Cerebral Palsy Alliance

NEWS
Cerebral Palsy Research

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Professor Nadia Badawi AM
Macquarie Group Foundation Chair of Cerebral Palsy

Interventions and Management

1. MMWR Surveill Summ. 2014 Sep 12;63:27-35.

Screening for Developmental Delays Among Young Children --- National Survey of Children's Health, United States, 2007.

Rice CE, Naarden Braun KV, Kogan MD, Smith C, Kavanagh L, Strickland B, Blumberg SJ.

Early childhood development typically follows a trajectory of achieving physical, cognitive, communication, social-emotional, and self-help milestones within a specified age range. Although most children reach these milestones within a similar range, others exhibit mild to severe developmental delays that indicate potential developmental disabilities. Developmental disabilities are a group of conditions caused by an impairment in one or more developmental domains (e.g., physical, learning, communication, behavior, or self-help). Developmental disabilities can become evident during the prenatal period through age 22 years, affect day-to-day functioning, and usually are lifelong. Approximately 15% of children aged 3-17 years in 2008 were estimated to have developmental disabilities of varying severity, such as language or learning disorders, intellectual disabilities, cerebral palsy, seizures, hearing loss, blindness, autism spectrum disorder (ASD), or other developmental delays.

PMID: 25208255 [PubMed - in process] Free full text

2. World Neurosurg. 2014 May-Jun;81(5-6):730-41. doi: 10.1016/j.wneu.2014.03.012. Epub 2014 Mar 12.

Recapitulating flesh with silicon and steel: advancements in upper extremity robotic prosthetics.

Lee B1, Attenello FJ2, Liu CY2, McLoughlin MP3, Apuzzo ML2.

With the loss of function of an upper extremity because of stroke or spinal cord injury or a physical loss from amputation, an individual's life is forever changed, and activities that were once routine become a magnitude more difficult. Much research and effort have been put into developing advanced robotic prostheses to restore upper extremity function. For patients with upper extremity amputations, previously crude prostheses have evolved to become exceptionally functional. Because the upper extremities can perform a wide variety of activities, several types of upper extremity prostheses are available ranging from passive cosmetic limbs to externally powered robotic limbs. In addition, new developments in brain-machine interface are poised to revolutionize how patients can control these advanced prostheses using their thoughts alone. For patients with spinal cord injury or stroke, functional electrical stimulation promises to provide the most sophisticated prosthetic limbs possible by reanimating paralyzed arms of these patients. Advances in technology and robotics continue to help patients

recover vital function. This article examines the latest neurorestorative technologies for patients who have either undergone amputation or lost the use of their upper extremities secondary to stroke or spinal cord injury.

PMID: 24631910 [PubMed - indexed for MEDLINE]

3. Neural Regen Res. 2013 Sep 15;8(26):2478-83. doi: 10.3969/j.issn.1673-5374.2013.26.009.

Differences in standing balance between patients with diplegic and hemiplegic cerebral palsy.

Rojas VG1, Rebolledo GM2, Muñoz EG3, Cortés NI4, Gaete CB4, Delgado CM5.

Maintaining standing postural balance is important for walking and handling abilities in patients with cerebral palsy. This study included 23 patients with cerebral palsy (seven with spastic diplegia and 16 with spastic hemiplegia), aged from 7 to 16 years of age. Standing posture balance measurements were performed using an AMTI model OR6-7 force platform with the eyes open and closed. Patients with diplegic cerebral palsy exhibited greater center of pressure displacement areas with the eyes open and greater center of pressure sway in the medial-lateral direction with the eyes open and closed compared with hemiplegic patients. Thus, diplegic patients exhibited weaker postural balance control ability and less standing stability compared with hemiplegic cerebral palsy patients.

PMID: 25206558 [PubMed] PMCID: PMC4146108 Free PMC Article

4. Dev Med Child Neurol. 2014 Sep 12. doi: 10.1111/dmcn.12583. [Epub ahead of print]

The effects of Kinesio Taping on body functions and activity in unilateral spastic cerebral palsy: a single-blind randomized controlled trial.

Kaya Kara O1, Atasavun Uysal S, Turker D, Karayazgan S, Gunel MK, Baltaci G.

AIM: The aim of this study was to investigate the effects of Kinesio Taping (KT) on the body functions and activity of children with unilateral spastic cerebral palsy (CP). METHOD: This study was designed as a single-blind, randomized, controlled trial. Thirty children with unilateral spastic CP were randomized and split equally between the KT group (eight males, seven females; mean age 9y [SD 2y 3mo] range 7-12y) and the control group (seven males, eight females; mean age 9y 7mo [SD 3y 4mo] range 7-14y) receiving usual care. All participants were evaluated with the Functional Independence Measure for Children (WeeFIM), the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP), the Gross Motor Function Measure (GMFM), short-term muscle power, agility and functional muscle strength tests. Wilcoxon signed-rank and Mann-Whitney U tests were used to evaluate within and between-group differences respectively. The level of significance was accepted as $p<0.05$. RESULTS: There were significant differences in muscle power sprint ($p=0.003$), lateral step-up test right ($p=0.016$), sit to stand ($p=0.018$), attain stand through half knee right ($p=0.003$), BOTMP Gross scores ($p=0.019$), and WeeFIM total ($p=0.003$) and self-care scores ($p=0.022$) between the groups ($p<0.05$). INTERPRETATION: Kinesio Taping is a promising additional approach to increase proprioceptive feedback and improve physical fitness, gross motor function, and activities of daily living in children with CP.

PMID: 25213082 [PubMed - as supplied by publisher]

5. Dev Med Child Neurol. 2014 Aug;56(8):709-10. doi: 10.1111/dmcn.12429. Epub 2014 Apr 9.

Movement quality: is beauty only in the eyes of the beholder?

Steenbergen B.

Comment on: The Quality Function Measure: reliability and discriminant validity of a new measure of quality of gross motor movement in ambulatory children with cerebral palsy. [Dev Med Child Neurol. 2014]

PMID: 24712978 [PubMed - indexed for MEDLINE]

6. Gait Posture. 2014 Aug 27. pii: S0966-6362(14)00675-4. doi: 10.1016/j.gaitpost.2014.08.011. [Epub ahead of print]

Superior functional outcome after femoral derotation osteotomy according to gait analysis in cerebral palsy.

