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Monday 27 September 2021

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Professor Nadia Badawi AM
CP Alliance Chair of Cerebral Palsy Research

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Interventions and Management

1. Predictors of gross motor function and activities of daily living in children with cerebral palsy
Halima Bukar Tarfa, Auwal Bello Hassan, Umaru Muhammad Badaru, Auwal Abdullahi

Int J Rehabil Res. 2021 Sep 17. doi: 10.1097/MRR.0000000000000497. Online ahead of print.

To determine the influence of selected impairment variables, spasticity, trunk control, upper limb function and selective motor control of the lower limb on gross motor function and activities of daily living in children with cerebral palsy (CP). Seventy children with CP, 40 boys and 30 girls, with age range between 11 and 156 months were recruited in this cross-sectional study. Data on spasticity, selective motor control of the lower limb, upper limb function and trunk control were assessed using modified Ashworth scale (MAS), selective motor control of the lower limb (SCALE), paediatric arm function test, trunk motor control assessment and GMFM88, respectively. Among all the variables assessed, only trunk control significantly predicted gross motor function (beta = 0.880; $P < 0.001$) and activities of daily living (beta = 0.550; $P < 0.05$). However, gross motor function and activities of daily living have significant ($P < 0.05$) negative correlations with spasticity, and positive correlations with selective motor control of the lower limb and trunk control. Trunk control is the most influencing factor on gross motor function and activities of daily living in children with CP. Therefore, achieving trunk control especially in those at GMFCS levels V and VI should be a priority during the rehabilitation of children with CP.

PMID: 34545854

2. Psychometric properties of trunk impairment scale in children with spastic diplegia
Vedasri Dasoju, Rakesh Krishna Kovela, Jaya Shanker Tedla, Devika Rani Sangadala, Ravi Shankar Reddy

Sci Rep. 2021 Sep 17;11(1):18529. doi: 10.1038/s41598-021-98104-7.

The Trunk Impairment Scale (TIS) is a valid and reliable tool to assess trunk impairment in children with heterogeneous cerebral palsy. The purpose of this study was to determine the reliability and validity of the TIS in assessing children with spastic diplegic cerebral palsy. The sample was a total of 30 subjects (15 = boys, 15 = girls). All subjects underwent an assessment of the sitting component of the Gross Motor Function Measure-88 and TIS by rater 1. Rater one observed video recordings within 24 h and scored TIS for intra-rater reliability, while rater two did likewise after 48 h for inter-rater reliability. The mean and standard deviation of the TIS and sitting components of the Gross Motor Function Measure-88 were 15.66 ± 4.20 and 52.36 ± 6.26, respectively. We established intra-rater and inter-rater reliability of the TIS with Intra Class Correlation Coefficient 0.991 and 0.972, respectively. The concurrent validity of the TIS with the sitting component of the Gross Motor Function Measure-88 was good, with an r-value of 0.844 ($p < 0.001$). This study showed the excellent intra-rater and inter-rater reliability and high concurrent validity of the TIS in assessing children with spastic diplegic cerebral palsy.

PMID: 34535713

3. Reliability, validity, and minimal clinically important differences of the Japanese version of the early clinical assessment of balance in children with cerebral palsy
Takahito Inoue, Hiroto Izumi, Hisato Nishibu, Nobuaki Himuro

Disabil Rehabil. 2021 Sep 19;1-7. doi: 10.1080/09638288.2021.1977859. Online ahead of print.

