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Cerebral palsy research news

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Interventions and Management

1. Ultrasound-guided spinal anaesthesia for a patient with severe scoliosis

Manabu Yoshimura, Yasuhiro Morimoto

Case Reports BMJ Case Rep. 2024 Oct 14;17(10):e261112. doi: 10.1136/bcr-2024-261112.

Ultrasound (US) guided spinal anaesthesia is gaining recognition for its ability to minimise technical difficulties encountered in patients with atypical spinal anatomy. Spinal anaesthesia is administered during a surgical procedure lithotripsy in patients with respiratory complications that can result from severe scoliosis or cerebral palsy. Here, we report a case in which US-guided spinal anaesthesia proved feasible and advantageous in a patient with cerebral paralysis and severe scoliosis. A man in his 60s with cerebral paralysis and severe scoliosis was scheduled for spinal anaesthesia because of his nocturnal SpO2 drops and need for nasal high flow. Using US guidance, we confirmed that the needle entry angle was consistent with the rotating spinous process. The spinal needle was then advanced successfully, and spinal anaesthesia was administered without issue. The US technique for detecting the rotation of the vertebrae and puncturing them is useful in patients with severe scoliosis.

PMID: 39406451

2. The effect of family posture control combined with GAME therapy on motor function in children with severe cerebral palsy

Jianping Xia, Yine Zhou, Jing Xiao

Medicine (Baltimore). 2024 Oct 18;103(42):e40078. doi: 10.1097/MD.0000000000040078.

This paper has a purpose to explore the effects of home posture control combined with goal-activity-exercise-environment therapy on motor function in children with severe cerebral palsy (CP). Data of 80 children with severe CP treated from January 2022 to December 2023 were collected. They were divided into experimental group (EG) and control group according to different treatment methods, with 40 people in each group. The controlled group (CG) obtained routine treating means, including occupational therapy, electromyographic biofeedback therapy, and other treatment items. The EG received a combination of home posture control and goal-activity-exercise-environment therapy on the basis of conventional treatment. Meanwhile, parents received professional training to manage their children's posture and received reinforcement training through goal-activity-exercise-environment therapy. The Gross motor function measure-88, Peabody developmental motor scale-fine motor, pediatric balance scale, Fugl-Meyer assessment and other scales were used to evaluate the motor function, balance ability, daily living activity ability, and developmental level of patients. After 3 months of treatment, the Gross motor function measure-88 scores of these 2 groups were 70.96 ± 18.29 and 57.42 ± 21.41, respectively. The Peabody developmental motor scale-fine motor scores were 76.48 ± 14.42 and 59.77 ± 14.89, respectively. The balance ability index, upper limb motor function index, daily living activity ability, and developmental level of the EG were significantly higher than the CG's, and the P-values were all <.05. The combination of home posture control and GAME therapy can significantly improve the motor function and daily living activities of children with severe CP. This helps to maintain the normal growth and development of the child, and has certain clinical value.

PMID: 39432631

3. Accurate neural control of a hand prosthesis by posture-related activity in the primate grasping circuit

Andres Agudelo-Toro, Jonathan A Michaels, Wei-An Sheng, Hansjörg Scherberger

Neuron. 2024 Oct 14:S0896-6273(24)00688-3. doi: 10.1016/j.neuron.2024.09.018. Online ahead of print.

Brain-computer interfaces (BCIs) have the potential to restore hand movement for people with paralysis, but current devices still lack the fine control required to interact with objects of daily living. Following our understanding of cortical activity during arm reaches, hand BCI studies have focused primarily on velocity control. However, mounting evidence suggests that posture, and not velocity, dominates in hand-related areas. To explore whether this signal can causally control a prosthesis, we developed a BCI training paradigm centered on the reproduction of posture transitions. Monkeys trained with this protocol were able to control a multidimensional hand prosthesis with high accuracy, including execution of the very intricate precision grip. Analysis revealed that the posture signal in the target grasping areas was the main contributor to control. We present, for the first time, neural posture control of a multidimensional hand prosthesis, opening the door for future interfaces to leverage this additional information channel.

PMID: 39419024

4. Microinstability of Major Joints in Movement Disorders: The Hidden Challenge

Rana Muhammad Anss Bin Qadir, Ahmad Hassan, Tanzeel Ur Rehman Buttar, Umar Bin Tariq, Wajeeha Kiran, M Hasaan Shahid

Review Cureus. 2024 Oct 14;16(10):e71449. doi: 10.7759/cureus.71449. eCollection 2024 Oct.