Niklasch M1, Dreher T2, Döderlein L3, Wolf SI1, Ziegler K1, Brunner R4, Rutz E4.

The femoral derotation osteotomy (FDO) is seen as the golden standard treatment in children with cerebral palsy and internal rotation gait. Variable outcomes with cases of over- and undercorrection mainly in the less involved patients have been reported. The determination of the amount of derotation is still inconsistent. 138 patients (age: 11 (±3.3) years) with cerebral palsy and internal rotation gait were examined pre- and 1 year postoperatively after distal or proximal FDO, using standardized clinical examination and 3D gait analysis. Three groups were defined retrospectively depending on the amount of derotation in relation to the mean hip rotation in stance (MHR) during gait analysis: Group A (derotation angle > MHR+10°), Group B (derotation angle=MHR±10°), Group C (derotation angle <MHR-10°), and compared according to their postoperative mean hip rotation. ANOVA with Bonferroni post hoc test was used for statistics ($p<0.05$). Group B had the greatest benefit with the highest rate (86%) of good results (postoperative MHR=±15°). In contrast there were 14% cases of overcorrection and 5% cases of deterioration in Group A with only 81% good results and only 79% good results in Group C. It can be concluded, that it is less likely to have unsatisfactory outcomes if the amount of FDO is defined according to the findings of gait analysis compared with clinical examination.

PMID: 25217494 [PubMed - as supplied by publisher]

7. Adapt Phys Activ Q. 2014 Oct;31(4):377-89. doi: 10.1123/apaq.2013-0064.

Improvement of the classification system for wheelchair rugby: athlete priorities.

Altmann VC1, Hart AL, van Limbeek J, Vanlandewijck YC.

A representative sample (N = 302) of the wheelchair rugby population responded to a survey about the classification system based on prioritized items by International Wheelchair Rugby Federation members. Respondents stated, "The classification system is accurate but needs adjustments" (56%), "Any athlete with tetraequivalent impairment should be allowed to compete" (72%), "Athletes with cerebral palsy and other coordination impairments should be classified with a system different than the current one" (75%), and "The maximal value for trunk should be increased from 1.0 to 1.5" (67%). A minority stated, "Wheelchair rugby should only be open to spinal cord injury and other neurological conditions" (36%) and "There should be a 4.0 class" (33%). Results strongly indicated that athletes and stakeholders want adjustments to the classification system in two areas: a focus on evaluation of athletes with impairments other than loss of muscle power caused by spinal cord injury and changes in classification of trunk impairment.

PMID: 25211483 [PubMed - in process]

8. Adapt Phys Activ Q. 2014 Oct;31(4):310-24. doi: 10.1123/apaq.2013-0088.

Ability of RT3 Accelerometer Cut Points to Detect Physical Activity Intensity in Ambulatory Children With Cerebral Palsy.

Ryan J1, Walsh M, Gormley J.

This study investigated the ability of published cut points for the RT3 accelerometer to differentiate between levels of physical activity intensity in children with cerebral palsy (CP). Oxygen consumption (metabolic equivalents; METs) and RT3 data (counts/min) were measured during rest and 5 walking trials. METs and corresponding counts/min were classified as sedentary, light physical activity (LPA), and moderate to vigorous physical activity (MVPA) according to MET thresholds. Counts were also classified according to published cut points. A published cut point exhibited an excellent ability to classify sedentary activity (sensitivity = 89.5%, specificity = 100.0%). Classification accuracy decreased when published cut points were used to classify LPA (sensitivity = 88.9%, specificity = 79.6%) and MVPA (sensitivity = 70%, specificity = 95-97%). Derivation of a new cut point improved classification of both LPA and MVPA. Applying published cut points to RT3 accelerometer data collected in children with CP may result in misclassification of LPA and MVPA.

PMID: 25211479 [PubMed - in process]

9. Dev Med Child Neurol. 2014 Sep 5. doi: 10.1111/dmcn.12578. [Epub ahead of print]

Physical inactivity and secondary health complications in cerebral palsy: chicken or egg?

Peterson M.

PMID: 25195946 [PubMed - as supplied by publisher]

10. Arch Oral Biol. 2014 Aug 23;59(12):1352-1358. doi: 10.1016/j.archoralbio.2014.08.011. [Epub ahead of print]

Test-retest reliability of electromyographic variables of masseter and temporal muscles in patients with cerebral palsy.

Giannasi LC1, Matsui MY2, Politti F3, F Batista SR2, Caldas BF2, Amorim JB2, de Oliveira LV3, Oliveira CS3, Gomes MF2.

INTRODUCTION: The aim of this study was to evaluate the reliability of surface electromyography of the masticatory muscles in patients with cerebral palsy. METHODS: Surface electromyography was performed over the masseter and temporal muscles in 15 patients with cerebral palsy with the mandible at rest and during maximum clenching effort in two sessions. The data were analyzed using the root mean square amplitude, mean frequency, median frequency, zero crossings and approximate entropy. RESULTS: In the within-day evaluations, intraclass correlation coefficients were higher (0.80-0.98) for the all electromyography variables and muscles during maximum clenching effort. In the resting position, the coefficients revealed good to excellent reliability (0.61-0.95) for root mean square, mean frequency, median frequency and zero crossings and fair to good reliability (0.53-0.74) for approximate entropy. In the between-day evaluations, the coefficients revealed good to excellent reliability (0.60-0.86) for mean frequency, median frequency, zero crossings and approximate entropy. In the resting position, the coefficients revealed poor to fair reliability (0.23-0.57) for all electromyography variables studied. The root mean square had the highest standard errors during maximum clenching effort (2.37-5.91) and at rest (1.47-6.86). CONCLUSION: Mean frequency, median frequency and approximate entropy are the most reliable variables of surface electromyography signals of the masseter and temporal muscles during maximum clenching effort in individuals with cerebral palsy. These measures can be used to evaluate the function and behaviour of the masticatory muscles in this population following oral rehabilitation and surgical oral procedures as well as for the study the physiology of these muscles.

PMID: 25195183 [PubMed - as supplied by publisher]

11. Brain Nerve. 2014 Sep;66(9):1039-47.

Botulinum toxin therapy for spasticity [Article in Japanese]

Masakado Y.

