Cerebral palsy research news

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Interventions and Management

1. Improved trunk and neck control after selective dorsal rhizotomy in children with spastic cerebral palsy
Chiara Maria Tacchino, Maria Grazia Calevo, Marco Pavanello, Paola Lanteri, Marta Bertamino

Childs Nerv Syst. 2020 Nov 24. doi: 10.1007/s00381-020-04979-8. Online ahead of print.

PMID: 33236182

2. Slackline Training in Children with Spastic Cerebral Palsy: A Randomized Clinical Trial
Lucía González, Juan Argüelles, Vicente González, Kristian Winge, Marta Iscar, Hugo Olmedillas, Miguel Blanco, Pedro L Valenzuela, Alejandro Lucia, Peter A Federolf, Luis Santos

Int J Environ Res Public Health. 2020 Nov 21;17(22):E8649. doi: 10.3390/ijerph17228649.

Objective: To assess whether a slackline intervention program improves postural control in children/adolescents with spastic cerebral palsy (CP). Design: Randomized controlled trial. Setting: Patients' association. Participants: Twenty-seven children/adolescents with spastic CP (9-16 years) were randomly assigned to a slackline intervention (n = 14, 13 ± 3 years) or control group (n = 13, 12 ± 2 years). Intervention: Three slackline sessions per week (30 min/session) for 6 weeks. Main outcome measures: The primary outcome was static posturography (center of pressure-CoP-parameters). The secondary outcomes were surface myoelectrical activity of the lower-limb muscles during the posturography test and jump performance (countermovement jump test and Abalakov test). Overall (RPE, >6-20 scale) rating of perceived exertion was recorded at the end of each intervention session. Results: The intervention was perceived as "very light" (RPE = 7.6 ± 0.6). The intervention yielded significant benefits on static posturography (a significant group by time interaction on Xspeed, p = 0.006) and jump performance (a significant group by time interaction on Abalakov test, p = 0.015). Conclusions: Slackline training improved static postural control and motor skills and was perceived as non-fatiguing in children/adolescents with spastic CP.

PMID: 33233328

3. Knee and foot contracture occur earliest in children with cerebral palsy: a longitudinal analysis of 2,693 children
Erika Cloodt, Philippe Wagner, Henrik Lauge-Pedersen, Elisabet Rodby-Bousquet

Acta Orthop. 2020 Nov 24;1-9. doi: 10.1080/17453674.2020.1848154. Online ahead of print.

Background and purpose - Joint contracture is a common problem among children with cerebral palsy (CP). To prevent severe contracture and its effects on adjacent joints, it is crucial to identify children with a reduced range of motion (ROM) early. We

examined whether significant hip, knee, or foot contracture occurs earliest in children with CP. Patients and methods - This was a longitudinal study involving 27,230 measurements obtained for 2,693 children (59% boys, 41% girls) with CP born 1990 to 2018 and registered before 5 years of age in the Swedish surveillance program for CP. The analysis was based on 4,751 legs followed up for an average of 5.0 years. Separate Kaplan-Meier (KM) curves were drawn for each ROM to illustrate the proportions of contracture-free legs at a given time during the follow-up. Using a clustered bootstrap method and considering the child as the unit of clustering, 95% pointwise confidence intervals were generated for equally spaced time points every 2.5 years for each KM curve. Results - Contracture developed in 34% of all legs, and the median time to the first contracture was 10 years from the first examination. Contracture was most common in children with a higher Gross Motor Function Classification System (GMFCS) level. The first contracture was a flexion contracture preventing dorsiflexion in children with GMFCS level I or II and preventing knee extension in children with GMFCS level III to V. Interpretation - Early interventions to prevent knee and foot contractures in children with CP should be considered.

PMID: 33228441

4. [Analysis to determine optimal age for surgical management of equinus foot in patients with childhood cerebral palsy][Article in Spanish]
S Gaytán-Fernández, P Chaidez, A García-Galicia, P Martínez-Asención, R G Barragán-Hervella, E Corpus-Mariscal, M Jiménez-Reyes, A J Montiel-Jarquín

Acta Ortop Mex. Jan-Feb 2020;34(1):2-5.