Purpose: We aimed to translate the Early Clinical Assessment of Balance (ECAB) from English to Japanese and examine the content validity, inter-rater reliability, intra-rater reliability, construct validity, and minimal clinically important difference (MCID) for children with cerebral palsy (CP). Methods: The ECAB was translated into Japanese per international standards. The study included 106 children with CP and, aged 1.5-12 years. The ECAB, the Gross Motor Function Classification System (GMFCS), and the Gross Motor Function Measure 66 Basal & Ceiling (GMFM-66-B&C) were measured. The content and construct validity were examined based on therapist feedback and correlations between the ECAB and GMFM-66-B&C. The inter-rater reliability and the intra-rater reliability were examined by the intra-class correlation coefficient (ICC). The MCID was calculated by the anchor-based method with the GMFM-66-B&C. Results: High content validity (more than 80% agreement), inter-rater and intra-rater reliability (ICC = 0.99 & 0.99, respectively), and construct validity (r = 0.96) were demonstrated, with MCID values of 7.39, 5.32, and 6.88 observed for the GMFCS I/II, III, and IV/V, respectively. Conclusion: The Japanese version of the ECAB is a reliable and valid measure of balance ability in children with CP. Furthermore, the MCID of the ECAB was established, appears to be useful in helping to provide rehabilitation.Implications for RehabilitationThe Japanese version of the Early Clinical Assessment of Balance is easy, safe, and low-cost, and has high reliability and validity for assessing balance ability in children with cerebral palsy.The use of the Japanese version of the Early Clinical Assessment of Balance is beneficial for determining the therapeutic effect, appropriate treatment, and prediction of prognosis regarding balance ability in children with cerebral palsy.The minimal detectable change of the Japanese version of the ECAB suggest that a score exceeding 6 is a true change and the minimal clinically important difference of the Japanese version of the ECAB suggest that the scores exceeding 8, 6, and 7 for the GMFCS I/II, III, and IV/V, respectively, is a clinically useful change.

PMID: 34541984

4. Bilateral pericapsular nerves group (PENG) block for analgesia in pediatric hip surgery [Article in English, Spanish]
J A Anido Guzmán, F Javier Robles Barragán, I Funcia de la Torre, F Alfonso Sanz, I A Becerra Cayetano, C de la Hoz Serrano

Case Reports Rev Esp Anestesiol Reanim. 2021 Sep 16;S0034-9356(21)00189-4. doi: 10.1016/j.redar.2021.05.018. Online ahead of print.

Effective management and control of peri- and postoperative pain in hip surgery is essential in order to minimize the use of opioids and their adverse effects. Effective regional analgesia for hip pain is made particularly challenging by the complex innervation of the hip joint. Standard regional techniques can be associated with complications, including incomplete anesthesia, hypotension, or lower limb weakness. We present the case of a 5-year-old girl with a history of infantile cerebral palsy who underwent bilateral varus derotation osteotomy and adductor tenotomy due to paralytic dislocation. She received bilateral PENG block and femoral cutaneous nerve block - a simple technique that covers all the nerves involved in the sensory innervation of the joint capsule without the need for multiple injections.

PMID: 34538664

5. Deep learning methods for automatic segmentation of lower leg muscles and bones from MRI scans of children with and without cerebral palsy
Jiayi Zhu, Bart Bolsterlee, Brian V Y Chow, Chengxue Cai, Robert D Herbert, Yang Song, Erik Meijering

NMR Biomed. 2021 Sep 21;e4609. doi: 10.1002/nbm.4609. Online ahead of print.

Cerebral palsy is a neurological condition that is known to affect muscle growth. Detailed investigations of muscle growth require segmentation of muscles from MRI scans, which is typically done manually. In this study, we evaluated the

performance of 2D, 3D, and hybrid deep learning models for automatic segmentation of 11 lower leg muscles and two bones from MRI scans of children with and without cerebral palsy. All six models were trained and evaluated on manually segmented T1 -weighted MRI scans of the lower legs of 20 children, six of whom had cerebral palsy. The segmentation results were assessed using the median Dice similarity coefficient (DSC), average symmetric surface distance (ASSD), and volume error (VError) of all 13 labels of every scan. The best performance was achieved by H-DenseUNet, a hybrid model (DSC 0.90, ASSD 0.5 mm, and VError 2.6 cm3). The performance was equivalent to the inter-rater performance of manual segmentation (DSC 0.89, ASSD 0.6 mm, and VError 3.3 cm3). Models trained with the Dice loss function outperformed models trained with the cross-entropy loss function. Near-optimal performance could be attained using only 11 scans for training. Segmentation performance was similar for scans of typically developing children (DSC 0.90, ASSD 0.5 mm, and VError 2.8 cm3) and children with cerebral palsy (DSC 0.85, ASSD 0.6 mm, and VError 2.4 cm3). These findings demonstrate the feasibility of fully automatic segmentation of individual muscles and bones from MRI scans of children with and without cerebral palsy.

PMID: 34545647

6. Feeding problems and malnutrition associated factors in a North African sample of multidisabled children with cerebral palsy
Soumaya Boudokhane, Houda Migaou, Amine Kalai, Aicha Dhahri, Anis Jellad, Zohra Ben Salah Frih

Res Dev Disabil. 2021 Sep 17;118:104084. doi: 10.1016/j.ridd.2021.104084. Online ahead of print.

