Cerebral palsy research news

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Interventions and Management

1. What Radiographic and Clinical Factors Ultimately Necessitate a C2-Sacrum Instrumented Posterior Spinal Fusion?
Justin Mathew, Scott L Zuckerman, Gerard Marciano, Matthew Simhon, Hannah Lin, Meghan Cerpa, Nathan J Lee, Venkat Boddapati, Ronald A Lehman, Zeeshan M Sardar, Marc D Dyrszka, Joseph M Lombardi, Lawrence G Lenke

Global Spine J. 2022 Nov 7;21925682221137031. doi: 10.1177/21925682221137031. Online ahead of print.

Objective: /Hypothesis: Patients undergoing C2-sacrum PSF have unique medical histories and multiple prior operations over an extended period. Design: Single center, retrospective cohort. Methods: Consecutive C2-sacrum PSF patients operated on by 4 surgeons at a single-center from 2015-2020 were reviewed. Demographics, comorbidities, indications, surgical history, and radiographic parameters were collected. Results: 23 patients underwent C2-sacrum PSF. 13 (57%) were male, and 21 (91.3%) were adults. Mean age at time of first spine surgery was 44 years (range 5-71) and 53 years (range 14-72) at the time of C2-sacrum PSF. Six patients (26%) had osteoporosis, and 6 patients (26%) had neurologic comorbidities-including Parkinson's disease (4), cerebral palsy (1), and Brown Sequard syndrome (1). Four (17%) had connective tissue disease. Two patients underwent C2-sacrum PSF as an index procedure: (1) 67M with myelomatous fractures and 124° of cervicothoracic kyphosis; (2) 28F with severe Marfan syndrome with 140° thoracic scoliosis and 130° thoracic kyphosis. The remaining 21 (91%) underwent C2-sacrum PSF as a revision following prior spinal surgeries on average, 4 previous surgeries (range 1-13) over 10.5 years (range .3-37.4). Indications for the remaining 21 C2-sacrum PSF revision procedures included 17 (81%) for kyphosis (5 of whom also had significant coronal deformity), 1 (5%) for only coronal malalignment, 2 (10%) for instrumentation failure, and 1 (5%) for myelopathy. Conclusions: 91% (21/23) of patients requiring C2-sacrum PSF were treated as revisions of prior fusions, with a mean of 4 prior surgeries over 10 years. Over 80% of these patients underwent C2-sacrum PSF to address kyphosis. 26% had neurologic conditions, and 26% had osteoporosis.

PMID: 36345053

2. Spontaneous bilateral femur neck fracture secondary to grand mal seizure: A case report
Eyup Senocak

Case Reports World J Clin Cases. 2022 Oct 26;10(30):11111-11115. doi: 10.12998/wjcc.v10.i30.11111.

Background: Spontaneous bilateral femur neck fracture is a rare entity in the general population. Case summary: A 17-year-old immobile, developmentally delayed male with the sequelae of cerebral palsy fractured both femoral necks during a grand mal epileptic seizure. He had been treated with valproic acid as an antiseizure medication for about 10 years; otherwise, he had no history of drug use. The laboratory analysis was normal except a marked vitamin D deficiency. Closed reduction and osteosynthesis with percutaneous cannulated screws were performed. Solid union was observed at 6 mo, and rapid

postoperative rehabilitation was started. Conclusion: A femoral neck fracture may occur in a person with epilepsy presenting with hip pain in the emergency department.

PMID: 36338213

3. Development of a core set of gait features and their potential underlying impairments to assist gait data interpretation in children with cerebral palsy
Marjolein M van der Krogt, Han Houdijk, Koen Wishaupt, Kim van Hutten, Sarah Dekker, Annemieke I Buizer

Front Hum Neurosci. 2022 Oct 20;16:907565. doi: 10.3389/fnhum.2022.907565. eCollection 2022.

Background: The interpretation of clinical gait data in children with cerebral palsy (CP) is time-consuming, requires extensive expertise and often lacks transparency. Here we aimed to develop a set of look-up tables to support this process, linking typical gait features as present in CP to their potential underlying impairments. Methods: We developed an initial core set of gait features and their potential underlying impairments based on biomechanical reasoning, literature and clinical experience. This core set was further specified through a Delphi process in a multidisciplinary group of experts in gait analysis of children with CP and evaluated on 20 patient cases. The likelihood of the listed gait feature-impairment relationships was scored by the expert panel on a five-point scale. Results: The final core set included 120 relevant gait feature-impairment relations including likelihood scores. This set was presented in the form of look-up tables in both directions, i.e., sorted by gait features with potential underlying impairment, and sorted by impairments with potential related gait features. The average likelihood score for the relations was 3.5 ± 0.6 (range 2.1-4.6). Conclusion: The developed set of look-up tables linking gait features and impairments, can assist gait analysts and clinicians in standardized biomechanical reasoning, to support treatment decision-making for gait impairments in children with CP. Keywords: biomechanics; cerebral palsy; clinical gait analysis; clinical reasoning; gait interpretation; impairment focused interpretation; interpretation tool; rehabilitation.