Botulinum toxin (BTX) administered as an adjunct to other interventions for spasticity can act as a useful and effective therapeutic tool for treating patients disabled by spasticity. Presence of other non-reflex motor disorders (muscle stiffness, shortness, and contracture) can complicate the clinical course and disturb rehabilitative process of patients with spasticity. Treatment of spasticity using BTX can improve paralysis by correcting muscular imbalance that follows these diseases. In patients with chronic severe spasticity, we also have to address unique and difficult-to-treat clinical conditions such as abnormal posture and movement disorders. The effectiveness of BTX in treating some of these conditions is discussed. Because patients with neurological disabilities can show complex dysfunctions, specific functional limitations, goals, and expected outcomes of treatment should be evaluated and discussed with the patient, family members, and caregivers, prior to initiating BTX therapy. BTX therapy might improve not only care, passive function, but also motor functions in these patients by supplementing intensive rehabilitation with repetitive transcranial magnetic stimulation, transcranial direct-current stimulation, peripheral electrical stimulation, muscle stretching, and other rehabilitation strategies.

PMID: 25200575 [PubMed - in process]

12. Neural Regen Res. 2014 Apr 15;9(8):888-96. doi: 10.4103/1673-5374.131612.

Virtual reality interface devices in the reorganization of neural networks in the brain of patients with neurological diseases.

Gatica-Rojas V1, Méndez-Rebolledo G2.

Two key characteristics of all virtual reality applications are interaction and immersion. Systemic interaction is achieved through a variety of multisensory channels (hearing, sight, touch, and smell), permitting the user to interact with the virtual world in real time. Immersion is the degree to which a person can feel wrapped in the virtual world through a defined interface. Virtual reality interface devices such as the Nintendo® Wii and its peripheral nunchuks-balance board, head mounted displays and joystick allow interaction and immersion in unreal environments created from computer software. Virtual environments are highly interactive, generating great activation of visual, vestibular and proprioceptive systems during the execution of a video game. In addition, they are entertaining and safe for the user. Recently, incorporating therapeutic purposes in virtual reality interface devices has allowed them to be used for the rehabilitation of neurological patients, e.g., balance training in older adults and dynamic stability in healthy participants. The improvements observed in neurological diseases (chronic stroke and cerebral palsy) have been shown by changes in the reorganization of neural networks in patients' brain, along with better hand function and other skills, contributing to their quality of life. The data generated by such studies could substantially contribute to physical rehabilitation strategies.

PMID: 25206907 [PubMed] PMCID: PMC4146258 Free PMC Article

13. Neural Regen Res. 2014 Apr 1;9(7):712-8. doi: 10.4103/1673-5374.131574.

Outcomes in spasticity after repetitive transcranial magnetic and transcranial direct current stimulations.

Gunduz A1, Kumru H2, Pascual-Leone A3.

Non-invasive brain stimulations mainly consist of repetitive transcranial magnetic stimulation and transcranial direct current stimulation. Repetitive transcranial magnetic stimulation exhibits satisfactory outcomes in improving multiple sclerosis, stroke, spinal cord injury and cerebral palsy-induced spasticity. By contrast, transcranial direct current stimulation has only been studied in post-stroke spasticity. To better validate the efficacy of non-invasive brain stimulations in improving the spasticity post-stroke, more prospective cohort studies involving large sample sizes are needed.

PMID: 25206878 [PubMed] PMCID: PMC4146264 Free PMC Article

14. Osteoporos Int. 2014 Sep 9. [Epub ahead of print]

Underdevelopment of trabecular bone microarchitecture in the distal femur of nonambulatory children with cerebral palsy becomes more pronounced with distance from the growth plate.

Modlesky CM1, Whitney DG, Singh H, Barbe MF, Kirby JT, Miller F.

We found that the underdeveloped trabecular bone microarchitecture in the distal femur of children with cerebral palsy (CP) who are unable to ambulate independently becomes more pronounced with increased distance from the growth plate. This suggests that the degree of underdevelopment in trabecular bone in children with CP is greater than previously understood. INTRODUCTION: Children with CP who are unable to ambulate independently have severely underdeveloped trabecular bone microarchitecture in the distal femur. The aim of the study was to determine if the level of underdevelopment in trabecular bone microarchitecture is consistent across the distal femur in children with CP. METHODS: Children with quadriplegic CP and typically developing children were studied (n = 12/group, 5-14 years). Apparent bone volume to total volume (appBV/TV), trabecular number (appTb.N), trabecular thickness (appTb.Th), and trabecular separation (appTb.Sp) were estimated in each of 20 magnetic resonance images collected above the growth plate in the distal femur. RESULTS: For the total region, appBV/TV, appTb.N, and appTb.Th were lower (30, 21, and 12 %, respectively) and appTb.Sp was higher (52 %) (all $p \leq 0.001$) in children with CP than in controls. Distance from the growth plate was inversely related to appBV/TV and appTb.N and was positively related to appTb.Sp at the same distance in children with CP and controls (all $p < 0.01$). However, the relationships were stronger ($r^2 = 0.87$ to 0.92 versus 0.36 to 0.65) and the slopes were steeper in children with CP (all $p < 0.01$). Furthermore, the steepness of the slopes in children with CP was positively related to appBV/TV, appTb.N, appTb.Th, and appTb.Sp for the total region ($r^2 = 0.37$ to 0.75, $p < 0.05$). CONCLUSIONS: The underdeveloped trabecular bone microarchitecture in the metaphysis of the distal femur in children with CP becomes more pronounced with greater distance from the growth plate. This pattern is most profound in children with the least developed trabecular bone microarchitecture.

PMID: 25199575 [PubMed - as supplied by publisher]

15. Med Arh. 2014;68(3):182-3.

Operative treatment of the knee contractures in cerebral palsy patients.

Bozinovski Z, Popovski N.