Background: In European and North American countries, stunting and malnutrition are common in children with cerebral palsy (CP), especially those with multiple disabilities. The extent of this problem in children with CP in North African countries is still unknown. Aims: To evaluate feeding problems and growth in a sample of North African multidisabled children with CP and to determine the factors associated with malnutrition in this population. Method: We conducted a cross-sectional study including multidisabled children with severe CP. Anthropometric measurements (body weight, height, mid-upper arm circumference and triceps skinfold thickness) were performed. In addition, a thorough nutritional survey was conducted including feeding time and the presence of signs in favor of gastrointestinal problems. Results: We included 40 children, mainly boys (60 %) with a mean age of 6.4 ± 3.7 (range 2-16 years). The nutritional survey had revealed the presence of dysphagia, constipation and gastroesophageal reflux in 55 %, 67.5 % and 70 % of cases, respectively. Sixty-five percent of children had a mealtime over 30 min. Based on World Health Organization (WHO) growth charts, 67.5 % of children were underweight. Forty percent of the children had their weight below the 20th percentile, 5 % and 7.5 % had their height and BMI below the 5th percentile according to CP specific growth charts. Triceps skinfold thickness and mid-upper arm circumference were below the 5th percentile in 50 % and 55 % of cases, respectively. Age ($p = 0.047$) and constipation ($p = 0.003$) were identified as predictors of malnutrition. Conclusions: Growth parameters and nutritional status are significantly altered in in our sample of North African multidisabled children with CP with a high prevalence of feeding problems represented especially by dysphagia, constipation and GER. Among the studied factors age and constipation may predict the existence of undernutrition.

PMID: 34543811

7. Prevalence of bruxism in adults with cerebral palsy institutionalized in Lisbon
Joana P Cabrita, Maria Carlos Quaresma, Maria de Fátima Bizarra

Spec Care Dentist. 2021 Sep 21. doi: 10.1111/scd.12650. Online ahead of print.

Objective: To determine the prevalence of bruxism in individuals with cerebral palsy (CP) and evaluating the various factors associated METHODS: One hundred and ten adults diagnosed with CP were selected from six institutions for people with special needs. Data were collected through oral examinations using the diagnostic criteria proposed by the American Academy of Sleep Medicine and the modified scale of Asworth RESULTS: Of the total sample, spastic tetraplegia was the most common type and half of the population presents severe intellectual disability. The prevalence of bruxism was 74,5%. Wear facets were observed in 67.9% of the sample, 59.1% of which were brilliant. There was a positive association between mixed bruxism (MB) and the spasticity classification. Through a logistic regression it was found that the risk of having MB and general bruxism (GB) is greater in individuals who have shiny wear facets. Conclusions: In the present study the high prevalence of GB indicates there is an urgent need for treatment options in people with CP. More studies are needed with standardized diagnostic protocols and representative samples to evaluate the factors that influence the presence of bruxism in this population and to establish an appropriate treatment planning.

PMID: 34547111

8. Lived experiences of pain in children and young people with cerebral palsy
Katarina Ostojic, Nicole L Sharp, Simon P Paget, Angela M Morrow

Dev Med Child Neurol. 2021 Sep 23. doi: 10.1111/dmcn.15061. Online ahead of print.

Aim: To explore the lived experiences of pain in children and young people with cerebral palsy (CP). Method: Participants were recruited from the Sydney Children's Hospitals Network and the New South Wales/Australian Capital Territory CP Registers. Inclusion criteria were as follows: CP; aged 9 to 17 years; current/past experience of pain; fluent in English; no greater than mild intellectual disability. Purposive sampling ensured representation across age, motor subtypes, and Gross Motor Function Classification System (GMFCS) levels. Semi-structured face-to-face interviews were conducted. Data were analysed following an interpretative phenomenological approach. Results: Ten participants (three male) were included (mean age 14y 5mo, SD 2y), GMFCS levels I (n=4), II (n=3), III (n=2), and IV (n=1). Analysis led to three superordinate themes: (1) Everybody's experience of pain is different; (2) When the pain is winning; (3) 'I know how to deal with it'. Pain contributors and locations varied between children. Pain intruded on school, physical activity, and psychosocial functioning. Children described personalized strategies used to deal with pain. Interpretation: In this study, children self-reported highly individualized pain experiences which interfered with their daily life and psychosocial well-being. There is a need for improvement in pain assessment and a personalized approach to pain management.