Introduction: Childhood cerebral palsy, a non-progressive brain injury, occurs before, during or after delivery, with variable neurological damage from mild to disabling. The deformity in equine is treated conservatively at an early age, but when is surgical management indicated? Objective: Our goal was to determine the optimal age for surgical management of the equine foot in CCP patients. Material and methods: Retrospective study, in patients diagnosed with CCP (all types), treated surgically with open or percutaneous Achilles tendon elongation, assessed with external consultation notes, in patients aged 1-16 years, and average follow-up of 6 years, evaluating progress with relapse of deformity and gait with plantigrade support. Results: 55 patients, 74 equinus feet (29 in girls, 45 in boys) were analyzed with surgical treatment. Those treated before six years old presented relapses, with vulnerable period in 4-6 years. Monoplegia presented 100% relapses, and triplegia presented 0%. Open surgery presented 50% recurrence and percutaneous technique only 19%. Conclusion: In our institution, the optimal age is suggested in 6-12 years. Percutaneous technique over the open, should be preferred, and greater attention should be paid to monitoring monoplexy.

PMID: 33230991

5. The effect of hip muscle weakness and femoral bony deformities on gait performance
Ines Vandekerckhove, Mariska Wesseling, Hans Kainz, Kaat Desloovere, Ilse Jonkers

Gait Posture. 2020 Oct 25;83:280-286. doi: 10.1016/j.gaitpost.2020.10.022. Online ahead of print.

Background: Children with cerebral palsy (CP) present with a pathological gait pattern due to musculoskeletal impairments, such as muscle weakness and altered bony geometry. However, the effect of these impairments on gait performance is still unknown. Research aim:This study aimed to explore the effect of hip muscle weakness and femoral deformities on the gait performance of CP and typical developing (TD) subjects. Methods: 6400 musculoskeletal models were created by weakening the hip extensors, abductors, adductors and flexors from 0% to 75 % and increasing the femoral anteversion angle (FAA) and neck shaft angle (NSA) from 20° to 60° and 120° to 160°, respectively. One TD and five CP gait patterns were imposed to each model and muscle forces were calculated. The effect of weakness and bony deformities on the capability gap (CG) at the hip, i.e. the lack in hip moment generating capacity to perform the gait pattern, was investigated using regression analysis. Results: The CG of apparent equinus, stiff knee gait, TD gait, jump gait and true equinus increased with 0.080, 0.038, 0.015, 0.023 and 0.005 Nm/kg per 10 percent hip abductor weakness increase, with 0.211, 0.130, 0.056, 0.045 and 0.011 Nm/kg per 10 degrees FAA increase and with 0.163, 0.080, 0.036, 0.043 and 0.011 Nm/kg per 10 degrees NSA increase, respectively. Combined weakness and bony deformities explained 96 %, 85 %, 82 %, 65 %, 40 % and 35 % of the variance in the CG of apparent equinus, TD gait, stiff knee gait, jump gait, true equinus and crouch gait, respectively. Significance: The results suggest that surgical correction of femoral deformities is more likely to be effective than strength training of hip muscles in enhancing CP gait performance. Jump gait, true equinus and especially crouch were more robust, while apparent equinus and stiff knee gait were limited by hip weakness and femoral deformities.

PMID: 33227606

6. Exploring change in young children's power mobility skill following several months' experience
Roslyn W Livingstone, Debra A Field

Disabil Rehabil Assist Technol. 2020 Nov 27;1-10. doi: 10.1080/17483107.2020.1847207. Online ahead of print.

Purpose: To measure and compare progression in children's power mobility skill among process and task-based measures following a loan of one of four early power mobility devices. Additionally, to explore different power mobility learner groups and skill development trajectories. Methods: In this pre-post study, children were purposefully sampled and power mobility skill was measured from video taken pre-post several months' experience (mean 192.40; SD 42.79 days) using the Assessment of Learning Powered mobility use (ALP) and two task-based measures. Associations among power mobility skill measures were examined. Child and environmental factors influencing ALP phase at loan-end were explored. Results: Forty-six children aged 13 - 68 months (mean 40.40; SD 15.60) participated, with cerebral palsy being the most common condition (n = 33; 71.74%). ALP change scores ranged from -2 to +4 ALP phases (median 1.0). Wilcoxon signed rank test was significant for pre-post differences with a large effect size ($z = 5.50$, $p < 0.001$; $r = 0.57$). End-of-loan Spearman correlations between ALP and two task-based paediatric measures were excellent ($rs = 0.92$). Kruskal-Wallis test revealed significant effect of device, access method, diagnostic group and communication abilities on loan-end ALP phase. Conclusion: Positive change was demonstrated with most children (n = 39; 84.78%) changing at least one ALP phase during the study. Positive change was seen with children at all phases of tool-use, using all devices and access methods. Process and task-based measures were highly correlated, but differed in application for different learner groups. Different trajectories of skill development may be associated with different child profiles and access abilities. IMPLICATIONS FOR REHABILITATION Children at all phases of tool-use can demonstrate positive change in power mobility skill using different devices and switch as well as joystick access methods The Assessment of Learning Powered mobility use (ALP) is useful for assessing tool-use and learning process skills for young children across the power mobility skill continuum. Task-based measures may also be helpful for guiding training and recording progress; The Power Mobility Training Tool (PMTT) is most useful for children exploring cause-effect and direction (ALP Phases 1-5), while the Power Mobility Program (PMP) is most useful for functional learners and those progressing from exploring direction to functional use (ALP Phases 5-8). Access method may influence power mobility learning trajectory and training.