INTRODUCTION: Knee flexion is one of the main problems of the lower extremities in cerebral palsy patients. Many operative procedures are recommended for contractures of the knee in cerebral palsy patients. We performed simple operation and analyzed the results after operative treatment with nine years follow up. METHOD: 85 patients with spastic cerebral palsy were treated in period 2001-2010. 40 were ambulatory and 45 non ambulatory with ability to stand with support. All of them underwent same surgical procedure with distal hamstrings lengthening. Tenotomies were performed on m. semitendinosus, m. semimembranosus, m. gracillis and biceps femoris. Only m. semitendinosus was tenotomized completely, other muscles were tenotomized only on tendinous part. The patients had a plaster immobilization for five days after the surgery with the knee extended. RESULTS: All 85 patients had improvement of the popliteal angle pre and post operative respectively. Improvement in the crouch gait was noticed in the period of rehabilitation. We had no complication with the wound. Three of the patients had overcorrection and achieved recurvatum of the knees. CONCLUSION: We consider this procedure very simple with satisfying improvement of standing, walking and sitting abilities in children with spastic cerebral palsy.

PMID: 25195348 [PubMed - in process]

16. Brain Nerve. 2014 Sep;66(9):1057-68.

Functional neurosurgery for spasticity [Article in Japanese]

Ayuzawa S1, Ihara S, Aoki T.

The basic concept of neurosurgical procedures to treat spasticity is to decrease the hyperactivity of the stretch reflex. Selective peripheral neurotomy is a method to partially resect the peripheral motor nerve. The alpha motor

and Ia afferent nerves are resected, but the latter is essential owing to its lasting effect in reducing spasticity. Focal spasticity in adult patients can be effectively treated using peripheral neurotomy. Functional posterior rhizotomy, mostly used to treat paraplegic spasticity in children with cerebral palsy, involves the sectioning of posterior rootlets associated with abnormal motor responses to electrical stimulation. Intrathecal baclofen therapy is useful in treating diffuse spasticity. Baclofen inhibits the activity of alpha motor neurons both pre and post synaptically at the level of the spinal cord. A decrease in Hmax/Mmax in the H-reflex electrophysiologically represents the effectiveness of these procedures. Good clinical results can be achieved by appropriate indication depending on the clinical features of spasticity in each patient.

PMID: 25200577 [PubMed - in process]

17. J Pediatr Orthop. 2014 Oct-Nov;34 Suppl 1:S44-8. doi: 10.1097/BPO.0000000000000259.

Update on neuromuscular disorders in pediatric orthopaedics: duchenne muscular dystrophy, myelomeningocele, and cerebral palsy.

Chambers HG.

The purpose of this seminar was to review a large range of lower extremity and neuromuscular disorders. Because of the diversity of the topics covered, including clubfoot and vertical talus treatment, management of Legg-Calve-Perthes disease, and limb lengthening in dwarfism, this review will focus on the neuromuscular subsection reviewing the current management of the muscular dystrophies, myelomeningocele, and cerebral palsy.

PMID: 25207736 [PubMed - in process]

18. J Pediatr Orthop. 2014 Oct-Nov;34 Suppl 1:S32-5. doi: 10.1097/BPO.0000000000000291.

Hip fusion as hip salvage procedure in cerebral palsy.

De Moraes Barros Fucs PM1, Yamada HH.

The treatment of the spastic hip in Cerebral Palsy (CP) remains a challenge especially in cases of advance changes. Many options are available and the key for a good outcome is to find the best surgical procedure to an individualized patient. The hip fusion is one of the surgical options. The authors presented a group of spastic CP with painful chronic hip subluxation and dislocation treated with hip fusion with a mean follow-up period of 14.5 years. Surgical technique, post-operative management and outcomes were shown, also with the observations done regarding the evolution of the contralateral hip after the hip fusion. They concluded that the hip arthrodesis is an option for patients with spastic CP with painful subluxation or dislocated hips with the goal of pain relief maintain or improve functional status, and facilitating the care. The best candidate is a young ambulatory patient with normal contralateral hip and normal spinal alignment.

PMID: 25207734 [PubMed - in process]

19. Spine J. 2014 Sep 5. pii: S1529-9430(14)01316-3. doi: 10.1016/j.spinee.2014.08.448. [Epub ahead of print]

Ventricular peritoneal shunt malfunction following operative correction of scoliosis: report of three cases.

Lai LP1, Egnor MR2, Carrion WV3, Haralabatos SS3, Wingate MT3.

BACKGROUND CONTEXT: Two of the most common disease processes associated with hydrocephalus in children are spina bifida and intraventricular hemorrhage of prematurity, both of which are known to be also associated with spinal deformity in later childhood. The occurrence of shunt malfunction following mechanical injury or stress to the hardware has been well documented. Newer techniques in the treatment of neuromuscular scoliosis, including anterior release with segmental fixation, have resulted in more powerful corrections of these large spinal deformities. A new potential cause of shunt malfunction is the aggressive correction of scoliosis. PURPOSE: We determined to report patients with neuromuscular curves averaging 100 degrees who were subsequently recognized to have perioperative shunt malfunction. Study Design/Setting: Three case studies from a

university hospital setting were included. PATIENT SAMPLE: All three children were young adolescents and had long term shunts. Two of the children had spina bifida and a third had cerebral palsy. All children underwent anterior release of their scoliosis with posterior segmental instrumentation with unit rods and sublaminar wires. All had significant correction of their scoliosis. OUTCOME MEASURES: Malfunctioning of the ventriculo peritoneal shunts were recorded. METHODS: Chart reviews of three cases were analyzed. RESULTS: Two children had shunt malfunctions within a month of their surgery, and one child had intraoperative recognition and externalization of the shunt. CONCLUSIONS: Older children undergoing repair of neuromuscular scoliosis are often readolescents or adolescents who have the same indwelling shunt systems originally implanted in early infancy. The shunt may be brittle and calcified, and the peritoneal catheter may be short. The correction of scoliosis often results in an almost instantaneous growth of a few inches. Because of the potential difficulty in recognizing shunt malfunction in the perioperative period, consideration should be given for elective revision of the peritoneal catheter in children at risk.

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20. Res Dev Disabil. 2014 Sep 5;35(12):3416-3422. doi: 10.1016/j.ridd.2014.08.024. [Epub ahead of print]

Socialization and nonverbal communication in atypically developing infants and toddlers.

Konst MJ1, Matson JL2, Goldin RL2, Williams LW2.