PMID: 34553772

9. Serious Game Design and Clinical Improvement in Physical Rehabilitation: Systematic Review
Catarina Vieira, Carla Ferreira da Silva Pais-Vieira, João Novais, André Perrotta

Review JMIR Serious Games. 2021 Sep 23;9(3):e20066. doi: 10.2196/20066.

Background: Serious video games have now been used and assessed in clinical protocols, with several studies reporting patient improvement and engagement with this type of therapy. Even though some literature reviews have approached this topic from a game perspective and presented a broad overview of the types of video games that have been used in this context, there is still a need to better understand how different game characteristics and development strategies might impact and relate to clinical outcomes. Objective: This review assessed the relationship between the characteristics of serious games (SGs) and their relationship with the clinical outcomes of studies that use this type of therapy in motor impairment rehabilitation of patients with stroke, multiple sclerosis, or cerebral palsy. The purpose was to take a closer look at video game design features described in the literature (game genre [GG], game nature [GN], and game development strategy [GDS]) and assess how they may contribute toward improving health outcomes. Additionally, this review attempted to bring together medical and game development perspectives to facilitate communication between clinicians and game developers, therefore easing the process of choosing the video games to be used for physical rehabilitation. Methods: We analyzed the main features of SG design to obtain significant clinical outcomes when applied to physical rehabilitation of patients recovering from motor impairments resulting from stroke, multiple sclerosis, and cerebral palsy. We implemented a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) database-adjusted electronic search strategy for the PubMed, IEEE Xplore, and Cochrane databases. Results: We screened 623 related papers from 2010-2021 and identified 12 that presented results compatible with our inclusion criteria. A total of 512 participants with stroke (8 studies, 417 participants), cerebral palsy (1 study, 8 participants), and multiple sclerosis (2 studies, 46 participants) were included; 1 study targeting the elderly (41 participants) was also included. All studies assessed motor, sensory, and functional functions, while some also measured general health outcomes. Interventions with games were used for upper-limb motor rehabilitation. Of the 12 studies, 8 presented significant improvements in at least one clinical measurement, of which 6 presented games from the casual GG, 1 combined the casual, simulation, and exergaming GGs, and 2 combined the sports and simulation GGs. Conclusions: Of the possible combinations of game design features (GG, GN, and GDS) described, custom-made casual games that resort to the first-person perspective, do not feature a visible player character, are played in single-player mode, and use nonimmersive virtual reality attain the best results in terms of positive clinical outcomes. In addition, the use of custom-made games versus commercial off-the-shelf games tends to give better clinical results, although the latter are perceived as more motivating and engaging.

PMID: 34554102

10. Finding Kinematics-Driven Latent Neural States from Neuronal Population Activity for Motor Decoding
Min-Ki Kim, Jeong-Woo Sohn, Sung-Phil Kim

IEEE Trans Neural Syst Rehabil Eng. 2021 Sep 22;PP. doi: 10.1109/TNSRE.2021.3114367. Online ahead of print.

While intracortical brain-machine interfaces (BMIs) demonstrate feasibility to restore mobility to people with paralysis, it is still challenging to maintain high-performance decoding in clinical BMIs. One of the main obstacles for high-performance BMI is the noise-prone nature of traditional decoding methods that connect neural response explicitly with physical quantity, such as velocity. In contrast, the recent development of latent neural state model enables a robust readout of large-scale neuronal population activity contents. However, these latent neural states do not necessarily contain kinematic information useful for decoding. Therefore, this study proposes a new approach to finding kinematics-dependent latent factors by extracting latent factors' kinematics-dependent components using linear regression. We estimated these components from the population activity through nonlinear mapping. The proposed kinematics-dependent latent factors generate neural trajectories that discriminate latent neural states before and after the motion onset. We compared the decoding performance of the proposed analysis model with the results from other popular models. They are factor analysis (FA), Gaussian process factor analysis (GPFA), latent factor analysis via dynamical systems (LFADS), preferential subspace identification (PSID), and neuronal population firing rates. The proposed analysis model results in higher decoding accuracy than do the others (>17% improvement on average). Our approach may pave a new way to extract latent neural states specific to kinematic information from motor cortices, potentially improving decoding performance for online intracortical BMIs.