PMID: 36337854

4. Effect of task-oriented training on gross motor function, balance and activities of daily living in children with cerebral palsy: A systematic review and meta-analysis
Weiyi Zai, Ning Xu, Wei Wu, Yueying Wang, Runfang Wang

Meta-Analysis Medicine (Baltimore). 2022 Nov 4;101(44):e31565. doi: 10.1097/MD.0000000000031565.

Background: To systematically evaluate task-oriented training (TOT) on the improvement of gross motor function, balance and activities of daily living in children with cerebral palsy (CP). Methods: A number of randomized controlled trials (RCTs) of TOT in children with CP were searched from Pubmed, Cochrane Library, Web of Science, EmBase, China National Knowledge Infrastructure, Chinese Biology Medicine, Chinese Scientific Journals Database and Wanfang data from the establishment of database to March 2022. The methodological quality of the included studies was evaluated, and meta-analysis was performed by RevMan5.4 software. Results: A total of 16 studies were included in the systematic review (n = 893). Meta-analysis showed that the gross motor function measure (GMFM) (MD = 11.05, 95%CI [8.26, 13.83], P < .00001), dimension D (MD = 3.05, 95%CI [1.58, 4.53], P < .0001) of the GMFM, dimension E (MD = 7.36, 95%CI [5.88, 8.84], P < .00001) of the GMFM, the Berg Balance Scale (BBS) (MD = 6.23, 95%CI [3.31, 9.15], P < .0001), the pediatric evaluation of disability inventory (PEDI) mobile function (MD = 6.44, 95%CI [3.85, 9.02], P < .00001) score improved significantly in the TOT group compared with the control group. Conclusions: Current evidence shows that TOT could effectively improve gross motor function, balance and activities of daily living in children with CP. Due to the limitations of the number and quality of the included studies, the above conclusions need to be verified by more high-quality studies.

PMID: 36343029

5. Instrumented strength assessment in typically developing children and children with a neural or neuromuscular disorder: A reliability, validity and responsiveness study
Ineke Verreydt, Ines Vandekerckhove, Elze Stoop, Nicky Peeters, Vanessa van Tittelboom, Patricia Van de Walle, Marleen Van den Hauwe, Nathalie Goemans, Liesbeth De Waele, Anja Van Campenhout, Britta Hanssen, Kaat Desloovere

Front Physiol. 2022 Oct 19;13:855222. doi: 10.3389/fphys.2022.855222. eCollection 2022.

The aim of this study was to determine the clinimetric properties, i.e., reliability, validity and responsiveness of an instrumented strength assessment in typically developing (TD) children and children with cerebral palsy (CP) and Duchenne muscular dystrophy (DMD). Force (N), torque (Nm) and normalized torque (Nm/kg) were defined for maximal voluntary isometric contractions (MVICs) of the lower limb muscles using a pre-established protocol. Intraclass correlation coefficient (ICC), standard error of measurement (SEM) and minimal detectable change (MDC) of TD children (n = 14), children with CP (n = 11) and DMD (n = 11) were used to evaluate intra-rater reliability for the three cohorts and the inter-rater intersession as well as inter-rater intrasession reliability for TD children. Construct validity was assessed by comparing MVICs in TD children (n = 28) to children with CP (n = 26) and to children with DMD (n = 30), using the Kruskal Wallis and post-hoc Mann-Whitney U tests. Responsiveness was investigated by assessing changes in MVICs following a strength intervention in CP (n = 26) and a 1 and 2 year follow-up study in DMD (n = 13 and n = 6, respectively), using the Wilcoxon Signed-Rank test. The overall intra-rater reliability, was classified as good to excellent for 65.1%, moderate for 27.0% and poor for 7.9% of the measures (47.6%, 76.2%, and 66.7% good-excellent; 28.6%, 23.8%, and 33.7% moderate; 23.8%, 0%, and 0% poor in TD, CP, and DMD, respectively), while ICC values for TD children were slightly lower for inter-rater intrasession reliability (38.1% good-excellent, 33.3% moderate and 26.6% poor) and for inter-rater intersession reliability (47.6% good-excellent, 23.8% moderate and 28.6% poor). Children with CP and DMD were significantly weaker than TD children ($p < 0.001$) and the majority of these strength differences exceeded the MDC. Children with CP significantly improved strength after training, with changes that exceeded the SEMs, whereas only limited strength decreases over time were observed in the DMD cohort. In conclusion, the investigated instrumented strength assessment was sufficiently reliable to confirm known-group validity for both cohorts and could detect the responsiveness of children with CP after a strength intervention. However, more research is necessary to determine the responsiveness of this assessment in children with DMD regarding their natural decline.

