if groups differed significantly. **Results:** Results found no significant differences on total scores or differences on the sub-scales of the BISCUIT-Part 3: Aggressive/Destructive, Stereotypic and Self-Injurious. Some trends in individual item endorsement were found. **Conclusions:** It is possible that differences among individuals with these disorders are not apparent until later in life. These results emphasize the importance of monitoring challenging behaviours in all at-risk infants and toddlers to ensure that early interventions to treat these challenging behaviours are possible.

PMID: 21810015 [PubMed - as supplied by publisher]

Prevention and Cure

11. *J Neurosci Res.* 2011 Aug 2. doi: 10.1002/jnr.22722. [Epub ahead of print]

Axon-glia synapses are highly vulnerable to white matter injury in the developing brain.

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The biology of cerebral white matter injury has been woefully understudied, in part because of the difficulty of reliably modeling this type of injury in rodents. Periventricular leukomalacia (PVL) is the predominant form of brain injury and the most common cause of cerebral palsy in premature infants. PVL is characterized by predominant white matter injury. No specific therapy for PVL is presently available, because the pathogenesis is not well understood. Here we report that two types of mouse PVL models have been created by hypoxia-ischemia with or without systemic coadministration of lipopolysaccharide (LPS). LPS coadministration exacerbated hypoxic-ischemic white matter injury and led to enhanced microglial activation and astrogliosis. Drug trials with the antiinflammatory agent minocycline, the antiexcitotoxic agent NBQX, and the antioxidant agent edaravone showed various degrees of protection in the two models, indicating that excitotoxic, oxidative, and inflammatory forms of injury are involved in the pathogenesis of injury to immature white matter. We then applied immunoelectron microscopy to reveal fine structural changes in the injured white matter and found that synapses between axons and oligodendroglial precursor cells (OPCs) are quickly and profoundly damaged. Hypoxia-ischemia caused a drastic decrease in the number of postsynaptic densities associated with the glutamatergic axon-OPC synapses defined by the expression of vesicular glutamate transporters, vGluT1 and vGluT2, on axon terminals that formed contacts with OPCs in the periventricular white matter, resulted in selective shrinkage of the postsynaptic OPCs contacted by vGluT2 labeled synapses, and led to excitotoxicity mediated by GluR2-lacking, Ca(2+) -permeable AMPA receptors. Overall, the present study provides novel mechanistic insights into the pathogenesis of PVL and reveals that axon-glia synapses are highly vulnerable to white matter injury in the developing brain. More broadly, the study of white matter development and injury has general implications for a variety of neurological diseases, including PVL, stroke, spinal cord injury, and multiple sclerosis. © 2011 Wiley-Liss, Inc.

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