PMID: 34550888

11. Genetic Testing in Various Neurodevelopmental Disorders Which Manifest as Cerebral Palsy: A Case Study From Iran
Marzieh Nejabat, Soroor Inaloo, Afsaneh Taghipour Sheshdeh, Shima Bahramjahan, Fatima Masoomi Sarvestani, Pegah Katibeh, Hamid Nemati, Seyed Mohammad Bagher Tabei, Mohammad Ali Faghihi

Front Pediatr. 2021 Sep 3;9:734946. doi: 10.3389/fped.2021.734946. eCollection 2021.

Purpose: Cerebral palsy (CP) is a heterogeneous permanent disorder impacting movement and posture. Investigations aimed at diagnosing this disorder are expensive and time-consuming and can eventually inconclusive. This study aimed to determine the diagnostic yield of next generation sequencing in patients with atypical CP (ACP). Methods: Patient eligibility criteria included impaired motor function with onset at birth or within the first year of life, and one or more of the following conditions: severe intellectual disability, positive family history, brain imaging findings not typical for cerebral palsy, abnormal neurometabolic profile, intractable seizure, normal neuroimaging despite severe psychomotor disability, after pediatric neurologist assessment including neuroimaging and biochemical-metabolic study offered for genetic study. Results: Exome sequencing was done for 66 patients which revealed pathogenic, likely pathogenic, and variants of unknown significance in 36.2, 9, and 43.9%, respectively. We also found 10 new mutations and were able to suggest specific and personalized treatments for nine patients. We also found three different mutations with different phenotypical spectrum in one gene that have not been reported for cerebral palsy. Conclusion: An accurate history and physical examination and determination of patients with atypical cerebral palsy for doing exome sequencing result in improved genetic counseling and personalized management.

PMID: 34540776

12. TEP1 is a risk gene for sporadic cerebral palsy
Yangong Wang, Yimeng Qiao, Ye Cheng, Yu Su, Lili Song, Yiran Xu, Hongwei Li, Lingling Zhang, Juan Song, Xiaoli Zhang, Jun Wang, Dengna Zhu, Tianxiang Tang, Qing Shang, Chao Gao, Xiaoyang Wang, Changlian Zhu, Qinghe Xing

J Genet Genomics. 2021 Sep 17;S1673-8527(21)00282-4. doi: 10.1016/j.jgg.2021.08.010. Online ahead of print.

PMID: 34543729

13. People with Cerebral Palsy and Their Family's Preferences about Genomics Research
Yana Alexandra Wilson, Sarah McIntyre, Emma Waight, Marelle Thornton, Saskia van Otterloo, Sophie Rachel Marmont, Michael Kruer, Gareth Baynam, Jozef Gecz, Nadia Badawi

Public Health Genomics. 2021 Sep 17;1-10. doi: 10.1159/000518942. Online ahead of print.

Introduction: The goal of this study was to understand individuals with cerebral palsy (CP) and their family's attitudes and preferences to genomic research, including international data sharing and biobanking. Methods: Individuals with CP and their family members were invited to participate in the web-based survey via email (NSW/ACT CP Register) or via posts on social media by Cerebral Palsy Alliance, CP Research Network, and CP Now. Survey responses included yes/no/unsure, multiple choices, and Likert scales. Fisher's exact and $\chi 2$ tests were used to assess if there were significant differences between subgroups. Results: Individuals with CP and their families (n = 145) were willing to participate in genomics research (68%), data sharing (82%), and biobanking efforts (75%). This willingness to participate was associated with completion of tertiary education, previous genetic testing experience, overall higher genomic awareness, and trust in international researchers. The survey respondents also expressed ongoing communication and diverse information needs regarding the use of their samples and data. Major concerns were associated with privacy and data security. Discussion: The success of genomic research and international data sharing efforts in CP are contingent upon broad support and recruitment. Ongoing consultation and engagement of individuals with CP and their families will facilitate trust and promote increased awareness of genomics in CP that may in turn maximize participant uptake and recruitment.

PMID: 34537775

14. Prenatal drug exposure as a risk factor for cerebral palsy and other developmental deficits
Wei Gao

Dev Med Child Neurol. 2021 Sep 23. doi: 10.1111/dmcn.15065. Online ahead of print.

PMID: 34553769

15. Microcephaly in Australian infants: A retrospective audit
Carlos Nunez, Anne Morris, Michele Hansen, Elizabeth J Elliott

J Paediatr Child Health. 2021 Sep 23. doi: 10.1111/jpc.15739. Online ahead of print.

