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Interventions and Management

1. Correction of Planovalgus Deformity Through Rotational Reinsertion of the Lateral Layers of the Achilles Tendons in Ambulatory Children With Cerebral Palsy.

Lashkouski U, Ihnatouski M, Pauk J, Daunoraviciene K.

J Foot Ankle Surg. 2019 May;58(3):528-533. doi: 10.1053/j.jfas.2018.11.001.

Symptomatic planovalgus deformity is a condition commonly seen in patients with cerebral palsy. The authors propose a new procedure for the management of this deformity through rotational reinsertion of the lateral layers of the Achilles tendon, and then they assess its benefit by comparing plantar pressure distribution patterns in children preoperatively and at 6- and 12-month intervals postoperatively. Pedobarographic measurements, range of motion of the ankle, and radiographic indexes were used to assess the outcome of the surgery. The functional abilities of the patients were assessed based on the Gross Motor Function Classification System. A total of 37 feet (22 patients) were included, with a mean \pm standard deviation age at surgery of 11.8 ± 2.7 (range 9.1 to 14.5) years. All feet were managed through rotational reinsertion of the lateral layers of the Achilles tendon. Surgical correction of planovalgus has good outcomes. Significant changes were observed with statistical significance at the 5% ($p \leq .05$) level in plantar pressure distribution in children preoperatively and at 6- and 12-month intervals postoperatively. The results show that the proposed method of surgery is effective in the correction of planovalgus in ambulatory children with cerebral palsy.

PMID: [31047028](#)

2. Selective dorsal rhizotomy in children with cerebral palsy.

Buizer AI.

Lancet Child Adolesc Health. 2019 Apr 29. pii: S2352-4642(19)30132-4. doi: 10.1016/S2352-4642(19)30132-4. [Epub ahead of print]

PMID: [31047844](#)

3. Selective dorsal rhizotomy in ambulant children with cerebral palsy: an observational cohort study.

Summers J, Coker B, Eddy S, Elstad M, Bunce C, Bourmpaki E, Pennington M, Aquilina K, Cawker S, Edwards R, Goodden J, Hawes S, McCune K, Pettorini B, Smith J, Sneade C, Vloeberghs M, Patrick H, Powell H, Verity C, Peacock JL; Selective Dorsal Rhizotomy Steering Committee.

Lancet Child Adolesc Health. 2019 Apr 29. pii: S2352-4642(19)30119-1. doi: 10.1016/S2352-4642(19)30119-1. [Epub ahead of print]

BACKGROUND: Selective dorsal rhizotomy (SDR) is an irreversible surgical procedure involving the division of selected sensory nerve roots, followed by intensive physiotherapy. The aim is to improve function and quality of life in children with cerebral palsy and a Gross Motor Function Classification System (GMFCS) level of II or III (walks with or without assistive devices, respectively). We assessed gross motor function before and after SDR and postoperative quality of life in a study commissioned by NHS England. **METHODS:** We did a prospective observational study in five hospitals in England who were commissioned to perform SDR on children aged 3-9 years with spastic diplegic cerebral palsy. The primary outcome was score changes in the 66-item Gross Motor Function Measure (GMFM-66) and seven domains of the Cerebral Palsy Quality of Life Questionnaire ([CP-QoL] social wellbeing and acceptance, feelings about functioning, participation and physical health, emotional wellbeing and self-esteem, access to services, family health, and pain and impact of disability) from before to 24 months after SDR. **FINDINGS:** From Sept 4, 2014, to March 21, 2016, 137 children underwent SDR. The mean age was 6.0 years (SD 1.8). The mean GMFM-66 score increased after SDR with an annual change of 3.2 units (95% CI 2.9 to 3.5, n=137). Of the seven CP-QoL domains, five showed significant improvements over time: feelings about functioning mean annual change 3.0 units (95% CI 2.0 to 4.0, n=133), participation and physical health 3.9 units (2.5 to 5.3, n=133), emotional wellbeing and self-esteem 1.3 units (0.2 to 2.3, n=133), family health 2.0 units (0.7 to 3.3, n=132), and pain and impact of disability -2.5 units (-3.9 to -1.2, n=133). 17 adverse events were reported in 15 children, of which none were severe and 15 (88%) resolved. **INTERPRETATION:** SDR improved function and quality of life in the 24 months after surgery in children with cerebral palsy classified as GMFCS levels II and III. On the basis of these findings, an interim national policy decision was made that SDR would be funded for eligible children in England from 2018. **FUNDING:** National Institute for Health and Care Excellence, National Institute for Health Research Biomedical Research Centre, NHS England.