PMID: 33245243

7. tDCS and motor training in individuals with central nervous system disease: A systematic review
Lucas Villalta Santos, Jamile Benite Palma Lopes, Natália Almeida Carvalho Duarte, Caio Roberto Aparecido de Pascoal Castro, Luanda André Collange Grecco, Claudia Santos Oliveira

J Bodyw Mov Ther. 2020 Oct;24(4):442-451. doi: 10.1016/j.jbmt.2020.07.010. Epub 2020 Jul 30.

Background: Transcranial direct current stimulation (tDCS) is a promising tool for patients with neurological disorders, as it increases cortical excitability, motor learning and functionality. The studies up to date have focused on the tDCS parameters while the effects of the motor training have not yet been fully addressed. The purpose of this study is to present a systematic review of all studies related to tDCS in conjunction with motor training (MT) to improve gait performance, functionality, mobility and balance in individuals with non-progressive central nervous system diseases. Methods: Seven databases were searched for articles from inception to October 2018. The search strategy followed Collaboration guidelines. The Physiotherapy Evidence Database (PEDro) Scale and Cochrane Collaboration's tool for assessing the risk of bias were applied to evaluate methodological quality. Results: Four hundred and sixteen recorded were screened. Ten studies met the inclusion criteria. All studies were randomized controlled trials, two of them had a crossover design and other two were pilot studies. Three paper analyzed children and adolescents with cerebral palsy, seven papers analyzed adults and elderly post stroke. tDCS with MT lead to significant results. Conclusions: This review found limited evidence for the use of tDCS with MT for in children with CP and adults post stroke, due to the small number of studies as well as their methodological heterogeneity. In the absence of more robust evidence, further studies with a consistent methodological design are needed to endorse the clinical application of tDCS with motor training.

PMID: 33218546

8. Leisure-time physical activity interventions for children and adults with cerebral palsy: a scoping review
Byron Lai, Eunbi Lee, Yumi Kim, Coke Matthews, Erin Swanson-Kimani, Drew Davis, Laura Vogtle, James H Rimmer

Review Dev Med Child Neurol. 2020 Nov 25. doi: 10.1111/dmcn.14751. Online ahead of print.

Aim: To summarize current evidence on the effects and reach of leisure-time physical activity (LTPA) interventions among children and adults with cerebral palsy (CP). Method: Systematic searches were conducted in PubMed, CINAHL, and Google Scholar to identify randomized controlled trials (RCTs) of LTPA interventions in CP. Data from eligible studies were extracted for qualitative synthesis. Results: Forty-eight studies enrolled a total of 1513 participants (mean [SD] age 13y [7y], range 5-43y; 818 males, 655 females, 40 not reported) and primarily included ambulatory children. RCTs underrepresented adults and people in Gross Motor Function Classification System (GMFCS) levels IV and V. Forty-one studies reported at least one favorable benefit from LTPA. Benefits included improvements to musculoskeletal strength, cardiorespiratory fitness, quality of life, spasticity, participation, and core aspects of physical function. Regarding reach, only 34% of people that were contacted to participate enrolled within a study. A smaller percentage of participants dropped out from intervention (8%) and follow-up periods (3%). Interpretation: Study findings highlight effective interventions to improve health, fitness, and function. To enhance the reach and generalizability of LTPA trials for CP, future studies should examine how to increase study sample sizes and aim to include a better representation of adults and people in GMFCS levels IV and V.

PMID: 33241561

9. Effectiveness of exercise interventions for children with cerebral palsy: A systematic review and meta-analysis of randomized controlled trials
Xianrong Liang, Zhujiang Tan, Guojun Yun, Jianguo Cao, Jinggang Wang, Qing Liu, Turong Chen

J Rehabil Med. 2020 Nov 23. doi: 10.2340/16501977-2772. Online ahead of print.