Aim: To describe clinical characteristics, outcomes and causes of microcephaly in children whose condition was identified within the first year of life. Methods: Retrospective review of medical records of microcephalic children born between 2008 and 2018 and admitted for any reason during the same period to a tertiary paediatric hospital. Microcephaly was defined as occipitofrontal circumference (OFC) more than two standard deviations below the mean (>-2 SD). Results: Between January 2008 and September 2018, 1083 medical records were retrieved. Of the children, 886 were ineligible and 197 were confirmed cases of microcephaly. Of cases, 73 (37%) had primary microcephaly (at birth) and 72 (37%) had severe microcephaly (OFC > -3 SD). Of microcephalic children, 192 (98%) had congenital anomalies, of whom 93% had major anomalies, mostly cardiovascular or musculoskeletal. Neurological signs or symptoms were reported in 148 (75%), seizures being the most common. Of the 139 children with abnormal central nervous system (CNS) imaging, one or more structural brain abnormalities were identified in 124 (89%). Failure to reach developmental milestones was observed in 69%, visual impairment in 41% and cerebral palsy in 13%. Microcephaly was idiopathic in 51% and 24% had diagnosed genetic disorders. There was no association between developmental outcomes or structural brain anomalies and severity of microcephaly or timing of diagnosis. Conclusion: Our results suggest the need for a systematic investigative approach to diagnosis, including a careful history, examination, genetic testing and neuroimaging, to determine the underlying cause of microcephaly, identify co-morbidities, predict prognosis and guide genetic counselling and therapy.

PMID: 34553803

16. Short- and Long-Term Complications of Bronchopulmonary Dysplasia
Travis D Homan, Ravi P Nayak

Review Respir Care. 2021 Oct;66(10):1618-1629. doi: 10.4187/respcare.08401.

Bronchopulmonary dysplasia (BPD) is a chronic lung disease most commonly seen in preterm infants of low birthweight who required postnatal respiratory support. Although overall incidence rates have not changed, recent advancements in medical care have resulted in lower mortality rates, and those affected are beginning to live longer. As a result, the long-term repercussions of BPD are becoming more apparent. Whereas BPD has been thought of as a disease of just the lungs, resulting in abnormalities such as increased susceptibility to pulmonary infections, impaired exercise tolerance, and pulmonary hypertension, the enduring complications of BPD have been found to extend much further. This includes an increased risk for cerebral palsy and developmental delays, lower intelligence quotient (IQ) scores, impaired executive functioning, behavioral challenges, delays in expressive and receptive language development, and an increased risk of growth failure. In addition, the deficits of BPD have been found to influence much more than just physical health; BPD survivors have been noted to have higher rates of health care use, starting with the initial hospitalization and continuing with therapy and specialist follow-up, as well as impairments in quality of life, both physical and psychological, that continue into adulthood. The long-term consequences of BPD may best be addressed through future research, including better understanding of the pathophysiologic mechanisms leading to BPD, further comparisons between newborns with BPD and those without, and long-term assessment and management of BPD patients as adults.

PMID: 34552015

17. Early detection relationship of cerebral palsy markers using brain structure and general movements in infants born <32 weeks gestational age
Jun Wang, Xiushu Shen, Xihong Hu, Hong Yang, Huanhuan Yin, Xiaoyun Zhu, Herong Gao, Yun Wu, Fanzhe Meng

Early Hum Dev. 2021 Aug 25;163:105452. doi: 10.1016/j.earlhumdev.2021.105452. Online ahead of print.