PMID: 36338500

6. A Probe Study on Vocal Development in Two Infants at Risk for Cerebral Palsy
Helen L Long, Naomi Eichorn, D Kimbrough Oller

Dev Neurorehabil. 2022 Nov 6;1-8. doi: 10.1080/17518423.2022.2143923. Online ahead of print.

The present work examined canonical babbling ratios longitudinally as a measure of onset and consolidation of canonical babbling in two infants at risk of cerebral palsy (CP) between 5 and 16 months. Ten typically developing infants were included for comparison at 6, 9, 12, and 16-19 months. Canonical babbling ratios (CBRs) were calculated from 5-min segments, and follow-up diagnostic outcomes were collected between 24 and 33 months. The two infants at risk demonstrated low CBR growth trajectories compared to the typical infant group, and slightly different patterns of consolidation. The two infants at risk were later diagnosed with different levels of CP and speech impairment severity. All infants demonstrated greater variability than expected. Studying canonical babbling and other prelinguistic milestones in this population may inform our perspective of the involvement of the motor system in the vocal domain. Additional implications on the analysis of canonical babbling using all-day home recordings are discussed.

PMID: 36335437

7. A Descriptive Study of Speech Breathing in Children With Cerebral Palsy During Two Types of Connected Speech Tasks
Sydney Kovacs, Meghan Darling-White

J Speech Lang Hear Res. 2022 Nov 9;1-20. doi: 10.1044/2022_JSLHR-22-00295. Online ahead of print.

Purpose: This study examined speech breathing during two connected speech tasks in children with cerebral palsy (CP) and typically developing (TD) peers. Understanding how the respiratory system supports speech production during various speech tasks can help researchers construct appropriate models of speech production and clinicians remediate speech disorders effectively. Method: Four children with CP and four age- and sex-matched TD peers completed two speech tasks, reading and extemporaneous speech. Respiratory kinematic and acoustic data were collected. Dependent variables included utterance

length, speech rate, sound pressure level, and lung volume variables. Results: Based on descriptive results, children with CP and speech motor involvement demonstrated reduced utterance length and speech rate, equivalent intensity levels, and changes in lung volume variables indicative of respiratory physiological impairment as compared to their TD peers. However, children with CP and no speech motor involvement exhibited speech production and speech breathing variables in the more typical range. In relation to task effects, the majority of children (CP and TD) produced shorter utterances, slower speech rates, equivalent intensity levels, higher lung volume initiation, termination, excursion, higher percent vital capacity per syllable, and longer inspiratory duration during extemporaneous speech as compared to reading. Conclusions: Two major themes emerged from the data: (a) Children with CP, particularly those with concomitant speech motor involvement, demonstrate different speech production and speech breathing patterns than their TD peers. (b) Speech task impacts speech production and speech breathing variables in both children with CP and their TD peers, but the extemporaneous speech task did not seem to exaggerate group differences.

PMID: 36351251

8. The Effects of Virtual Reality Training on Balance, Gross Motor Function, and Daily Living Ability in Children With Cerebral Palsy: Systematic Review and Meta-analysis
Cong Liu, Xing Wang, Rao Chen, Jie Zhang

Review JMIR Serious Games. 2022 Nov 9;10(4):e38972. doi: 10.2196/38972.

Background: The increasing number of children with cerebral palsy (CP) has a serious impact on individuals, families, and society. As a new technology, virtual reality (VR) has been used in the rehabilitation of children with CP. Objective: This study aimed to systematically evaluate the effect of VR training on balance, gross motor function, and daily living ability in children with CP. Methods: PubMed, Embase, The Cochrane Library, Web of Science, and China National Knowledge Infrastructure databases were searched by computer, with the search period being from the establishment of each database to December 25, 2021, to collect randomized controlled trials (RCTs) on the effects of VR training on balance, gross motor function, and daily living ability in children with CP. The Cochrane risk of bias assessment tool was used to conduct quality assessment on the included literature, and RevMan software (version 5.3) was used to analyze data. Results: A total of 16 articles were included, involving 513 children with CP. VR training can improve the balance function (Pediatric Balance Scale: mean difference 2.06, 95% CI 1.15-2.97; P<.001; Berg Balance Scale: mean difference 3.66, 95% CI 0.29-7.02; P=.03) and gross motor function (standardized mean difference [SMD] 0.60, 95% CI 0.34-0.87; P<.001) of children with CP. However, there is still certain disagreement on the impact on daily living ability (SMD 0.37, 95% CI -0.04 to 0.78; P=.08); after removing the source literature with heterogeneity, VR training can improve the daily living ability of children with CP (SMD 0.55, 95% CI 0.30-0.81; P<.001). Conclusions: VR training can significantly improve the balance function and gross motor function of children with CP, but the effect on the daily living ability of children with CP remains controversial.