Objective: The results of previous research into exercise interventions for children with cerebral palsy are inconsistent. The aim of this study is to assess the effectiveness of such exercise interventions. Design: Meta-analysis. Methods: Systematic searches of the PubMed, Embase and Cochrane Library databases for randomized controlled trials involving exercise interventions for children with cerebral palsy, from inception to January 2020, were performed. Pooled weighted mean differences (WMDs) with 95% confidence intervals (95% CI) for gross motor function, gait speed, and muscle strength were calculated using random-effects models. Results: A final total of 27 trials, including 834 children with cerebral palsy, were selected for quantitative analysis. Exercise interventions had no significant effect on the level of gross motor function (WMD 1.19; 95% CI -1.07 to 3.46; p = 0.302). However, exercise interventions were associated with higher levels of gait speed (WMD 0.05; 95% CI 0.00-0.10; p = 0.032) and muscle strength (WMD 0.92; 95% CI 0.19-1.64; p = 0.013). Conclusion: These results suggest that exercise interventions may have beneficial effects on gait speed and muscle strength, but no significant effect on gross motor function in children with cerebral palsy.

PMID: 33225375

10. Review. Feeding Disability In Children
Yumna Riaz, Consolato Sergi

In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan. 2020 Nov 7.

Feeding disability in children is termed as a pediatric inadequacy to take food and includes disorders resulting in delayed development of milestones, inappropriate weight gain, and/or failure to thrive. Feeding disorder may present as a child refusing to eat a certain group of foods or a specific food element class. The child can manifest with crying, vomiting, choking, or spitting up during feeds. It requires a comprehensive assessment of medical, psychosocial, feeding skill-based systems and associated nutritional based complications. Gastrointestinal disturbance in children with neurodisability (e.g., cerebral palsy) reflects the interplay between the central nervous system (CNS) and the enteric nervous system (ENS), resulting in a mandatory comprehensive review of child pathology. Feeding disability is acute when the duration is less than three months and chronic when greater than three months have elapsed.

PMID: 33231976

11. Exploring treatments for drooling in children with neurological disorders
Antonella Riva, Camilla Federici, Gianluca Piccolo, Elisabetta Amadori, Alberto Verrotti, Pasquale Striano

Expert Rev Neurother. 2020 Nov 21. doi: 10.1080/14737175.2021.1855146. Online ahead of print.

Introduction: Drooling represents a major problem in the every-day life of pediatric patients with neurological disorders. The significant burden, both physical and socio-psychological, of the disorder requires adequate clinical evaluation and proper management. However, treating drooling remains a challenge for clinicians. This is a review of the most up-to-date therapeutic options for the treatment of drooling in the pediatric population, hence both conservative, pharmacological, and surgical approaches are discussed. Areas covered: Randomized clinical trials (RCTs), structured reviews, and case reports are included. Special focus is paid on the methods used to evaluate the efficacy and safety outcomes in the selected RCTs, trying to promote the use of more validated scales to assess drooling in the future. Expert opinion: The lack of reliable metrics to assess efficacy and safety outcomes in drooling limits researchers from identifying the best patient-suitable treatment. The relatively small number of clinical trials carried out over the last two decades is also due to the difficulty in assessing drooling using subjective scales. A key enabler for new efficient therapies stands in the introduction of accurate and robust metrics to measure treatment effectiveness on drooling.

PMID: 33222543

12. Locomotor and robotic assistive gait training for children with cerebral palsy
Dayna Pool, Jane Valentine, Nicholas F Taylor, Natasha Bear, Catherine Elliott

Dev Med Child Neurol. 2020 Nov 22. doi: 10.1111/dmcn.14746. Online ahead of print.

Aim: To determine if robotic assisted gait training (RAGT) using surface muscle electrical stimulation and locomotor training enhances mobility outcomes when compared to locomotor training alone in children with cerebral palsy (CP). Method: Forty children (18 females, 22 males; mean age 8y 1mo, SD 2y 1mo; range 5y 1mo-12y 11mo) with CP in Gross Motor Function Classification System levels (GMFCS) III, IV, and V were randomly assigned to the RAGT and locomotor training (RAGT+LT) group or locomotor training only group (dosage for both: three 1-hour sessions a week for 6 weeks). Outcomes were assessed at baseline T1 (week 0), post-treatment T2 (week 6), and retention T3 (week 26). The primary outcome measure was the Goal Attainment Scale. Secondary outcome measures included the 10-metre walk test, children's functional independence measure mobility and self-care domain, the Canadian Occupational Performance Measure, and the Gross Motor Function Measure. Results: There were no significant differences between the groups for both the primary and secondary outcome measures. All participants completed the intervention in their original group allocation. There were no reported adverse events. Interpretation: The addition of RAGT to locomotor training does not significantly improve motor outcomes in children with CP in GMFCS levels III, IV, and V. Future studies could investigate health and well-being outcomes after locomotor training.