Microinstability, characterized by subtle and often painful disturbances in joint stability, significantly impacts individuals engaged in activities requiring extensive ranges of motion, such as dancing or gymnastics, and is particularly prevalent in young female athletes. This condition, resulting from progressive microtrauma, architectural and functional abnormalities, or iatrogenic factors, is challenging to diagnose and often underreported. Understanding the biomechanical nuances of microinstability is essential for accurate diagnosis and effective management. Upper limb joints, including the shoulder, elbow, wrist, and hand, each exhibit unique anatomical and functional characteristics that contribute to their susceptibility to microinstability. Movement disorders, such as Parkinson's disease, essential tremor, dystonia, and cerebral palsy, exacerbate joint instability due to impaired proprioception, altered muscle tone, and uncoordinated muscle contractions. Effective diagnosis involves physical examination techniques and advanced imaging modalities. Therapeutic interventions encompass physical therapy, pharmacological treatments, surgical procedures, and assistive devices, tailored to enhance joint stability and improve the quality of life for affected individuals.

PMID: 39403424

5. Feasibility of the Challenge Assessment, the Gait Outcomes Assessment List and ' Moving Together' ('Sammen I Bevægels e'), a Group-Based Motor Skills Intervention for Independent School-Aged Children with Cerebral Palsy

Kirsten Nordbye-Nielsen, F Virginia Wright, Ole Rahbek, Bjarne Møller-Madsen, Thomas Maribo

Dev Neurorehabil. 2024 Oct 17:1-13. doi: 10.1080/17518423.2024.2410180. Online ahead of print.

This single group pre and posttest study evaluated the feasibility of a new 10-week group-based motor skills enhancement intervention: "Moving Together," and associated use of the Challenge assessment and Gait Outcomes Assessment List (GOAL). Participant attendance/completion and satisfaction with the assessments and intervention were evaluated, and a first estimate of associated motor skill-related changes obtained. Ten ambulatory children with cerebral palsy (7-14 years) and their parents participated. Ninety percent of Challenge sessions were attended and 82.5% of GOAL questionnaires completed. Program attendance was 83% overall. Satisfaction with assessments was high for the Challenge and moderate for the GOAL, and intervention satisfaction was high. Mean change scores (95% CI) post-intervention for the Challenge and GOAL were 4.2 (-11.4 to 3.1) and 3.6 (-14.4 to 4.0) points (/100) respectively. Challenge and GOAL use was feasible and appropriate for "MovingTogether" and associated with gains in motor skill performance and functional abilities.

PMID: 39417559

6. Effects of 3D-printed ankle-foot orthoses on gait: a systematic review

Tasmia Nourin Pollen, Abu Jor, Farhan Munim, Yufan He, Aliyeh Daryabor, Fan Gao, Wing-Kai Lam, Toshiki Kobayashi

Review Assist Technol. 2024 Oct 17:1-17. doi: 10.1080/10400435.2024.2411563. Online ahead of print.

This systematic review aimed to explore comprehensive evidence on the efficacy of the 3D-printed ankle-foot orthoses (AFOs) on gait parameters in individuals with neuromuscular and/or musculoskeletal ankle impairments. Electronic databases including PubMed, Scopus, Web of Science, Embase, ProQuest, Cochrane, and EBSCOhost were searched from inception to August 2023. Ten studies that had participants with ankle impairments, as a result of stroke, cerebral palsy, mechanical trauma, muscle weakness, or Charcot-Marie-Tooth disease, investigated the immediate effects of the 3D-printed AFOs on gait parameters were included. Methodological rigor was evaluated using the modified Downs & Black index. The gait parameters included lower extremity joint angles, moments, and work/power, plantar pressures, spatiotemporal measures, and patient satisfaction were improved with the 3D-printed AFOs when compared to the no-AFO (i.e. barefoot, or shoe-only) conditions. 3D-printed AFOs revealed similar functional efficacy as conventional AFOs. Notably, the level of patient satisfaction regarding fitting and comfort was higher with the 3D-printed AFOs. Although the study on the effects of the 3D-printed AFOs are limited, emerging evidence indicates their effectiveness in improving gait biomechanics and functions. To further confirm their effects, rigorous randomized control studies with larger sample sizes and longer follow-ups on the effects are warranted in the future.

PMID: 39417773

7. Intrathecal baclofen obviating the need for bladder stimulator use in a patient with secondary dystonia: illustrative case

Ryan K Wang, Victoria Jane Horak, Sunny Abdelmageed, Melissa A LoPresti, Maryam N Shahin, Benjamin Katholi, Jeffrey S Raskin

J Neurosurg Case Lessons. 2024 Oct 14;8(16):CASE24364. doi: 10.3171/CASE24364. Print 2024 Oct 14.