PMID: 36350683

9. [Effectiveness of robotic technology and virtual reality for the rehabilitation of motor function in cerebral palsy. Systematic review][Article in Spanish]
C Meneses Castaño, P Penagos, B Yamile Jaramillo

Review Rehabilitacion (Madr). 2022 Nov 4;S0048-7120(22)00079-2. doi: 10.1016/j.rh.2022.07.001. Online ahead of print.

Introduction: Cerebral palsy (CP) is a health condition secondary to non-progressive damage that occurs during brain development in the fetal or infant stage. To evaluate the effectiveness of robotic technology and virtual reality on motor function in patients with CP compared to conventional rehabilitation strategies such as physical therapy, occupational therapy, neurodevelopmental intervention, and transcranial stimulation. A review of randomized controlled trials of the last 5 years was carried out. For the evaluation of the methodological quality of the included studies, the PEDro scale was used, with evaluation of the level of evidence and degree of recommendation according to the Oxford classification. Results: Seventeen articles met the eligibility criteria. Robotic technology and virtual reality proved to be effective in improving motor function, manual skills, and visual-perceptual skills in patients with CP, compared to the use of conventional rehabilitation strategies.

PMID: 36344300

10. On the feasibility of simple brain-computer interface systems for enabling children with severe physical disabilities to explore independent movement
Erica D Floreani, Danette Rowley, Dion Kelly, Eli Kinney-Lang, Adam Kirton

Front Hum Neurosci. 2022 Oct 21;16:1007199. doi: 10.3389/fnhum.2022.1007199. eCollection 2022.

Introduction: Children with severe physical disabilities are denied their fundamental right to move, restricting their development, independence, and participation in life. Brain-computer interfaces (BCIs) could enable children with complex physical needs to access power mobility (PM) devices, which could help them move safely and independently. BCIs have been studied for PM control for adults but remain unexamined in children. In this study, we explored the feasibility of BCI-enabled PM control for children with severe physical disabilities, assessing BCI performance, standard PM skills and tolerability of BCI. Materials and methods: Patient-oriented pilot trial. Eight children with quadriplegic cerebral palsy attended two sessions where they used a simple, commercial-grade BCI system to activate a PM trainer device. Performance was assessed through controlled activation trials (holding the PM device still or activating it upon verbal and visual cueing), and basic PM skills (driving time, number of activations, stopping) were assessed through distance trials. Setup and calibration times, headset tolerability, workload, and patient/caregiver experience were also evaluated. Results: All participants completed the study with favorable tolerability and no serious adverse events or technological challenges. Average control accuracy was 78.3 ± 12.1%, participants were more reliably able to activate (95.7 ± 11.3%) the device than hold still (62.1 ± 23.7%). Positive trends were observed between performance and prior BCI experience and age. Participants were able to drive the PM device continuously an average of 1.5 meters for 3.0 s. They were able to stop at a target 53.1 ± 23.3% of the time, with significant variability. Participants tolerated the headset well, experienced mild-to-moderate workload and setup/calibration times were found to be practical. Participants were proud of their performance and both participants and families were eager to participate in future power mobility sessions. Discussion: BCI-enabled PM access appears feasible in disabled children based on evaluations of performance, tolerability, workload, and setup/calibration. Performance was comparable to existing pediatric BCI literature and surpasses established cut-off thresholds (70%) of "effective" BCI use. Participants exhibited PM skills that would categorize them as "emerging operational learners." Continued exploration of BCI-enabled PM for children with severe physical disabilities is justified.

PMID: 36337857

11. Noninvasive Neuromodulation May Help Improve Function in Cerebral Palsy
Howard D Larkin

JAMA. 2022 Nov 8;328(18):1798. doi: 10.1001/jama.2022.18447.

No abstract available

PMID: 36346426

12. SUpporting People in extreme POverty with Rehabilitation and Therapy (SUPPORT CP): a trial among families of children with cerebral palsy in Bangladesh
Mahmudul Hassan Al Imam, Israt Jahan, Manik Chandra Das, Sk Md Kamrul Bashar, Arifuzzaman Khan, Mohammad Muhit, Rosalie Power, Delwar Akbar, Nadia Badawi, Gulam Khandaker

Dev Med Child Neurol. 2022 Nov 6. doi: 10.1111/dmcn.15445. Online ahead of print.