PMID: 33225442

13. Virtual reality in the rehabilitation process for individuals with cerebral palsy and Down syndrome: A systematic review
Jamile Benite Palma Lopes, Natalia de Almeida Carvalho Duarte, Roberta Delasta Lazzari, Claudia Santos Oliveira

Review J Bodyw Mov Ther. 2020 Oct;24(4):479-483. doi: 10.1016/j.jbmt.2018.06.006. Epub 2018 Jun 28.

Background: Childhood neurological diseases result in neuromotor impairment, which affects selective motor control, compromising the acquisition of motor skills and functional independence. The positive results achieved with virtual reality are

believed to be related to training in an interactive environment that provides a broad range of activities and scenarios with multiple sensory channels, enabling the creation of exercises at an intensity based on individual need. Therefore, a review was conducted to answer the following question: What are the possible effects of virtual reality for the pediatric population, specifically children with cerebral palsy and Down syndrome? Objective: The objective of the present study was to conduct a systematic review of the literature to determine the possible effects of virtual reality therapy in children with cerebral palsy and Down's syndrome. Methods: The PubMed, Bireme, Scielo and PEDro electronic databases were searched in the period from January to March 2016 using the following keywords: Down syndrome and virtual reality, virtual reality and cerebral palsy, virtual reality and neuropediatrics, and Down's syndrome and virtual reality. Only randomized controlled trials published in English in the previous 10 years (2007-2016) that addressed the specific purpose of this review and achieved a score of at least 4 points on the PEDro methodological quality scale were eligible for inclusion. Results: The initial research led to the retrieval of 214 articles, which were analyzed considering the inclusion criteria. Eighteen articles were submitted to an appraisal of methodological quality using the PEDro scale, only five of which received a score of four or more points and were described in the present review. Three of the studies selected analyzed children with cerebral palsy and two analyzed children with Down syndrome. Despite the different physiopathological characteristics of the two conditions, the authors employed similar therapeutic methods and evaluations. The results of the studies demonstrated that virtual reality training either alone or combined with motor training leads to improvements in sensory-motor functions and can be used as a complement to other successful rehabilitation interventions in the two populations. Conclusion: Based on the results of the studies included in the present systematic review, despite differences in the characteristics of each population, the objectives and methods proposed by the authors were similar and virtual reality demonstrated promising effects for individuals with cerebral palsy and Down syndrome.

PMID: 33218550

14. Screening tools for early identification of children with developmental delay in low- and middle-income countries: a systematic review
Tasnuva Faruk, Catherine King, Mohammad Muhit, Md Kafiul Islam, Israt Jahan, Kamran Ul Baset, Nadia Badawi, Gulam Khandaker

Objective: To systematically review, identify and report the screening tools used for early identification of developmental delay in low- and middle-income countries. Design: Systematic review. Data sources: Four bibliographic databases: Medline (1946 to 13 July 2020), Embase (1974 to 13 July 2020), Scopus (1823 to 11 July 2020) and PsycINFO (1987 to July week 1 2020). Eligibility criteria: Peer-reviewed original articles published in English addressing validated culturally sensitive developmental screening tools among children aged <5 years were included in this review. Data extraction and synthesis: One author (CK, medical librarian) developed the search strategy. Three authors conducted the database search (phase I: CK; phase II: IJ and MKI). Three authors (TF, IJ and MKI) independently screened the title and abstracts. TF, MKI and GK independently performed the full-text review of the screened articles. During each step of the study selection process, disagreements were resolved through discussion. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement was used to guide the systematic review. Data extraction and analysis were performed using MS Excel. Meta-analysis was not possible due to heterogeneity of the study findings. Results: We identified 3349 articles, of which 18 studies from 10 countries, reporting 16 screening tools, were selected for qualitative synthesis. Six cultural contexts were explored. Twelve general, two motor and two speech-language tools were identified. Seven of them found to be parent-completed ones. Five screening tools (American Speech-Language and Hearing Association, Guide for Monitoring Child Development, Infant Neurological International Battery, New Delhi-Development Screening Questionnaire and Woodside Screening Technique) reported relatively higher sensitivity (82.5%-100%) and specificity (83%-98.93%). Conclusions: Limited number of culturally sensitive developmental screening tools were validated for children aged <5 years in low- and middle-income countries. Revising existing screening tools in different ethnic and cultural settings and subsequent validation with normative value should be a research priority.