Background: Children with cerebral palsy often have neurogenic bladders. Bladder function is further affected by complex medical management and multifactorial disease processes, leading to worsened function and poorer quality of life. Intrathecal baclofen (ITB) therapy has been used to treat hypertonia and spasticity, but implications in neurogenic bladder management have not been well described. Observations: A 20-year-old female with a history of cerebral palsy and neurogenic bladder treated with sacral neuromodulation underwent ITB therapy and subsequently experienced improvement in bladder control, obviating the need for bladder stimulator use. Lessons: ITB improves hypertonia and can effectively obviate the need for neurostimulation to treat neurogenic bladder in patients with cerebral palsy. Further research is necessary to discern mechanisms. https://thejns.org/doi/10.3171/CASE24364.

PMID: 39401463

8. The impact of caregiver training on the oral health of people with disabilities: A systematic review

Matheus Urias Cruz Santos, Aluísio Eustáquio de Freitas Miranda Filho, Kelly Fernanda Molena, Léa Assed Bezerra da Silva, Maria Bernadete Sasso Stuani, Alexandra Mussolino de Queiroz

Spec Care Dentist. 2024 Oct 16. doi: 10.1111/scd.13072. Online ahead of print.

Aims: This systematic review aimed to assess the impact of oral health training for caregivers of individuals with disabilities. Materials and methods: A systematic review was conducted using five electronic databases: Medline (PubMed), SciELO, Web of Science, LILACS, and CAFe, adhering to PRISMA guidelines. The PICO strategy was defined as follows: Participants: caregivers of individuals with disabilities; Intervention: training or education in oral health for caregivers; Control: no caregiver training; and Outcomes: evaluating whether oral health training for caregivers improves the oral health of people with disabilities. The study aimed to address the research question: "What is the impact of oral health training for caregivers of individuals with disabilities?" The study was preregistered in PROSPERO (CRD42023416760). Results: A total of 14 studies were included, with trained caregivers being either staff members or parents, and various disabilities reported, with cerebral palsy being the most prevalent. Caregiver training methods varied, such as instructions on the importance of oral health care, supervised oral hygiene, and demonstration of toothbrushing techniques. Overall, the intervention groups showed an improvement in measures such as to the Gingival Index, Plaque Index, Simplified Oral Hygiene Index, and Gingival Bleeding Index on upon probing. Additionally, improvements were observed in the quality, frequency, and duration of toothbrushing among intervention groups. Conclusion: The findings suggest that oral health training for caregivers has a positive impact on the oral health of individuals with disabilities, potentially leading to better oral health outcomes.

PMID: 39411806

9. Child, family and professional views on valued communication outcomes for non-verbal children with neurodisability: A qualitative meta-synthesis

Katherine Buckeridge, Vanessa Abrahamson, Tracy Pellatt-Higgins, Diane Sellers, Lindsay Forbes

Review Int J Lang Commun Disord. 2024 Oct 17. doi: 10.1111/1460-6984.13121. Online ahead of print.

Background: There are many children with neurodisability who are unable to rely on speech to communicate and so use a range of augmentative and alternative communication (AAC) methods and strategies to get their message across. Current instruments designed to measure the outcomes of speech and language therapy interventions lack specific attention to communication outcomes that are valued by non-verbal children with neurodisability, their families and support networks. This qualitative meta-synthesis was conducted to identify valued communication outcomes to inform the next stage of developing a novel outcome measure. Aims: To systematically identify and synthesise the qualitative evidence about which communication outcomes non-verbal children with neurodisability, their family members, healthcare professionals and educators think are important to achieve, specifically which communication outcomes are most valued by: (1) non-verbal children with neurodisability; (2) parents or other family members of non-verbal children with neurodisability; and (3) professionals who work with non-verbal children with neurodisability. Methods & procedures: A systematic search of bibliographic databases and the grey literature was undertaken to identify qualitative studies that included evidence of views expressed by children, family members, healthcare professionals and educators on outcomes in relation to the communication of non-verbal children with neurodisability. All papers meeting the inclusion criteria were quality appraised using the Critical Appraisal Skills Programme Qualitative checklist, although none were excluded on this basis. The data synthesis involved organising coded data into descriptive themes which were then synthesised into analytical themes. Main contribution: We found 47 papers containing qualitative data meeting the inclusion criteria from research situated in 14 countries. The views of 35 children, 183 parents, six other family members, 42 healthcare professionals and 18 educators are represented in the review. The included studies contained very few data reported by children themselves; most data were provided by adults, especially parents. Three main analytical themes were identified: Experiences of communication and expectations; adapting to and acceptance of AAC; and becoming an autonomous communicator. Conclusions & implications: This meta-synthesis brings together the limited qualitative research findings about what parents, professionals and children consider are important communication outcomes for non-verbal children with neurodisability. The synthesis identifies key gaps in our knowledge about the perspectives of children and their siblings. This synthesis will inform primary research to understand valued communication outcomes in this group, and ultimately the development of a patient-reported outcome measure (PROM) that can be used to demonstrate the effect of interventions, at both clinical and service levels. What this paper adds: What is already known on the subject Studies of children with cerebral palsy and autism spectrum disorder indicate that at least 25% of children with these conditions are non -verbal. Studies on the health outcomes of children with neurodisability have identified that communication is rated as important by parents and health professionals. There is an evidence gap about which communication outcomes are important to non-verbal children, their families and the people who work with them. What this paper adds to the existing knowledge This is the first synthesis of data that relates to communication outcomes for non-verbal children with neurodisability. This qualitative meta-synthesis identifies from previous research studies the communication outcomes valued by children who are non-verbal, their parents or other family members, and the professionals who work with them. The findings will be used to shape further primary research and the development of a novel patient-reported communication outcome measure for non-verbal children with neurodisability. It is anticipated that this will be used by clinicians to measure the effect of their interventions. What are the practical and clinical implications of this work? Clinicians should reflect on parents' experiences of communication with their child before discussing potential outcomes with them. Gaining insight into the lived experience of communication for non -verbal children and their families will help healthcare professionals to understand which goals are important to them and why. Few studies have specifically asked which communication outcomes are important for non-verbal children with neurodisability. Further exploration is needed to determine which communication outcomes non-verbal children and their families would like to see included in outcome measures used by clinicians.