Aim: To test the efficacy of an integrated microfinance/livelihood and community-based rehabilitation (IMCBR) programme in improving health-related quality of life (HRQoL) and motor function of children with cerebral palsy (CP) and gain in social capital to their ultra-poor families in rural Bangladesh. Method: This was an open-label cluster randomized control trial. Children with CP aged 5 years or under were randomly allocated to three arms; Arm A: IMCBR; Arm B: community-based rehabilitation (CBR); and Arm C: care-as-usual. The CBR was modified with phone follow-up followed by home-based CBR at 2.5 months post-enrolment because of the COVID-19 pandemic. Intention-to-treat analysis was performed. Results: Twenty-four clusters constituting 251 children-primary caregivers' dyads were assigned to three arms (Arm A = 80; Arm B = 82; Arm

C = 89). Between baseline and endline, the percentage mean change in the physical functioning domain of HRQoL was highest in Arm A (30.0%) with a significant mean difference between Arm A and Arm B (p = 0.015). Improvement in the mean social capital score was significantly higher in Arm A compared to Arm C (p < 0.001). Interpretation: The findings suggest that IMCBR could improve the HRQoL of children with CP and the social capital of their ultra-poor families. Long-term follow-up of the trial participants and future exploration of such interventions are essential. The integrated livelihood and CBR programme holds potential to improve health and well-being of children with CP and their ultra-poor families.

PMID: 36335570

13. Spectrum of Common Pediatric Neurological Disorders: A Cross-Sectional Study From Three Tertiary Care Centres Across Pakistan

Prem Chand, Tipu Sultan, Shazia Kulsoom, Farida Jan, Shahnaz Ibrahim, Khairunnisa Mukhtiar, Safia Awan, Ibrar Rafique, Durray Shahwar A Khan, Asna Sulaiman, Muhammad Arif Nadeem Saqib, Muhammad Sajid, Zahra Ali Padhani, Jai K Das, Shazia Soomro, Mohammad Wasay

Pediatr Neurol. 2022 Oct 7;138:33-37. doi: 10.1016/j.pediatrneurol.2022.09.005. Online ahead of print.

Background: There is dearth of information on the spectrum of neurological disorders among children less than 18 years of age. The aim of this study is to identify the commonly presenting neurological disorders among children aged ≤ 18 years in Pakistan. Methods: We conducted a cross-sectional study at three tertiary care hospitals in Pakistan. Results: A total of 17,176 children were included in our study; 61.8% were boys and 38.2% females. The most commonly presenting neurological disorder was epilepsy (36%), followed by behavior disorders (16%) and cerebral palsy (10.5%). There was significant difference between children less than 5 years and greater than 5 years age groups, with less than 5 years age group showing higher prevalence for behavioral disorders (P < 0.001), cerebral palsy (P < 0.001), infections (P = 0.014), sequalae (P < 0.001), and developmental disorders (P < 0.001). Gender-wise distribution showed epilepsy to be the most common neurological disorder among both genders, with a significant difference being reported between gender and epilepsy (P = 0.009), headache disorders (P < 0.001), neuroinflammatory disorders (P = 0.025), neurocutaneous syndromes (P < 0.001), behavioral diseases (P < 0.001), cerebral palsy (P = 0.009), and movement disorders (P < 0.001). Conclusions: The result of this analysis helps to assess the commonly presenting neurological disorders in children. This study will help health care workers in resource-poor settings within Pakistan to be mindful of the common neurological disorders while diagnosing a child with neurological symptoms in an outpatient setting. Health care providers need to be trained to identify and treat these common conditions; however, there is still a dire need for more trained neurologists across the country.

PMID: 36335840

14. The developing brain: Challenges and opportunities to promote school readiness in young children at risk of neurodevelopmental disorders in low- and middle-income countries

Mijna Hadders-Algra

Front Pediatr. 2022 Oct 21;10:989518. doi: 10.3389/fped.2022.989518. eCollection 2022.

This paper discusses possibilities for early detection and early intervention in infants with or at increased risk of neurodevelopmental disorders in low- and middle-income countries (LMICs). The brain's high rate of developmental activity in the early years post-term challenges early detection. It also offers opportunities for early intervention and facilitation of school readiness. The paper proposes that in the first year post-term two early detection options are feasible for LMICs: (a) caregiver screening questionnaires that carry little costs but predict neurodevelopmental disorders only moderately well; (b) the Hammersmith Infant Neurological Examination and Standardized Infant NeuroDevelopmental Assessment (SINDA) which are easy tools that predict neurodisability well but require assessment by health professionals. The young brain's neuroplasticity offers great opportunities for early intervention. Ample evidence indicates that families play a critical role in early intervention of infants at increased risk of neurodevelopmental disorders. Other interventional key elements are responsive parenting and stimulation of infant development. The intervention's composition and delivery mode depend on the infant's risk profile. For instance, in infants with moderately increased risk (e.g., preterm infants) lay community health workers may provide major parts of intervention, whereas in children with neurodisability (e.g., cerebral palsy) health professionals play a larger role.