Aim: To detect early brain structural and clinical functional markers of brain injury and development based on a magnetic resonance imaging (MRI) scoring system and a general movement assessment (GMA) for preterm infants later diagnosed with cerebral palsy (CP). Study design: Retrospective cohort study. General movements (GMs) were scored according to a semiquantitative scoring system: the GMs optimality score (GMOS) at preterm and term ages and the Motor Optimality Score (MOS) at the corrected age of 3 months after birth. Brain magnetic resonance imaging (MRI) at term-equivalent age was scored using an MRI scoring system. We analyzed the relationship between the early degree of cerebral white matter (WM) abnormality and the GMOS and the MOS for infants born <32 weeks gestational age later diagnosed with CP in a comparison group of neurotypical controls. Subjects: Sixteen preterm infants were included in this study who underwent MRI and GMs assessment. 8 out of the 16 preterm infants were later diagnosed with CP, while the other 8 infants with normal motor development (N) were placed into the control group. Their median gestational age was 30w6d and 27w6d for each group respectively. Results: The cerebral WM MRI scores were significantly higher in the CP group than in the control group ($p < 0.01$). The GMOS and MOS were significantly higher in the control group than in the CP group ($p < 0.05$). The MOS showed a strong correlation to the cerebral WM MRI score ($r = -0.88$) and the subscale of cerebral WM items (the cystic degeneration and the focal signal abnormalities) of the MRI score ($r = -0.94$) in the CP group. The MOS also showed a correlation with corrected biparietal diameter (cBPD) in the preterm infant group with CP ($r = 0.75$). Results of linear regression analyses between term MRI and GMs measures in preterm infants with CP are presented. Cerebral WM scores were associated with the MOS ($\beta = -0.63$; 95%CI = -0.97, -0.29; $p < 0.01$). Cerebral WM injury, including the subscale of cystic degeneration and focal signal abnormalities was closely associated with the MOS ($\beta = -0.83$; 95%CI = -1.13, -0.54; $p < 0.001$). Conclusion: Cerebral WM scores show a strong association with a decreased motor performance on the MOS in preterm infants later diagnosed with CP. Severe white matter injury and significantly decreased MOS scores may provide useful early markers and strong evidence to early predict the risk of later development of cerebral palsy in preterm infants.

PMID: 34543944

18. [Infantile cerebral palsy][Article in German]
Stephan Martin

Orthopade. 2021 Sep 23. doi: 10.1007/s00132-021-04165-x. Online ahead of print.

PMID: 34554291

19. Interventions to improve physical function for children and young people with cerebral palsy: international clinical practice guideline
Michelle Jackman, Leanne Sakzewski, Catherine Morgan, Roslyn N Boyd, Sue E Brennan, Katherine Langdon, Rachel A M Toovey, Susan Greaves, Megan Thorley, Iona Novak

Dev Med Child Neurol. 2021 Sep 21. doi: 10.1111/dmcn.15055. Online ahead of print.

Aim: To provide recommendations for interventions to improve physical function for children and young people with cerebral palsy. Method: An expert panel prioritized questions and patient-important outcomes. Using Grading of Recommendations Assessment, Development and Evaluation (GRADE) methods, the panel assessed the certainty of evidence and made recommendations, with international expert and consumer consultation. Results: The guideline comprises 13 recommendations (informed by three systematic reviews, 30 randomized trials, and five before-after studies). To achieve functional goals, it is recommended that intervention includes client-chosen goals, whole-task practice within real-life settings, support to empower families, and a team approach. Age, ability, and child/family preferences need to be considered. To improve walking ability, overground walking is recommended and can be supplemented with treadmill training. Various approaches can facilitate hand use goals: bimanual therapy, constraint-induced movement therapy, goal-directed training, and cognitive approaches. For self-care, whole-task practice combined with assistive devices can increase independence and reduce caregiver burden. Participation in leisure goals can combine whole-task practice with strategies to address environmental, personal, and social barriers. Interpretation: Intervention to improve function for children and young people with cerebral palsy needs to include client-chosen goals and whole-task practice of goals. Clinicians should consider child/family preferences, age, and ability when selecting specific interventions.

PMID: 34549424

20. Safety of day surgery for patients with special needs
Antoine Lefevre-Scelles, Cédric Sciaraffa, Jérôme Moriceau, Mélanie Roussel, Jocelyn Croze, Hervé Moizan, Véronique Fourdrinier, Bertrand Dureuil, Vincent Compere

Anaesth Crit Care Pain Med. 2021 Sep 16;100949. doi: 10.1016/j.accpm.2021.100949. Online ahead of print.

Background: The objective of this study was to assess the safety and quality of day care management for dental surgery under general anaesthesia in a population with special needs and to compare with a control population. Methods: A retrospective observational cohort study was performed. The study population included all patients who had day care dental surgery under general anaesthesia for one year. The primary endpoint was the rate of unscheduled admission, which was defined as the unplanned need to maintain a hospital stay on the evening of the surgical procedure. Secondary endpoints included occurrence of complications during the perioperative period (either anaesthesia or surgery related)) on the day of surgery (D0) and on day 1 and satisfaction of patients or their relatives. Results: Data from 138 patients (70 with special needs and 68 controls) were analysed. In both groups, patients were young (mean age 33 years ± 14 in each group). Special needs were mainly related to autism (34%), cerebral palsy (19%), intellectual disability (19%) and Down syndrome (10 %). Surgical procedures were more extensive in the control group. There was 1 unscheduled admission in the special needs group and 3 in the control group (RR 0.32, 95% CI [0.03; 3.04]). There was no difference in the rate of complications. Conclusion: In our cohort, day care management for dental surgery under general anaesthesia is safe and effective for patients with special needs.