PMID: 39417318

10. Executive function in children with neurodevelopmental conditions: a systematic review and meta-analysis

Ayesha K Sadozai, Carter Sun, Eleni A Demetriou, Amit Lampit, Martha Munro, Nina Perry, Kelsie A Boulton, Adam J Guastella

Nat Hum Behav. 2024 Oct 18. doi: 10.1038/s41562-024-02000-9. Online ahead of print.

Executive function (EF) delays are well documented in paediatric neurodevelopmental conditions (NDCs). There is no consensus about whether EF delay represents a transdiagnostic feature of NDCs. This systematic review and meta-analysis synthesized 180 studies reporting two or more NDC comparisons on EF, examined differences between NDCs, and the moderating effects of gender, age, publication year, DSM editions and assessment types. Studies using established EF measures across seven domains (attention, fluency, set-shifting, set-switching, response inhibition, planning and working memory) in participants under 18 were included. Summary effects were compared: (1) for all reported NDCs relative to control, (2) for each individual NDC relative to control and (3) between NDC groups. Results confirmed that EF delay was a transdiagnostic feature of neurodevelopmental delay, with a moderate effect size of delay across all NDCs (g = 0.56, 95% confidence interval

(CI) 0.49-0.63) compared with control. This effect increased with comorbidities (g = 0.72, 95% CI 0.59-0.86), DSM-5 criteria and informant measures. Comparisons between NDCs revealed few differences: children with tic disorders (TD) showed smaller EF delays, children with attention-deficit/hyperactivity disorder (ADHD) showed larger delays in attention, response inhibition, planning and working memory compared with TD and specific learning disorders, while children with autism spectrum disorders showed greater delays on set-switching compared with ADHD. Findings support transdiagnostic models of neurodevelopment to further a developmentally sensitive science that can reveal how EF delays contribute to brain circuitry, symptom profiles and functioning, and ultimately support early interventions and outcomes for all children with NDCs.

PMID: 39424962

11. A systematic review on machine learning approaches in cerebral palsy research

Anjuman Nahar, Sudip Paul, Manob Jyoti Saikia

Review PeerJ. 2024 Oct 18:12:e18270. doi: 10.7717/peerj.18270. eCollection 2024.

Background: This review aims to explore advances in the field of cerebral palsy (CP) focusing on machine learning (ML) models. The objectives of this study is to analyze the advances in the application of ML models in the field of CP and to compare the performance of different ML algorithms in terms of their effectiveness in CP identification, classifying CP into its subtypes, prediction of abnormalities in CP, and its management. These objectives guide the review in examining how ML techniques are applied to CP and their potential impact on improving outcomes in CP research and treatment. Methodology: A total of 20 studies were identified on ML for CP from 2013 to 2023. Search Engines used during the review included electronic databases like PubMed for accessing biomedical and life sciences, IEEE Xplore for technical literature in computer, Google Scholar for a broad range of academic publications, Scopus and Web of Science for multidisciplinary high impact journals. Inclusion criteria included articles containing keywords such as cerebral palsy, machine learning approaches, outcome response, identification, classification, diagnosis, and treatment prediction. Studies were included if they reported the application of ML techniques for CP patients. Peer reviewed articles from 2013 to 2023 were only included for the review. We selected full-text articles, clinical trials, randomized control trial, systematic reviews, narrative reviews, and meta-analyses published in English. Exclusion criteria for the review included studies not directly related to CP. Editorials, opinion pieces, and non-peer-reviewed articles were also excluded. To ensure the validity and reliability of the findings in this review, we thoroughly examined the study designs, focusing on the appropriateness of their methodologies and sample sizes. To synthesize and present the results, data were extracted and organized into tables for easy comparison. The results were presented through a combination of text, tables, and figures, with key findings emphasized in summary tables and relevant graphs. Results: Random forest (RF) is mainly used for classifying movements and deformities due to CP. Support vector machine (SVM), decision tree (DT), RF, and K-nearest neighbors (KNN) show 100% accuracy in exercise evaluation. RF and DT show 94% accuracy in the classification of gait patterns, multilayer perceptron (MLP) shows 84% accuracy in the classification of CP children, Bayesian causal forests (BCF) have 74% accuracy in predicting the average treatment effect on various orthopedic and neurological conditions. Neural networks are 94.17% accurate in diagnosing CP using eye images. However, the studies varied significantly in their design, sample size, and quality of data, which limits the generalizability of the findings. Conclusion: Clinical data are primarily used in ML models in the CP field, accounting for almost 47%. With the rise in popularity of machine learning techniques, there has been a rise in interest in developing automated and data-driven approaches to explore the use of ML in CP.