PMID: 36340733

15. Potentially Preventable Hospitalizations Among Adults With Pediatric-Onset Disabilities
Elham Mahmoudi, Paul Lin, Anam Khan, Neil Kamdar, Mark D Peterson

Mayo Clin Proc. 2022 Nov 3;S0025-6196(22)00468-2. doi: 10.1016/j.mayocp.2022.07.026. Online ahead of print.

Objective: To examine the risk of any and specific potentially preventable hospitalizations (PPHs) for adults with cerebral palsy (CP) or spina bifida (SB). We hypothesize that PPH risk is greater among adults with CP/SB compared with the general population. Patients and methods: Using January 1, 2007, to December 31, 2017, national private administrative claims data (OptumInsight) in the United States, we identified adults with CP/SB (n=10,617). Adults without CP/SB were included as controls (n=1,443,716). To ensure a similar proportion in basic demographics, we propensity-matched our controls with cases in age and sex (n=10,617). Generalized estimating equation models were applied to examine the risk of CP/SB on PPHs. All models were adjusted for age, sex, race/ethnicity, health indicators, US Census Division data, and socioeconomic variables. Adjusted odds ratios were compared within a 4-year follow-up. Results: Adults with CP/SB had higher risk for any PPH (odds ratio [OR], 4.10; 95% CI, 2.31 to 7.31), and PPHs due to chronic obstructive pulmonary disease/asthma (OR, 1.85; CI, 1.23 to 2.76), pneumonia (OR, 3.01; 95% CI, 2.06 to 4.39), and urinary tract infection (OR, 6.48; 95% CI, 3.91 to 10.75). Cases and controls who had an annual wellness visit had lower PPH risk (OR, 0.52; 95% CI, 0.41 to 0.67); similarly, adults with CP/SB who had an annual wellness visit compared with adults with CP/SB who did not had lower odds of PPH (OR, 0.75; 95% CI, 0.60 to 0.94). Conclusion: Adults with pediatric-onset disabilities are at a greater risk for PPHs. Providing better access to preventive care and health-promoting services, especially for respiratory and urinary outcomes, may reduce PPH risk among this patient population.

PMID: 36336517

16. Perinatal Stroke in Fetuses, Preterm and Term Infants
R Srivastava, J Mailo, M Dunbar

Review Semin Pediatr Neurol. 2022 Oct;43:100988. doi: 10.1016/j.spen.2022.100988. Epub 2022 Aug 5.

Perinatal stroke is a well-defined heterogenous group of disorders involving a focal disruption of cerebral blood flow between 20 weeks gestation and 28 days of postnatal life. The most focused lifetime risk for stroke occurs during the first week after birth. The morbidity of perinatal stroke is high, as it is the most common cause of hemiparetic cerebral palsy which results in lifelong disability that becomes more apparent throughout childhood. Perinatal strokes can be classified by the timing of diagnosis (acute or retrospective), vessel involved (arterial or venous), and underlying cause (hemorrhagic or ischemic). Perinatal stroke has primarily been reported as a disorder of term infants; however, the preterm brain possesses different vulnerabilities that predispose an infant to stroke injury both in utero and after birth. Accurate diagnosis of perinatal stroke syndromes has important implications for investigations, management, and prognosis. The classification of perinatal stroke by age at presentation (fetal, preterm neonatal, term neonatal, and infancy/childhood) is summarized in this review, and includes detailed descriptions of risk factors, diagnosis, treatment, outcomes, controversies, and resources for family support.

PMID: 36344024

17. Neurodevelopmental outcomes after antenatal therapy for fetal supraventricular tachyarrhythmias: 3-year follow-up of a multicenter trial
T Miyoshi, Y Maeno, T Matsuda, Y Ito, N Inamura, K-S Kim, I Shiraishi, K Kurosaki, T Ikeda, H Sago, Japan Fetal Arrhythmia Group

Ultrasound Obstet Gynecol. 2022 Nov 9. doi: 10.1002/uog.26113. Online ahead of print.