Emphasis on early identification of atypical development has increased as evidence supporting the efficacy of intervention has grown. These increases have also directly affected the availability of funding and providers of early intervention services. A majority of research has focused on interventions specific to an individual's primary diagnoses. For example, interventions for those with cerebral palsy (CP) have traditionally focused on physiological symptoms, while intervention for individuals with Autism Spectrum Disorder (ASD) focus on socialization, communication, and restricted interests and repetitive behaviors. However deficits in areas other than those related to their primary diagnoses (e.g., communication, adaptive behaviors, and social skills) are prevalent in atypically developing populations and are significant predictors of quality of life. Therefore, the purpose of the current study was to examine impairments in socialization and nonverbal communication in individuals with Down's syndrome (DS), CP, and those with CP and comorbid ASD. Individuals with comorbid CP and ASD exhibited significantly greater impairments than any diagnostic group alone. However, individuals with CP also exhibited significantly greater impairments than those with DS. The implications of these results are discussed.

PMID: 25200676 [PubMed - as supplied by publisher]

21. Res Dev Disabil. 2014 Sep 8;35(12):3469-3481. doi: 10.1016/j.ridd.2014.08.029. [Epub ahead of print]

Oropharyngeal dysphagia in preschool children with cerebral palsy: Oral phase impairments.

Benfer KA1, Weir KA2, Bell KL3, Ware RS4, Davies PS5, Boyd RN6.

PURPOSE: This study aimed to document the prevalence and patterns of oral phase oropharyngeal dysphagia (OPD) in preschool children with cerebral palsy (CP), and its association with mealtime duration, frequency and efficiency. METHODS: Cross-sectional population-based cohort study of 130 children diagnosed with CP at 18-36 months ca (mean=27.4 months, 81 males) and 40 children with typical development (mean=26.2, 18 males). Functional abilities of children with CP were representative of a population sample (GMFCS I=57, II=15, III=23, IV=12, V=23). Oral phase impairment was rated from video using the Dyspahgia Disorders Survey, Schedule for Oral Motor Impairment, and Pre-Speech Assessment Scale. Parent-report was collected on a feeding questionnaire. Mealtime frequency, duration and efficiency were calculated from a three day weighed food record completed by parents. Gross motor function was classified using the Gross Motor Function Classification System (GMFCS). RESULTS: Overall, 93.8% of children had directly assessed oral phase impairments during eating or drinking, or in controlling saliva (78.5% with modified cut-points). Directly assessed oral phase impairments were associated with declining gross motor function, with children from GMFCS I having a 2-fold increased likelihood of oral phase impairment compared to the children with TD (OR=2.0, p=0.18), and all children from GMFCS II-V

having oral phase impairments. Difficulty biting (70%), cleaning behaviours (70%) and chewing (65%) were the most common impairments on solids, and difficulty sipping from a cup (60%) for fluids. OPD severity and GMFCS were not related to mealtime frequency, duration or efficiency, although children on partial tube feeds had significantly reduced mealtime efficiency. CONCLUSIONS: Oral phase impairments were common in preschool children with CP, with severity increasing stepwise with declining gross motor function. The prevalence and severity of oral phase impairments were significantly greater for most tasks when compared to children with typical development, even for those with mild CP. Children who were partially tube fed had significantly lower feeding efficiency, so this could be a useful early indicator of children needing supplementation to their nutrition (through increasing energy density of foods/fluids, or tube feeds).

PMID: 25213472 [PubMed - as supplied by publisher]

22. Bull Tokyo Dent Coll. 2014;55(3):157-62.

Survey on Choice of Intravenous Sedative Agent at Department of Dental Anesthesiology, Tokyo Dental College Chiba Hospital between 2010 and 2011.

Matsuki Y1, Okamura T, Shiozaki K, Matsuura N, Kasahara M, Ichinohe T.

Use of intravenous sedation is increasing in the management of dental patients in consideration of accompanying diseases and patient demand for comfort and safety. We surveyed choice of sedative agent and dosage on the basis of accompanying diseases or conditions in patients receiving treatment at the Department of Dental Anesthesiology, Tokyo Dental College Chiba Hospital between 2010 and 2011. A total of 5,256 patients were reviewed and divided into the following categories: 1) medically compromised patients (MC); 2) minor oral surgery (OS); 3) cerebral palsy (CP); 4) mental retardation (MR); 5) mental disorder (MD); and 6) dental phobia with/without gag reflex. The investigated variables were sex, age, weight, duration of sedation, and dosage of agent. Dosage of midazolam (M), M plus propofol (MP), and P alone was investigated. A total of 2,336 patients were managed by intravenous sedation during the study period. The combination of MP was used in approximately 63-79% of patients in all categories, except MC. Midazolam was used in approximately 47% in the MC group. Propofol was used in approximately 32% of patients in the MR group. Other agents (minor tranquilizers, analgesics, and so on) were used in approximately 12% in the OS group. The dose of M was approximately 0.05-0.06 mg/kg. When MP was administered, the dose of M showed no difference among groups. The dose of P, however, tended to be lower in the MC and CP groups than in the other groups. These results suggest that MP is chosen for intravenous sedation in most types of dental treatment.

PMID: 25212561 [PubMed - in process] Free full text

23. Int J Paediatr Dent. 2014 Sep 8. doi: 10.1111/ipd.12132. [Epub ahead of print]

Mechanical control of biofilm in children with cerebral palsy: a randomized clinical trial.

Ferraz NK1, Tataounoff J, Nogueira LC, Ramos-Jorge J, Ramos-Jorge ML, Pinheiro ML.

BACKGROUND: Dental biofilm removal is difficult and can be ineffective in individuals with cerebral palsy. OBJECTIVE: Determine the effectiveness of brushing with an electric toothbrush on and off in comparison with manual brushing for the removal of biofilm in children aged four to 16 years with cerebral palsy. METHODS: A crossover, randomized, simple-blind, clinical trial was conducted. The examiner was blinded to the brushing method (G1: manual; G2: electric toothbrush on; and G3: electric toothbrush off). The order was determined randomly. The participants (n = 40) were examined before and after brushing performed by caregivers using the Turesky-Quigley-Hein biofilm index. Statistical analysis involved the paired t-test, Wilcoxon, Kruskal-Wallis, and anova tests. RESULTS: Biofilm was significantly reduced with the three brushing methods ($P < 0.001$) (mean reductions: 47.6% in G1; 47.4% in G2; 44.5% in G3). Significant differences were found between G1 and G3 ($P < 0.001$) and between G2 and G3 ($P = 0.007$). No significant difference was found between G1 and G2 ($P = 0.06$). CONCLUSION: All methods reduced biofilm. Effectiveness was similar between manual brushing and with the electric toothbrush on, whereas both these methods achieved better results in comparison with the electric toothbrush switched off.