PMID: 39434788

12. Early identification and communication in cerebral palsy: Navigating a collaborative approach for neonatal follow-up programmes

Paige Terrien Church, Rudaina Banihani, Karen Thomas, Maureen Luther, Brenda Agnew, Amber Makino, Sophie Lam-Damji, Darcy Fehlings

Review Acta Paediatr. 2024 Oct 14. doi: 10.1111/apa.17458. Online ahead of print.

Aim: This article will provide a clinical case demonstrating the implementation of early identification and review the tools and findings and the diagnostic approach. We will review highlighted literature on the subject of communicating a diagnosis. While improved function is a critical goal, the process of communicating the diagnosis of CP can be challenging for both parents and providers. It aims to provide insights on the evidence supporting early identification and discusses strategies for effective communication of crucial information. Methods: The article reviews the literature on communication of a diagnosis. Results: Thirteen articles were identified relating to the communication of a diagnosis of CP and parent experience. We examine this evidence, leveraging the knowledge of an interdisciplinary team and incorporating feedback from parents. Conclusion: Strategies for effective communication include engagement with families, community therapy teams and all medical providers. Consistent, individualised, collaborative communication is critical. Awareness of ableism and use of balanced, value-neutral terminology is recommended.

PMID: 39400456

13. Individualized Neuroprognostication in Neonates With Hypoxic-Ischemic Encephalopathy Treated With Hypothermia

Andrea Van Steenis, Mehmet N Cizmeci, Floris Groenendaal, Marianne Thoresen, Frances M Cowan, Linda S de Vries, Sylke J Steggerda

Neurol Clin Pract. 2025 Feb;15(1):e200370. doi: 10.1212/CPJ.0000000000200370. Epub 2024 Oct 8.

Background and objectives: To determine whether post-rewarming brain MRI enables individualized domain-specific prediction of neurodevelopmental outcomes at 2 years of age in infants treated with hypothermia for hypoxic-ischemic brain injury. Methods: We conducted a retrospective multicenter study of infants with moderate-to-severe hypoxic-ischemic encephalopathy (HIE) treated with hypothermia. Brain MRI abnormalities and the prediction of domain-specific 2-year neurodevelopmental outcomes were scored independently by 2 investigators after which consensus was reached for both imaging findings and outcome prediction. Neuroimaging patterns were categorized as normal, white matter (WM)/watershed-predominant, deep gray matter (DGM)-predominant, and near-total injury. Outcomes were predicted separately for mortality, cerebral palsy (CP) type and severity, cognitive delay, epilepsy, cerebral visual impairment (CVI), and feeding difficulties; these outcomes were predicted as highly unlikely, possible, probable, or highly likely. Results: Of the 152 study infants, 27 (18%) died. The neurodevelopmental outcome at 2 years was available in all 125 survivors. CP was seen in 21 of 125 surviving infants (17%). No infants in the highly unlikely category developed CP while 90% in the highly likely category did. When CP was predicted as possible, 40% developed CP; all were mild and ambulatory. When CP was predicted as probable, 67% developed CP of whom 40% were severe and nonambulatory. Cognitive scores were available in 104 of 125 infants (83%). Cognitive delay was seen in 23 of 104 infants (22%) (15% mild and 7% severe). When cognitive delay was predicted as highly unlikely, 92% did not develop cognitive delay and the delay was mild in those who did. When cognitive delay was considered highly likely, this developed in 100%. When epilepsy, CVI, and feeding problems were predicted as highly unlikely, 98% did not develop epilepsy; for CVI and feeding problems, this was 100% and 97%, respectively. In 27 of 152 infants (18%), the investigators reached consensus that the overall injury was severe enough to consider redirection of care; 21 of 27 infants (78%) died. Of the survivors, 5 infants developed severe CP and 1 had a mild dyskinetic CP with swallowing problems and CVI. Discussion: Individualized domain-specific categorical neuroprognostication mainly based on brain MRI is feasible, reliable, and highly accurate in infants with HIE.