Objectives: Although many studies have supported the efficacy of transplacental treatment for fetal supraventricular tachyarrhythmias, the long-term neurodevelopmental outcome after antenatal antiarrhythmic treatment is not well understood. The aim of this study was to clarify prognosis and neurodevelopmental outcome after protocol-defined antenatal therapy for fetal supraventricular tachyarrhythmias, in addition to the incidence of tachyarrhythmias after birth. Methods: This 3-year follow-up study of a multicenter trial for fetal supraventricular tachycardia and atrial flutter evaluated the primary endpoint of

mortality and neurodevelopmental impairment (NDI). NDI was defined as any of the following outcomes: cerebral palsy, bilateral blindness, bilateral deafness, or neurodevelopmental delay. The detection rate of tachyarrhythmia was also evaluated as the secondary endpoint. In addition, the correlations between NDI and perinatal factors or postnatal factors were analyzed at 36 months of corrected age. Results: Of 50 patients, the exclusions during the protocol-defined transplacental treatment were 1 patient because of withdrawal of consent and 2 patients with fetal death, leaving 47 patients available for enrollment in this follow-up study. Among these 47 neonates, 45 were available for analysis after 2 were lost to follow-up. The mortality rate was 2.2% (1/45) during a median follow-up of 3.2 years (2.1-9.4 years). Of these 45 infants, 2 dropped out, of whom 1 died at age 2.1 years, and 1 had missing neurodevelopmental assessment data. For the remaining 43 infants, at 36 months of corrected age, NDI was detected in 9.3% (4/43) of infants overall and in 2 of 3 infants of fetal hydrops with subcutaneous edema; cerebral palsy was found in 2 infants with severe subcutaneous edema or ascites at early gestational age; and neurodevelopmental delay was found in 2 infants with tuberous sclerosis or heterotaxy syndrome. Tachyarrhythmias were present in 31.9% (15/47) in the neonatal period and gradually decreased to 8.9% (4/45) and 4.5% (2/44) at 18 and 36 months of corrected age, respectively. The ventricular rate at diagnosis was significantly higher in infants with NDI than those without (median, 265 bpm vs. 229 bpm, P=0.003). In infants with NDI, fetal hydrops with subcutaneous edema at diagnosis was more common (50.0% vs. 2.6%, P=0.019), and the duration of fetal effusion was longer (median, 10.5 days vs. 0 day, P=0.013) than those without. Whereas postnatal arrhythmia and physical development abnormalities were not associated with NDI. Conclusions: Our multicenter 3-year follow-up study was the first to demonstrate the long-term mortality and morbidity of infants born with protocol-defined transplacental treatment for fetal supraventricular tachycardia and atrial flutter. NDI was associated with the presence of fetal hydrops with subcutaneous edema at diagnosis and longer duration of fetal effusion. Neurodevelopmental delay was detected only in infants with severe congenital abnormalities. Therefore, the risk of NDI was rather low in the absence of other comorbidities. The risk for long-term neurologic morbidity might be considered, especially in cases of fetal hydrops with subcutaneous edema and/or associated severe congenital abnormalities.

PMID: 36350016

18. Mammillary body abnormalities and cognitive outcomes in children cooled for neonatal encephalopathy
Arthur P C Spencer, Maarten H Lequin, Linda S de Vries, Jonathan C W Brooks, Sally Jary, James Tonks, Frances M Cowan, Marianne Thoresen, Ela Chakkarapani

Dev Med Child Neurol. 2022 Nov 6. doi: 10.1111/dmcn.15453. Online ahead of print.

Aim: To evaluate mammillary body abnormalities in school-age children without cerebral palsy treated with therapeutic hypothermia for neonatal hypoxic-ischaemic encephalopathy (cases) and matched controls, and associations with cognitive outcome, hippocampal volume, and diffusivity in the mammillothalamic tract (MTT) and fornix. Method: Mammillary body abnormalities were scored from T1-weighted magnetic resonance imaging (MRI) in 32 cases and 35 controls (median age [interquartile range] 7 years [6 years 7 months-7 years 7 months] and 7 years 4 months [6 years 7 months-7 years 7 months] respectively). Cognition was assessed using the Wechsler Intelligence Scale for Children, Fourth Edition. Hippocampal volume (normalized by total brain volume) was measured from T1-weighted MRI. Radial diffusivity and fractional anisotropy were measured in the MTT and fornix, from diffusion-weighted MRI using deterministic tractography. Results: More cases than controls had mammillary body abnormalities (34% vs 0%; $p < 0.001$). Cases with abnormal mammillary bodies had lower processing speed ($p = 0.016$) and full-scale IQ ($p = 0.028$) than cases without abnormal mammillary bodies, and lower scores than controls in all cognitive domains ($p < 0.05$). Cases with abnormal mammillary bodies had smaller hippocampi (left $p = 0.016$; right $p = 0.004$) and increased radial diffusivity in the right MTT ($p = 0.004$) compared with cases without mammillary body abnormalities. Interpretation: Cooled children with mammillary body abnormalities at school-age have reduced cognitive scores, smaller hippocampi, and altered MTT microstructure compared with those without mammillary body abnormalities, and matched controls.