PMID: 33234622

15. The effects of education levels of developmental care in Australia: Perceptions and challenges
Nadine Griffiths, Kaye Spence, Claire Galea, Kim Psaila, Maralyn Foureur, Lynn Sinclair

Aust Crit Care. 2020 Nov 18;S1036-7314(20)30310-6. doi: 10.1016/j.aucc.2020.10.003. Online ahead of print.

Background: Developmental care consists of a range of clinical, infant-focused, and family-focused interventions designed to modify the neonatal intensive care environment and caregiving practices to reduce stressors on the developing brain. Since the inception of developmental care in the early 1980s, it has been recommended and adopted globally as a component of routine

practice for neonatal care. Despite its application for almost 40 y, little is known of the attitude of neonatal nurses in Australia towards the intervention. Aims and objectives: The objective of this study was to establish Australian neonatal nurse perceptions of developmental care and explore associations between developmental care education levels of the nurses and personal beliefs in the application of developmental care. Design: This involves a cross-sectional survey design. Methods: An online questionnaire was completed by 171 neonatal nurses. Participants were members of the Australian College of Neonatal Nursing (n = 783). Covariate associations between key components of developmental care and respondents' geographical location, place of employment, professional qualifications, and developmental care education level were analysed. The reporting of this study is in accordance with the Enhancing the Quality and Transparency of Health Research Checklist for Reporting Results of Internet E-Surveys. Results: Differences were observed between groups for geographical location, place of employment, and professional qualification level. Rural nurses were less likely to support the provision of skin-to-skin care (odds ratio [OR]: 0.6, 95% confidence interval [CI]: 0.2-1.8) than nurses in a metropolitsan unit. Nurses working in a neonatal intensive care unit and nurses with postgraduate qualifications were more likely to support parental involvement in care ([OR: 2.3, 95% CI: 0.9-6.2] and [OR: 2.1, 95% CI: 0.6-7.4], respectively). Rural respondents were more likely to have attended off-site education (OR: 3.6, 95% CI: 1.3-9.9) than metropolitan respondents. Conclusion: The application of developmental care in Australia may be influenced by inadequate resources and inequitable access to educational resources, and similar challenges have been reported in other countries. Overcoming the challenges requires a focused education strategy and support within and beyond the neonatal intensive care unit.

PMID: 33221131

16. First trimester maternal biomarkers: can they reveal causes of cerebral palsy?
Anne Eskild

Dev Med Child Neurol. 2020 Nov 22. doi: 10.1111/dmcn.14744. Online ahead of print.

PMID: 33225449

17. Maternal Infection During Pregnancy and Risk of Cerebral Palsy in Children: A Systematic Review and Meta-analysis
Erfan Ayubi, Saeedeh Sarhadi, Kamyar Mansori

J Child Neurol. 2020 Nov 24;883073820972507. doi: 10.1177/0883073820972507. Online ahead of print.

Background and aim: The association between maternal infection during pregnancy and the risk of cerebral palsy has been previously reported. However, their results were relatively inconsistent. This systematic review and meta-analysis were carried out to investigate the association between maternal infection during pregnancy and the risk of cerebral palsy in children. Methods: PubMed, Scopus, and Web of Sciences databases were searched from inception to October 28, 2019. Heterogeneity was assessed using the I2 value. In case of substantial heterogeneity (I2 > 50%), a random effects model was applied, otherwise, a fixed effects model was used. The pooled associations were expressed as relative risks (RRs) and 95% confidence intervals (CIs). Publication bias and quality of studies included in the systematic review were checked using the Egger's regression test and Newcastle-Ottawa Scale (NOS), respectively. Results: Thirty-seven studies were included in the systematic review. Among them, 21 studies were eligible for the meta-analysis. The pooled RR of cerebral palsy risk was 2.50 (95% CI 1.94, 3.21; I2 = 88.7%, P < .001) among children born to mothers who had any infection during pregnancy. The risk was increased to 2.85 (95% CI 1.96, 4.15; I2 = 75.9%, P < .001) when the mother was diagnosed with chorioamnionitis. Publication bias tests suggested no evidence of potential publication bias and 76% of the studies included in the meta-analysis were of high quality (NOS ≥ 6). Conclusion: This systematic review and meta-analysis provides evidence that maternal infection during pregnancy may be associated with an increased risk of cerebral palsy in children.