PMID: 39399559

14. Cerebral palsy characteristics in term-born children with and without detectable perinatal risk factors: A cross-sectional study

Kai Suzuki, Nafisa Husein, Maryam Oskoui, Darcy Fehlings, Michael Shevell, Adam Kirton, Mary J Dunbar; and members of the Canadian Cerebral Palsy Registry

Dev Med Child Neurol. 2024 Oct 15. doi: 10.1111/dmcn.16111. Online ahead of print.

Aim: To compare, in term-born children with cerebral palsy (CP), the characteristics of those who exhibit detectable risk factors for CP at birth with those who do not. Method: This was a cross-sectional study of term-born children using the Canadian Cerebral Palsy Registry comparing those with and without perinatal risk factors and/or neonatal symptoms for pregnancy, birth and neonatal characteristics, magnetic resonance imaging (MRI) findings, CP subtype, and impairment severity. Risk factors were quantified with a CP risk calculator. Multivariable and multinomial regressions were expressed as odds ratios (OR) and relative risk ratios. Results: Of 1333 term-born children, 781 (58.6%) had complete variables for the CP risk calculator, of whom 195 (25%) had 'undetectable' newborn infant CP risk, and they did not have greater postneonatal brain injury. Focal injury on MRI was more common (OR 2.0, 95% confidence interval [CI] 1.3-3.1) than in the 'detectable' group. The 'undetectable' group had more unilateral CP (OR 1.8, 95% CI 1.3-2.6), less severe motor impairment (OR 0.76, 95% CI 0.67-0.86), and were more verbal (OR 2.3, 95% CI 1.5-3.6). Interpretation: In the Canadian CP Registry, one-quarter of term-born children lacked neonatal encephalopathy, seizures, or perinatal risk factors. They were more likely to have unilateral CP, focal MRI findings, and communicate with words than children with risk factors or neonatal symptoms.

PMID: 39404141

15. Neonatal Survival and Outcomes following Periviable Rupture of Membranes

Elizabeth J Okonek, Elizabeth V Schulz, Kira Belzer, James K Aden, Caitlin M Drumm

Am J Perinatol. 2024 Oct 15. doi: 10.1055/a-2414-1006. Online ahead of print.

Objective: To clarify survival for infants affected by periviable prolonged preterm premature rupture of membranes (PPROM) in the military health system (MHS). To add to current literature on outcomes following expectant management, including long-term neurodevelopment outcomes. Study design: Retrospective matched cohort review of six level 3 military neonatal intensive care units (NICUs; 2010-2020). Cases were matched 1:1 with control infants, matched by location, gender,

gestational age (within 1 week), birth weight (within 300 g), and rupture of membranes (ROM) within 24 hours of delivery. Follow-up data were obtained for each infant through 48 months' corrected age or age of last documented health visit in a military treatment facility. Results: Forty-nine infants met inclusion criteria. Mean ROM for cohort infants was 20.7 weeks, with mean latency period of 34.6 days and mean gestational age at delivery of 25.7 weeks. Cohort infants had a mean birth weight of 919 g. Cohort survival to NICU discharge was 75.5 versus 77.6% of controls ($p = 0.81$). Statistically significant short-term outcomes: oligohydramnios or anhydramnios at delivery ($p < 0.0001$), pulmonary hypertension ($p = 0.0003$), and high-frequency ventilation ($p = 0.004$) were higher in cohort infants. No differences were found regarding rates of early sepsis, intraventricular hemorrhage, surgical necrotizing enterocolitis, oxygen at 36 weeks or at discharge. No statistical difference in long-term outcomes at 18 to 48 months of age or incidence of autism, cerebral palsy, attention deficit hyperactivity disorder, or asthma. Conclusion: Cohort survival to discharge in the MHS was 75.5%, higher than previously reported and not different from matched controls. Infants born after periviable PPROM should deliver at centers with access to high-frequency ventilation and ability to manage pulmonary hypertension. There was no difference in long-term neurodevelopment between the groups. Key points: · Survival to NICU discharge is similar between infants exposed to periviable PPROM and controls.. · Cohort survival to discharge was 75.5%, higher than previously reported in recent literature. · Infant with periviable PPROM should delivery at centers capable of managing pulmonary complications.

PMID: 39406365

16. Understanding the complexity of decision-making for mothers of young children with ambulatory cerebral palsy: A qualitative phenomenological study

Meghan E Munger, Rhonda G Cady, Nathan D Shippee, Timothy J Beebe, Tom F Novacheck, Beth A Virnig

Dev Med Child Neurol. 2024 Oct 16. doi: 10.1111/dmcn.16114. Online ahead of print.