PMID: 25200983 [PubMed - as supplied by publisher]

24. Pediatr Neurol. 2014 Jul 19. pii: S0887-8994(14)00403-2. doi: 10.1016/j.pediatrneurol.2014.07.005. [Epub ahead of print]

Epidemiology of Severe Hearing Impairment in a Population-Based Cerebral Palsy Cohort.

Dufresne D1, Dagenais L1, Shevell MI2; REPACQ Consortium.

BACKGROUND: Comorbidities including hearing impairment occur commonly in the context of cerebral palsy (CP). METHODS: Hearing impairment was assessed in a registry-derived population-based sample of children with CP. RESULTS: Hearing impairment was documented in 12.7% (27 of 212) with less than a quarter of these (or 2.7% overall [6 of 212]) having a severe hearing loss of greater than 70 dB bi-aurally. Those with severe hearing impairment were more likely to be nonambulatory (Gross Motor Function Classification System IV/V; 100% versus 34.0% in the registry; P < 0.001) and have a spastic quadriplegic or dyskinetic CP variant (100% versus 42%, P = 0.001). Severe neonatal hyperbilirubinemia necessitating exchange transfusion demonstrated a striking association with hearing impairment in the context of CP in spite of small observed numbers; three of three had severe hearing loss, accounting for 50% of cases of severe hearing loss. CONCLUSIONS: These results suggest a specific CP context and antecedent conditions that necessitate a heightened vigilance for the detection and remediation of hearing impairment.

PMID: 25194720 [PubMed - as supplied by publisher]

25. Asia Pac J Public Health. 2014 Sep 9. pii: 1010539514548756. [Epub ahead of print]

Factors Associated With Caregiver Burden Among Caregivers of Children With Cerebral Palsy in Sri Lanka.

Wijesinghe CJ1, Cunningham N2, Fonseka P3, Hewage CG4, Ostbye T5.

A cross-sectional study was conducted among 375 caregivers of children with cerebral palsy attending a tertiary care setting in Sri Lanka, to identify factors associated with caregiver burden. Caregiver burden was defined as "caregiver's response to various stressors associated with caregiving" and was measured using Caregiver Difficulties Scale (CDS), developed specifically for this purpose. Multivariate linear regression was used to assess associations between sociodemographic, stressor, and coping factors and caregiver burden; and to examine whether coping reduces the effect of stressors on burden. Low income, rural residence, male sex, and number of functional deficits of the disabled child correlated significantly with higher caregiver burden, while spousal support correlated with lower burden. Seeking social support reduced the increased burden associated with greater functional impairments. Psychosocial interventions focused on evaluating and improving social support for caregivers may help families at high risk for caregiver distress, to minimize negative outcomes.

PMID: 25204802 [PubMed - as supplied by publisher]

26. Res Dev Disabil. 2014 Sep 5;35(12):3403-3415. doi: 10.1016/j.ridd.2014.08.023. [Epub ahead of print]

Ease of Caregiving for Children: A measure of parent perceptions of the physical demands of caregiving for young children with cerebral palsy.

Ward KD1, Chiarello LA2, Bartlett DJ3, Palisano RJ1, McCoy SW4, Avery L5.

The Ease of Caregiving for Children is a parent-completed measure of how difficult it is for them to safely help their children participate in activities of daily living. The objectives of this study were to determine the internal

consistency, test-retest reliability, and construct validity (known groups methods) of the Ease of Caregiving for Children and create an interval-level scale. Participants included 429 parents of children with cerebral palsy (CP) and 110 parents of children without motor delay. Children ranged in age from 18 to 60 months. Parents completed the Ease of Caregiving for Children and therapists assessed children's gross motor function. The Rasch model of item response analysis was used to create an interval-level scale. Results indicated high internal consistency and acceptable test-retest reliability. Ease of caregiving varied by children's ages for parents of children without motor delay, however there was no significant difference by age for parents of children with CP. Parents of children with less gross motor ability reported more difficulty in caregiving than parents of children with higher gross motor ability. Rasch analysis for children with CP resulted in a hierarchical ordering of items by difficulty with good fit and logical ordering. Findings support the Ease of Caregiving for Children as a reliable and valid measure of parents' perceptions of their difficulty to safely assist their children to perform activities of daily living. The measure should enable health care providers to assess and provide interventions that address families' needs in caring for their children with CP.

PMID: 25200675 [PubMed - as supplied by publisher]

27. J Phys Ther Sci. 2014 Aug;26(8):1209-13. doi: 10.1589/jpts.26.1209. Epub 2014 Aug 30.

Expectations from Rehabilitation of Children with Cerebral Palsy: The Agreement between the Physiotherapists and Mothers.

Kavlak E1, Altuğ F1, Cavlak U1, Kavlak HA2, Senol H3.

Purpose: The aim of this study was to examine the agreement between physiotherapists (PTs) and mothers (Ms) about the treatment of children with cerebral palsy (CP) who received treatment in special education and rehabilitation centers. Subjects: Ms of 130 children with CP (75 boys, 55 girls) and 130 PTs who applied rehabilitation programs were interviewed. [Methods] Clinical types and gross motor function levels of the children were recorded. A questionnaire consisting of 6 open-ended questions was used to describe the expectations and views of the PTs and Ms about the physiotherapy and rehabilitation programs for the children. Results: The mean age of the children was 89.80±52.05 months. The mean treatment period for the children was 73.62±42.11 months. The mean age of the mothers was 35.47±5.79 years, and the mean age of the PTs was 28.07±7.28 years. We found a statistically moderate level of agreement between the PTs and Ms regarding the appropriateness of the treatment provided to the children. There was statistically insignificant agreement regarding the applied treatment methods and the appropriateness of the applied rehabilitation programs. Conclusion: We believe that the views and expectations of the Ms should be taken into account by the PTs when preparing a treatment program for children with CP.

PMID: 25202182 [PubMed] PMCID: PMC4155221 Free PMC Article

Prevention and Cure

28. Cell Biochem Biophys. 2014 Sep 13. [Epub ahead of print]

Comparison of the Efficacy of Cord Blood Mononuclear Cells (MNCs) and CD34+ Cells for the Treatment of Neonatal Mice with Cerebral Palsy.