PMID: 33231118

18. Epidural analgesia, intrapartum hyperthermia, and neonatal brain injury: a systematic review and meta-analysis
Sarah Morton, Justin Kua, Christopher J Mullington

Review Br J Anaesth. 2020 Nov 17;S0007-0912(20)30854-0. doi: 10.1016/j.bja.2020.09.046. Online ahead of print.

Background: Epidural analgesia is associated with intrapartum hyperthermia, and chorioamnionitis is associated with neonatal brain injury. However, it is not known if epidural hyperthermia is associated with neonatal brain injury. This systematic review and meta-analysis investigated three questions: (1) does epidural analgesia cause intrapartum hyperthermia, (2) is intrapartum hyperthermia associated with neonatal brain injury, and (3) is epidural-induced hyperthermia associated with neonatal brain injury? Methods: PubMed, ISI Web of Knowledge, The Cochrane Library, and Embase were searched from inception to January 2020 using Medical Subject Headings (MeSH) terms relating to epidural analgesia, hyperthermia, labour, and neonatal brain injury. Studies were reviewed independently for inclusion and quality by two authors (Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach). Two meta-analyses were performed using the Mantel-Haenszel fixed effect method to generate odds ratios (ORs) and 95% confidence intervals (CIs). Results: Forty-one studies were included for Question 1 (646 296 participants), 36 for Question 2 (11 866 021 participants), and two studies for Question 3 (297 113 participants). When the mode of analgesia was randomised, epidural analgesia was associated with intrapartum hyperthermia (OR: 4.21; 95% CI: 3.48-5.09). There was an association between intrapartum hyperthermia and neonatal brain injury (OR: 2.79; 95% CI: 2.54-2.3.06). It was not possible to quantify the association between epidural-induced hyperthermia and neonatal brain injury. Conclusions: Epidural analgesia is a cause of intrapartum hyperthermia, and intrapartum hyperthermia of any cause is associated with neonatal brain injury. Further work is required to establish if epidural-induced hyperthermia is a cause of neonatal brain injury.

PMID: 33218673

19. Current Status of the Obstetric Compensation System for Cases of Cerebral Palsy at a General Hospital in Tochigi, Japan
Kobayashi Yasuaki, Tsukui Mizue, Shibata Akimichi, Suda Yoshio

Glob Pediatr Health. 2020 Nov 13;7:2333794X20973845. doi: 10.1177/2333794X20973845. eCollection 2020.

Objective. The Japan Obstetric Compensation System for Cerebral Palsy (JOCSC) was launched in January 2009 as the first nationwide no-fault compensation system. The aim of the study was to clarify the present status of functioning of the JOCSC in pediatric and obstetric departments at a general hospital. Method. Children eligible for compensation are as follows: (1) Gestational week at 32 weeks or later and birth weight of 1400 g or more, or 28 weeks or later with apparent asphyxia at birth. (2) Severe cerebral palsy related to hypoxia at delivery, not caused by congenital reasons or factors during the neonatal period. Results. Applications for the JOCSC were submitted for 11 cases (5 cases born at our hospital and 6 cases born at other childbirth facilities). Eight cases (4 cases born at our hospital and 4 cases born at other childbirth facilities) were authorized for the JOCSC. Remaining 3 cases were judged as not being eligible because of 2 cases with congenital reasons for the condition and 1 case with the judgement as mild cerebral palsy. Conclusion. Ten years have elapsed since the establishment of the JOCSC. Improved awareness of the medical staff and caregivers of children with cerebral palsy about the JOCSC should be promoted.

PMID: 33241087

20. An autosomal dominant neurological disorder caused by de novo variants in FAR1 resulting in uncontrolled synthesis of ether lipids
Sacha Ferdinandusse, Kirsty McWalter, Heleen Te Brinke, Lodewijk IJlst, Petra M Mooijer, Jos P N Ruiter, Alida E M van Lint, Mia Pras-Raves, Eric Wever, Francisca Millan, Maria J Guillen Sacoto, Amber Begtrup, Mark Tarnopolsky, Lauren Brady, Roger L Ladda, Susan L Sell, Catherine B Nowak, Jessica Douglas, Cuixia Tian, Elizabeth Ulm, Seth Perlman, Arlene V Drack, Karen Chong, Nicole Martin, Jennifer Brault, Elly Brokamp, Camilo Toro, William A Gahl, Ellen F Macnamara, Lynne Wolfe, Undiagnosed Diseases Network; Quinten Waisfisz, Petra J G Zwijnenburg, Alban Ziegler, Magalie Barth, Rosemarie Smith, Sara Ellingwood, Deborah Gaebler-Spira, Somayeh Bakhtiari, Michael C Kruer, Antoine H C van Kampen, Ronald J A Wanders, Hans R Waterham, David Cassiman, Frédéric M Vaz