Aim: To investigate non-clinical factors that affect health-related decision-making in mothers with young ambulatory children living with cerebral palsy (CP). Method: Guided by phenomenology, we asked parents to describe early experiences of raising a young ambulatory child living with CP. Conversations were audio-recorded, transcribed, coded, and analysed using a qualitative inductive approach. Results: Eighteen parents (all mothers) of 20 children participated. Five themes emerged related to decision-making, each influencing goal setting, prioritization, and health service use. Mothers had to balance both child and family well-being. Acceptance of their child's diagnosis and abilities changed over time, partially influenced by their child's emerging voice. Uncertainty arose when weighing multiple factors regarding child, family, and what the future held. Experiences were laden with system-level burdens related to underinsurance and care coordination. Themes regularly overlapped and persisted. Interpretation: Our findings highlight the complexity of the decision-making experienced by mothers of young ambulatory children living with CP. Probing this information can inform appropriate shared care planning that meets the preferences and circumstances of mothers and their families.

PMID: 39412081

17. Cerebellar haemorrhage and atrophy in infants born extremely preterm with intraventricular haemorrhage

Julia Buchmayer, Renate Fuiko, Patric Kienast, Sophie Stummer, Gregor Kasprian, Angelika Berger, Katharina Goeral

Dev Med Child Neurol. 2024 Oct 20. doi: 10.1111/dmcn.16123. Online ahead of print.

Aim: To investigate the impact of cerebellar haemorrhage (CBH) and atrophy in infants born extremely preterm with intraventricular haemorrhage (IVH) on neurodevelopment at 2 years of age. Method: This retrospective case-control study included infants born at less than 28 weeks' gestation with IVH over a 10-year period. CBH, along with the assessment of cerebellar size, using magnetic resonance imaging, were studied. The impact of injuries on neurodevelopmental outcome at 2 years' corrected age was conducted, using multivariable regression analysis for comprehensive evaluation. Results: In a cohort of 103 patients, 69 (67.0%) showed CBH with a median grade of 1 (interquartile range = 0-3). At the corrected age of 2 years, CBH was significantly associated with impaired cognitive and motor outcome. CBH emerged as an independent predictor of poor cognitive and motor development, as well as cerebral palsy. Cerebellar atrophy, affecting 30 (29.1%) infants, was linked to a significantly worse outcome across all domains. Conversely, an increase in cerebellar size was correlated with improved motor development. Interpretation: Infants born extremely preterm with IVH and concomitant CBH exhibited significant cognitive and motor impairment. The severity of developmental delay correlated with the grade of CBH. These findings hold potential to support the prediction of long-term outcome and parental counselling.

PMID: 39428664

18. Parenting and outcomes for children with cerebral palsy

Mary Lauren Neel

Pediatr Res. 2024 Oct 15. doi: 10.1038/s41390-024-03615-4. Online ahead of print.

No abstract available

PMID: 39406953

19. VP3.15 reduces acute cerebellum damage after germinal matrix-intraventricular hemorrhage of the preterm newborn

Isabel Atienza-Navarro, Angel Del Marco, Maria de Los Angeles Garcia-Perez, Alvaro Raya-Marin, Carmen Gil, Ana Martinez, Isabel Benavente-Fernandez, Simon Lubian-Lopez, Monica Garcia-Alloza

Biomed Pharmacother. 2024 Oct 15:180:117586. doi: 10.1016/j.biopha.2024.117586. Online ahead of print.

Germinal matrix-intraventricular hemorrhage (GM-IVH) is one of the most common complications of the preterm newborn. The pathology of the GM-IVH is not completely understood and even regions distant from the lesion area are severely affected. It has been suggested that cerebellar diaschisis may underlie the neurodevelopmental problems that many of these kids show, including cerebral palsy, attention deficit disorders or hyperactivity. Additionally, GM-IVH has no successful treatment. VP3.15 is a dual action phosphodiesterase 7 (PDE7) and glycogen synthase kinase-3β (GSK-3β) inhibitor that limits neuroinflammation and neuronal loss. Therefore, it might also provide a relevant tool to reduce complications associated with GM-IVH. We have used a murine model of GM-IVH to analyze the short and long-term effects of VP3.15 in brain pathology and behavioral complications. In our hands, the induction of unilateral GM-IVH to P7 CD1 mice results in a short-term (P14) compromise of the cerebellar neuronal population and Purkinje cells arborization, an increase of microglia burden in the nuclei and an overall increase of punctuate cerebellar hemorrhages. Whereas brain alterations are no longer observed in the long term (P110), these animals present overt hyperactivity when analyzed in the adulthood, supporting the long-term behavioral impairment. Also, hyperactivity significantly correlates with ipsi and contralateral cerebellar sizes, neuronal densities and myelin basic protein levels. Importantly, treatment with VP3.15 significantly reduces neuronal loss, Purkinje cells simplification, the presence of cerebellar hemorrhages, as well as hyperactivity. Altogether, our data support the neuroprotective effects of VP3.15 in GM-IVH of the PT.