Li X1, Shang Q, Zhang L.

To compare the efficacy of cord blood mononuclear cells (MNCs) and CD34+ cells for the treatment of neonatal mice models with cerebral palsy (CP). CP model in neonatal mice was established by the ligation of carotid artery. Mice were randomly designated into MNCs group, CD34+ group, model group and control group (30 mice per group). MNCs and CD34+ cells were isolated from human umbilical cord blood. MNCs were transplanted into mice in the MNCs group and CD34+ cells into mice in the CD34+ group through the jugular vein, respectively. The body

weight, histopathology, apoptosis-related gene expression, learning and memory, and motor function of mice in the four groups were compared. Compared with control group, the body weight of mice in model group was significantly lower ($P < 0.05$). In addition, the right hemisphere was significantly liquefied and voids were found in model mice, in which degeneration and necrosis were found by HE staining. Real-time quantitative fluorescent PCR showed elevated levels of apoptosis-related gene expression and learning and memory function, and motor function were significantly decreased ($P < 0.05$) in model mice. In the MNCs group and CD34+ group, the weight of mice was significantly increased compared with the model group ($P < 0.05$). Moreover, neither liquefaction and voids in the hemispheres of mice were found in these two groups, nor degeneration and necrosis of cell. Meanwhile, levels of apoptosis-related gene expression were significantly lower than that of the model group ($P < 0.05$). Compared with the MNCs group, the expression of apoptotic gene TNF-α and CD40 was significantly lower ($P < 0.05$). Learning and memory function, and motor function of mice in the MNCs group and CD34+ group were significantly improved than the model group ($P < 0.05$), and the CD34+ group produced greater improvement than the MNCs group ($P < 0.05$). MNCs and CD34+ cells can reduce the degree of injury in the neonatal mice with CP. In addition, treatment with MNCs and CD34+ cells suppressed apoptotic gene expression and restored memory and motor function. The efficacy of CD34+ cells after separation and purification was more significant for the treatment of mice with CP.

PMID: 25217068 [PubMed - as supplied by publisher]

29. J Pediatr. 2014 Sep 9. pii: S0022-3476(14)00697-0. doi: 10.1016/j.jpeds.2014.07.049. [Epub ahead of print]

An Update on the Impact of Postnatal Systemic Corticosteroids on Mortality and Cerebral Palsy in Preterm Infants: Effect Modification by Risk of Bronchopulmonary Dysplasia.

Doyle LW1, Halliday HL2, Ehrenkranz RA3, Davis PG4, Sinclair JC5.

Infants at higher risk of bronchopulmonary dysplasia had increased rates of survival free of cerebral palsy after postnatal corticosteroid treatment in a previous metaregression of data from 14 randomized controlled trials. The relationship persists and is stronger in an updated analysis with data from 20 randomized controlled trials.

PMID: 25217197 [PubMed - as supplied by publisher]

30. Neural Regen Res. 2014 Mar 15;9(6):637-45. doi: 10.4103/1673-5374.130085.

Effect of dexamethasone on intelligence and hearing in preterm infants: a meta-analysis.

Zhang R, Bo T, Shen L, Luo S, Li J.

OBJECTIVE: A meta-analysis of published randomized controlled trials investigating the long-term effect of dexamethasone on the nervous system of preterm infants. DATA SOURCES: Online literature retrieval was conducted using The Cochrane Library (from January 1993 to June 2013), EMBASE (from January 1980 to June 2013), MEDLINE (from January 1963 to June 2013), OVID (from January 1993 to June 2013), Springer (from January 1994 to June 2013) and Chinese Academic Journal Full-text Database (from January 1994 to June 2013). Key words were preterm infants and dexamethasone in English and Chinese. STUDY SELECTION: Selected studies were randomized controlled trials assessing the effect of intravenous dexamethasone in preterm infants. The quality of the included papers was evaluated and those without the development of the nervous system and animal experiments were excluded. Quality assessment was performed through bias risk evaluation in accordance with Cochrane Handbook 5.1.0 software in the Cochrane Collaboration. The homogeneous studies were analyzed and compared using Revman 5.2.6 software, and then effect model was selected and analyzed. Those papers failed to be included in the meta-analysis were subjected to descriptive analysis. MAIN OUTCOME MEASURES: Nervous system injury in preterm infants. RESULTS: Ten randomized controlled trials were screened, involving 1,038 subjects. Among them 512 cases received dexamethasone treatment while 526 cases served as placebo control group and blank control group. Meta-analysis results showed that the incidence of cerebral palsy, visual impairment and hearing loss in preterm infants after dexamethasone treatment within 7 days after birth was similar to that in the control group (RR = 1.47, 95%CI: 0.97-2.21; RR = 1.46, 95%CI: 0.97-2.20; RR = 0.80, 95%CI: 0.54-1.18; $P > 0.05$), but intelligence quotient was significantly decreased compared with the control group (MD = -3.55, 95%CI: -6.59 to -0.51; $P = 0.02$). Preterm infants treated with dexamethasone 7 days after birth demonstrated an

incidence of cerebral palsy and visual impairment, and changes in intelligence quotient similar to those in the control group (RR = 1.26, 95%CI: 0.89-1.79; RR = 1.37, 95%CI: 0.73-2.59; RR = 0.53, 95%CI: 0.32-0.89; RR = 1.66, 95%CI: -4.7 to 8.01; P > 0.05). However, the incidence of hearing loss was significantly increased compared with that in the control group (RR = 0.53, 95%CI: 0.32-0.89; P = 0.02). CONCLUSION: Dexamethasone may affect the intelligence of preterm infants in the early stages after birth, but may lead to hearing impairment at later stages after birth. More reliable conclusions should be made through large-size, multi-center, well-designed randomized controlled trials.

PMID: 25206867 [PubMed] PMCID: PMC4146231 Free PMC Article

31. Neural Regen Res. 2013 Mar 25;8(9):817-24. doi: 10.3969/j.issn.1673-5374.2013.09.006.

A rat pup model of cerebral palsy induced by prenatal inflammation and hypoxia.

Hu Y1, Chen G2, Wan H3, Zhang Z4, Zhi H2, Liu W4, Qian X2, Chen M2, Wen L4, Gao F4, Li J5, Zhao L6.