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Purpose: In this study we investigate the disease etiology in 12 patients with de novo variants in FAR1 all resulting in an amino acid change at position 480 (p.Arg480Cys/His/Leu). Methods: Following next-generation sequencing and clinical phenotyping,

functional characterization was performed in patients' fibroblasts using FAR1 enzyme analysis, FAR1 immunoblotting/ immunofluorescence, and lipidomics. Results: All patients had spastic paraparesis and bilateral congenital/juvenile cataracts, in most combined with speech and gross motor developmental delay and truncal hypotonia. FAR1 deficiency caused by biallelic variants results in defective ether lipid synthesis and plasmalogen deficiency. In contrast, patients' fibroblasts with the de novo FAR1 variants showed elevated plasmalogen levels. Further functional studies in fibroblasts showed that these variants cause a disruption of the plasmalogen-dependent feedback regulation of FAR1 protein levels leading to uncontrolled ether lipid production. Conclusion: Heterozygous de novo variants affecting the Arg480 residue of FAR1 lead to an autosomal dominant disorder with a different disease mechanism than that of recessive FAR1 deficiency and a diametrically opposed biochemical phenotype. Our findings show that for patients with spastic paraparesis and bilateral cataracts, FAR1 should be considered as a candidate gene and added to gene panels for hereditary spastic paraplegia, cerebral palsy, and juvenile cataracts.

PMID: 33239752

21. Diagnostic Specificity of Cerebral Magnetic Resonance Imaging for Punctate White Matter Lesion Assessment in a Preterm Sheep Fetus Model
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Recent studies, using magnetic resonance imaging (MRI) to assess white matter injury in preterm brains, increasingly recognize punctate white matter lesions (PWML) as the primary lesion type. There are some papers showing the relationship between the size and number of PWML and the prognosis of infants. However, the histopathological features are still unknown. In this study, we experimentally induced periventricular leukomalacia (PVL) in a sheep fetus model, aiming to find whether MRI can visualize necrotic foci (small incipient lesions of PVL) as PWML. Three antenatal insults were employed to induce PVL in preterm fetuses at gestational day 101-117: (i) hypoxia under intrauterine inflammation, (ii) restriction of artificial placental blood flow, and (iii) restriction of artificial placental blood flow after exposure to intrauterine inflammation. MRI was performed 3-5 days after the insults, and standard histological studies of the PVL validated its findings. Of the 89 necrotic foci detected in histological samples from nine fetuses with PVL, 78 were visualized as PWML. Four of the lesions detected as abnormal findings on MRI could not be histologically detected as corresponding abnormal findings. The diagnostic sensitivity and positive predictive values of histologic focal necrosis visualized as PWML were 0.92 and 0.95, respectively. The four lesions were excluded from these analyses. These data suggest that MRI can visualize PVL necrotic foci as PWML 3-5 days after the injury induction. PWML can spontaneously become obscure with time after birth, so their accurate diagnosis in the acute phase can prevent overlooking mild PVL.

PMID: 33237519

22. The evolution of cerebral palsy publications and global productivity: a bibliometric analysis between 1980 and 2019
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Although cerebral palsy (CP), which affects the quality of life of many children and their families, is the most common cause of motor dysfunction in children, no comprehensive bibliometric study has holistically evaluated the publications on CP. This study aimed to analyze the scientific outputs published on CP in pediatrics research between 1980 and 2019 using bibliometric and statistical methods, and reveal new study trends in this field. The literature search was performed in the Web of Science database using the keyword cerebral palsy in the title section of the articles published only in the pediatrics research field. Four -thousand seventy-five publications were obtained in the field of pediatrics research on CP, 3027 of which were articles. We shared abstract information of 3027 articles published between 1980 and 2019 with this comprehensive bibliometric study, which will be a useful guide for physicians and scientists on the global outcomes of CP, and we discussed new trends in this topic. We think that comprehensive bibliometric analyzes on subjects that we frequently encounter in clinics and which are widely researched will contribute to the field.

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