PMID: 39413619

20. Gut microbiota as a potential therapeutic target for children with cerebral palsy and epilepsy

Hui Wu, Congfu Huang, Shenghua Xiong

Review Brain Dev. 2024 Oct 18:S0387-7604(24)00127-X. doi: 10.1016/j.braindev.2024.09.002. Online ahead of print.

Gut microbiota (GM), the "second genome," exerts influence on human health by impacting brain function through the gut-brain axis. This interaction involves various mechanisms, including immune regulation, metabolites, and neuronal pathways. The application of the next-generation sequencing technology provides a revolutionary tool for the study of GM, which contributes to a deeper comprehension of the GM-host relationship. Children with cerebral palsy (CP), a common neurological disorder in children, are more likely to develop epilepsy, which can exacerbate CP symptoms, particularly those related to cognitive impairment and gastrointestinal tract, such as constipation. The current study identified specific changes in the GM of children with CP accompanied by epilepsy. Furthermore, both diet and oral microbiota have the potential to influence the composition of the GM. Interventions with probiotics and dietary fiber based on GM can improve constipation and cognition, and this approach may be a potential therapeutic strategy.

PMID: 39426843

21. Cerebral palsy Foreword

John M Pascoe

Editorial Curr Probl Pediatr Adolesc Health Care. 2024 Oct 16:101702. doi: 10.1016/j.cppeds.2024.101702. Online ahead of print.

No abstract available

PMID: 39419652

22. Riboflavin as a potential new therapeutic agent for perinatal encephalopathies caused by cerebral oxygen deprivation

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Nutr Neurosci. 2024 Oct 15:1-4. doi: 10.1080/1028415X.2024.2415087. Online ahead of print.

Objective: This letter to the editor presents suggestions for the therapeutic use of riboflavin in perinatal brain lesions caused by oxygen deprivation.Methods: Clinical and preclinical studies using riboflavin conjugated with other components for the treatment of cerebral oxygen deprivation were included in the discussion.Results: Oxygen deprivation is predisposed by anoxia, hypoxia, or ischemia and causes severe early central damage, including sensorimotor impairment. At the moment, these lesions lack effective and affordable therapies. We present studies demonstrating the neuroprotective effects of riboflavin-containing drugs to treat children affected by hypoxic perinatal injuries.Discussion: This article suggests conducting preclinical studies to elucidate the potential isolated effects of riboflavin on the pathogenesis of perinatal brain injury caused by oxygen deprivation, by presenting routes for future clinical strategies for the prevention or treatment of perinatal encephalopathies.

PMID: 39405204

23. Safety and tolerability of a Muse cell-based product in neonatal hypoxic-ischemic encephalopathy with therapeutic hypothermia (SHIELD trial)

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Stem Cells Transl Med. 2024 Oct 14:szae071. doi: 10.1093/stcltm/szae071. Online ahead of print.

Hypoxic-ischemic encephalopathy (HIE), associated with high mortality and neurological sequelae, lacks established treatment except therapeutic hypothermia. Clinical-grade multilineage-differentiating stress-enduring (Muse) cells (CL2020) demonstrated safety and efficacy in nonclinical HIE rat models, thereby leading to an investigator-initiated clinical trial to evaluate CL2020 safety and tolerability in neonatal HIE as a single-center open-label dose-escalation study with 9 neonates with moderate-to-severe HIE who received therapeutic hypothermia. Each patient received a single intravenous injection of CL2020 cells between 5 and 14 days of age. The low-dose (3 patients) and high-dose (6 patients) groups received 1.5 × 106 and 1.5 × 107 cells/dose, respectively. The occurrence of any adverse event within 12 weeks following CL2020 administration was the primary endpoint of this trial. No significant changes in physiological signs including heart rate, blood pressure, and oxygen saturation were observed during or after administration. The only adverse event that may be related to cell administration was a mild γ-glutamyltransferase level elevation in one neonate, which spontaneously resolved without any treatment. All patients enrolled in the trial survived, and normal developmental quotients (≥ 85) in all 3 domains of the Kyoto Scale of Psychological Development 2001 were observed in 67% of the patients in this trial. CL2020 administration was demonstrated to be safe and tolerable for neonates with HIE. Considering the small number of patients, a randomized controlled confirmatory study is warranted to verify these preliminary findings and evaluate the efficacy of this therapy.

PMID: 39401019