Animal models of cerebral palsy established by simple infection or the hypoxia/ischemia method cannot effectively simulate the brain injury of a premature infant. Healthy 17-day-pregnant Wistar rats were intraperitoneally injected with lipopolysaccharide then subjected to hypoxia. The pups were used for this study at 4 weeks of age. Simultaneously, a hypoxia/ischemia group and a control group were used for comparison. The results of the footprint test, the balance beam test, the water maze test, neuroelectrophysiological examination and neuropathological examination demonstrated that, at 4 weeks after birth, footprint repeat space became larger between the forelimbs and hindlimbs of the rats, the latency period on the balance beam and in the Morris water maze was longer, place navigation and ability were poorer, and the stimulus intensity that induced the maximal wave amplitude of the compound muscle action potential was greater in the lipopolysaccharide/hypoxia and hypoxia/ischemia groups than in the control group. We observed irregular cells around the periventricular area, periventricular leukomalacia and breakage of the nuclear membrane in the lipopolysaccharide/hypoxia and hypoxia/ischemia groups. These results indicate that we successfully established a Wistar rat pup model of cerebral palsy by intraperitoneal injection of lipopolysaccharide and hypoxia.

PMID: 25206729 [PubMed] PMCID: PMC4146090 Free PMC Article

32. Neural Regen Res. 2013 Dec 5;8(34):3255-62. doi: 10.3969/j.issn.1673-5374.2013.34.010.

Establishing a rat model of spastic cerebral palsy by targeted ethanol injection.

Yu Y, Li L, Shao X, Tian F, Sun Q.

Spastic cerebral palsy is generally considered to result from cerebral cortical or pyramidal tract damage. Here, we precisely targeted the left pyramidal tract of 2-month-old Sprague-Dawley rats placed on a stereotaxic instrument under intraperitoneal anesthesia. Based on the rat brain stereotaxic map, a 1-mm hole was made 10 mm posterior to bregma and 0.8 mm left of sagittal suture. A microsyringe was inserted perpendicularly to the surface of the brain to a depth of 9.7 mm, and 15 μL of ethanol was slowly injected to establish a rat model of spastic cerebral palsy. After modeling, the rats appeared to have necrotic voids in the pyramidal tract and exhibited typical signs and symptoms of flexion spasms that lasted for a long period of time. These findings indicate that this is an effective and easy method of establishing a rat model of spastic cerebral palsy with good re-producibility. Ethanol as a chemical ablation agent specifically and thoroughly damages the pyramidal tract, and therefore, the animals display flexion spasms, which are a typical symptom of the disease.

PMID: 25206647 [PubMed] PMCID: PMC4146179 Free PMC Article

33. Obstet Gynecol. 2014 Sep 5. [Epub ahead of print]

Association of Duration of Neuroprotective Magnesium Sulfate Infusion With Neonatal and Maternal Outcomes.

McPherson JA1, Rouse DJ, Grobman WA, Palatnik A, Stamilio DM.

OBJECTIVE: To evaluate the association of duration of magnesium sulfate infusion with stillbirth or death, cerebral palsy, and select adverse maternal and neonatal outcomes. METHODS: This is a secondary cohort analysis of women randomized to receive magnesium sulfate within a previously reported Maternal-Fetal Medicine Units Network prospective clinical trial. The association of antenatal infusion of magnesium sulfate for less than 12 hours, 12-18 hours, and greater than 18 hours on maternal and perinatal outcomes was compared. The primary outcome was cerebral palsy of any severity or death. Secondary outcomes included cerebral palsy, death, and select maternal and neonatal outcomes. Stratified and logistic regression analyses were used. The models were adjusted for race, gestational age at birth, time since last magnesium sulfate, any magnesium sulfate at delivery, and eligibility criteria as appropriate. RESULTS: Of 933 women available for analysis, 356, 341, and 236 received antenatal magnesium sulfate infusion for a total of less than 12 hours, 12-18 hours, or greater than 18 hours, respectively. Any cerebral palsy or death occurred in 39 women (11.7%) who received magnesium sulfate less than 12 hours, 34 women (10.3%) who received 12-18 hours of magnesium sulfate, and 20 women (8.8%) who received greater than 18 hours of magnesium sulfate. There was no difference in death or cerebral palsy among groups (less than 12 hours as reference; adjusted odds ratio [OR] 1.03, 95% confidence interval [CI] 0.60-1.77 for 12-18 hours; adjusted OR 1.08, 95% CI 0.57-2.03 for greater than 18 hours). Select maternal adverse drug affects and neonatal morbidities were also similar across groups. CONCLUSION: The duration of antenatal magnesium sulfate infusion is not associated with risk of death or cerebral palsy. The optimal treatment duration needed for maximal neuroprotection remains unknown.

LEVEL OF EVIDENCE:: II.

PMID: 25198275 [PubMed - as supplied by publisher]

34. Pediatr Neurol. 2014 Jul 24. pii: S0887-8994(14)00456-1. doi: 10.1016/j.pediatrneurol.2014.07.027. [Epub ahead of print]

Extremely Severe Complicated Spastic Paraplegia 3A With Neonatal Onset.

Yonekawa T1, Oya Y2, Higuchi Y3, Hashiguchi A3, Takashima H3, Sugai K4, Sasaki M4.

BACKGROUND: Spastic paraplegia 3A typically manifests in childhood as an uncomplicated form of hereditary spastic paraplegia with slow progression. Most affected individuals present with spasticity and weakness in the legs before the end of the first decade. PATIENT: We describe a 12-year-old boy with neonatal onset of extremely severe complicated spastic paraplegia 3A associated with a de novo c.1226G>A (p.G409D) mutation in ATL1, a gene which encodes atlatsin GTPase 1. He manifested general hypertonia and hypokinesia since the neonatal period and was initially diagnosed with cerebral palsy. He was never able to move without assistance because of severe spastic quadriplegia with distal dominant muscle weakness. He also developed with pseudobulbar palsy; his speech, chewing, and swallowing were severely impaired. Electrophysiological studies revealed severe diffuse axonal neuropathy. CONCLUSIONS: Extremely severe complicated spastic paraplegia 3A can be caused by mutations in the linker or three-helix bundle of atlastin 1.

PMID: 25193411 [PubMed - as supplied by publisher]