PMID: 36335569

19. Chorionicity and neurodevelopmental outcomes in twin pregnancy: a systematic review and meta-analysis
Shuhan Yan, Yuan Wang, Zhifang Chen, Feng Zhang

Review J Perinatol. 2022 Nov 4. doi: 10.1038/s41372-022-01534-y. Online ahead of print.

Objective: Through a systematic review and meta-analyses, we aimed to analyze the impact of chorionicity on

neurodevelopment outcomes. Study design: We conducted a comprehensive search strategy through Medline, Embase, Web of Science, and reference lists of the retrieved studies until August 2022. Studies that examined the association between chorionicity and children's neurodevelopment outcomes were included. Results: Twelve studies were included. Monochorionic (MC) twins increased the odds of neurodevelopment impairment, cerebral palsy compared to dichorionic (DC) twins. The differences in neurodevelopmental impairment and cerebral palsy between the two groups disappeared after excluding infants with twin-twin transfusion (TTTS). After fetoscopic laser surgery (FLS) for MC twins, there were no differences too. Conclusions: Compared to DC twins, MC twins were associated with an increased risk of neurodevelopment impairment. MC twins complicated by TTTS were at high risk of neurologic disability, and FLS was an acceptable treatment modality for them.

PMID: 36333420

20. [Surgical and biological techniques in cerebral palsy][Article in Spanish]
R L Lieber

Editorial Rehabilitacion (Madr). 2022 Nov 3;S0048-7120(22)00091-3. doi: 10.1016/j.rh.2022.09.002. Online ahead of print.

No abstract available

PMID: 36336483

21. Is scalp-based acupuncture and moxibustion better than conventional rehabilitation therapy for children with cerebral palsy?
Qingbo Feng, Xiaoyin Liu, Qiuping Ren, Wenwei Liao, Jiaxin Li

Comment Transl Pediatr. 2022 Oct;11(10):1735-1736. doi: 10.21037/tp-22-249.

No abstract available

PMID: 36345440

22. Explanation of issues in " Is scalp-based acupuncture and moxibustion better than conventional rehabilitation therapy for children with cerebral palsy' from the readers?"
Yuman Xue, Shuai Shi, Shuang Zheng, Zhongfeng Yang, Jiaben Xu, Feifei Gong

Transl Pediatr. 2022 Oct;11(10):1737-1738. doi: 10.21037/tp-2022-02.

No abstract available

PMID: 36345455

23. Neonatal kaempferol exposure attenuates gait and strength deficits and prevents altered muscle phenotype in a rat model of cerebral palsy
Int J Dev Neurosci. 2022 Nov 7. doi: 10.1002/jdn.10239. Online ahead of print.

Diego Bulcão Visco , Raul Manhães de Castro, Marcia Maria da Silva, Bárbara Juacy Rodrigues Costa de Santana, Henrique José Cavalcanti Bezerra Gouveia, Maria Laura Rodrigues de Moura Ferraz, Glayciele Leandro de Albuquerque, Diego Cabral Lacerda, Diogo Antônio Alves de Vasconcelos, Omar Guzman Quevedo, Ana Elisa Toscano

Cerebral palsy (CP) is characterized by brain damage at a critical period of development of the central nervous system, and, as a result, motor, behavioral, and learning deficits are observed in those affected. Flavonoids such as kaempferol have demonstrated potential anti-inflammatory and neuroprotective properties for neurological disorders. This study aimed to assess the effects of neonatal treatment with kaempferol on the body development, grip strength, gait performance and morphological and biochemical phenotype of skeletal muscle in rats subjected to a model of CP. The groups were formed by randomly allocating male Wistar rats after birth to four groups as follows: C = control treated with vehicle; K = control treated with kaempferol; CP = CP treated with vehicle; and CPK = CP treated with kaempferol. The model of CP involved perinatal anoxia and sensorimotor restriction of the hind paws during infancy, from the second to the 28th day of postnatal life. Treatment with kaempferol (1 mg/kg) was performed intraperitoneally during the neonatal period. Body weight and length, muscle strength, gait kinetics, and temporal and spatial parameters were evaluated in the offspring. On the 36th day of postnatal life, the animals were euthanized for soleus muscle dissection. The muscle fiber phenotype was assessed using the myofibrillar ATPase technique and the muscle protein expression was measured using the Western blot technique. A reduction in the impact of CP on body phenotype was observed and this also attenuated deficits in muscle strength and gait. Treatment also mitigated the impact on muscle phenotype by preventing a reduction in the proportion of oxidative fibers and in the histomorphometric parameters in the soleus muscle of rats in the CP group. The results demonstrate that neonatal treatment with kaempferol attenuated gait deficits, and impaired muscle strength and muscle maturation in rats subjected to a model of CP.

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