PMID: 34537388

Prevention and Cure

21. Neural stem cell treatment for perinatal brain injury: A systematic review and meta-analysis of preclinical studies
Madeleine J Smith, Madison Claire Badawy Paton, Michael C Fahey, Graham Jenkin, Suzanne L Miller, Megan Finch-Edmondson, Courtney A McDonald

Stem Cells Transl Med. 2021 Sep 20. doi: 10.1002/sctm.21-0243. Online ahead of print.

Perinatal brain injury can lead to significant neurological and cognitive deficits and currently no therapies can regenerate the damaged brain. Neural stem cells (NSCs) have the potential to engraft and regenerate damaged brain tissue. The aim of this systematic review was to evaluate the preclinical literature to determine whether NSC administration is more effective than controls in decreasing perinatal brain injury. Controlled interventional studies of NSC therapy using animal models of perinatal brain injury were identified using MEDLINE and Embase. Primary outcomes were brain infarct size, motor, and cognitive function. Data for meta-analysis were synthesized and expressed as standardized mean difference (SMD) with 95% confidence intervals (CI), using a random effects model. We also reported secondary outcomes including NSC survival, migration, differentiation, and effect on neuroinflammation. Eighteen studies met inclusion criteria. NSC administration decreased infarct size (SMD 1.09; CI: 0.44, 1.74, P = .001; I2 = 74%) improved motor function measured via the impaired forelimb preference test (SMD 2.27; CI: 0.85, 3.69, P = .002; I2 = 86%) and the rotarod test (SMD 1.88; CI: 0.09, 3.67, P = .04; I2 = 95%). Additionally, NSCs improved cognitive function measured via the Morris water maze test (SMD of 2.41; CI: 1.16, 3.66, P = .0002; I2 = 81%). Preclinical evidence suggests that NSC therapy is promising for the treatment of perinatal brain injury. We have identified key knowledge gaps, including the lack of large animal studies and uncertainty regarding the necessity of immunosuppression for NSC transplantation in neonates. These knowledge gaps should be addressed before NSC treatment can effectively progress to clinical trial.

PMID: 34542242

22. Differential DNA methylation and transcriptional signatures characterize impairment of muscle stem cells in pediatric human muscle contractures after brain injury
Lydia A Sibley, Nicole Broda, Wendy R Gross, Austin F Menezes, Ryan B Embry, Vineeta T Swaroop, Henry G Chambers, Matthew J Schipma, Richard L Lieber, Andrea A Domenighetti

FASEB J. 2021 Oct;35(10):e21928. doi: 10.1096/fj.202100649R.

Limb contractures are a debilitating and progressive consequence of a wide range of upper motor neuron injuries that affect skeletal muscle function. One type of perinatal brain injury causes cerebral palsy (CP), which affects a child's ability to move and is often painful. While several rehabilitation therapies are used to treat contractures, their long-term effectiveness is marginal since such therapies do not change muscle biological properties. Therefore, new therapies based on a biological understanding of contracture development are needed. Here, we show that myoblast progenitors from contractured muscle in children with CP are hyperproliferative. This phenotype is associated with DNA hypermethylation and specific gene expression patterns that favor cell proliferation over quiescence. Treatment of CP myoblasts with 5-azacytidine, a DNA hypomethylating agent, reduced this epigenetic imprint to TD levels, promoting exit from mitosis and molecular mechanisms of cellular quiescence. Together with previous studies demonstrating reduction in myoblast differentiation, this suggests a mechanism of contracture formation that is due to epigenetic modifications that alter the myogenic program of muscle-generating stem cells. We suggest that normalization of DNA methylation levels could rescue myogenesis and promote regulated muscle growth in muscle contracture and thus may represent a new nonsurgical approach to treating this devastating neuromuscular condition.

PMID: 34559924

23. Hope, hype, cures, and persons with cerebral palsy
Leigh Turner

Dev Med Child Neurol. 2021 Sep 18. doi: 10.1111/dmcn.15064. Online ahead of print.

PMID: 34536300