PMID: [31047843](#)

4. Australian children undergoing selective dorsal rhizotomy: protocol for a national registry of multidimensional outcomes.

Lewis J, Bear N, Baker F, Fowler A, Lee O, McLennan K, Richardson E, Scheinberg A, Smith N, Thomason P, Tidemann A, Wynter M, Paget S.

BMJ Open. 2019 May 1;9(4):e025093. doi: 10.1136/bmjopen-2018-025093.

INTRODUCTION: Selective dorsal rhizotomy (SDR) is a neurosurgical intervention intended to permanently reduce spasticity in the lower limbs and improve mobility in selected children with cerebral palsy (CP). Despite SDR having been performed worldwide for the past 30 years, there is moderate quality of evidence that SDR is effective in reducing spasticity with low to very low evidence of its effectiveness in improving gait, function and participation, using the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) system. Published studies have described outcomes for groups that differ in selection, surgical technique and postoperative rehabilitation making it difficult for clinicians to use this information to advise families on best management. There is substantial community interest in SDR. A small number of children with CP undergo SDR in Australia each year and some families seek the intervention at international sites. Capturing clinical outcomes and adverse event (AE) data for Australian children undergoing SDR will provide clinicians with information to help guide families considering SDR. **METHODS AND ANALYSIS:** The Australian SDR Research Registry is a national registry of multidimensional outcomes for Australian children undergoing SDR in an Australian or overseas centre. Data will be collected for up to 10 years following the surgery, to include surgery and admission details, surgical and long-term AEs, and outcome measures across the body structure and functions, activity and participation domains of the International Classification of Functioning, Disability and Health. Data will be collected at baseline, during inpatient admission and at 1, 2, 5 and 10 years post. The aim of collecting these data is to improve understanding of short-, medium- and long-term outcomes and adverse effects of the intervention. **ETHICS AND DISSEMINATION:** This study was approved by the individual Human Research and Ethics committees at the five Australian tertiary hospitals involved. Results will be disseminated via peer-reviewed publications and conference presentations. **TRIAL REGISTRATION NUMBER:** ACTRN12618000985280; Pre-results.

PMID: [31048430](#)

5. Motor Abilities in Adolescents Born Preterm Are Associated With Microstructure of the Corpus Callosum.

Groeschel S, Holmström L, Northam G, Tournier JD, Baldeweg T, Latal B, Caflisch J, Vollmer B.

Front Neurol. 2019 Apr 16;10:367. doi: 10.3389/fneur.2019.00367. eCollection 2019.

Background: Preterm birth is associated with increased risk of neuromotor impairment. Rates of major neuromotor impairment (cerebral palsy) have decreased; however, in a large proportion of those who do not develop cerebral palsy impaired neuromotor function is observed and this often has implications for everyday life. The aim of this study was to investigate motor performance in preterm born adolescents without cerebral palsy, and to examine associations with alterations of motor

system pathway structure. Design/Methods: Thirty-two adolescents (12 males) without cerebral palsy, born before 33 weeks of gestation (mean 27.4 weeks, SD 2.4; birth weight mean 1,084.5 g; SD 387.2), treated at a single tertiary unit, were assessed (median age 16 years; min 14, max 18). Timed performance and quality of movements were assessed with the Zürich Neuromotor Assessment. Neuroimaging included Diffusion Magnetic Resonance Imaging for tractography of the major motor tracts and measurement of fractional anisotropy as a measure of microstructure of the tracts along the major motor pathways. Separate analyses were conducted for areas with predominantly single and predominantly crossing fiber regions. Results: Motor performance in both tasks assessing timed performance and quality of movements, was poorer than expected in the preterm group in relation to norm population. The strongest significant correlations were seen between performance in tasks assessing movement quality and fractional anisotropy in corpus callosum fibers connecting primary motor, primary somatosensory and premotor areas. In addition, timed motor performance was significantly related to fractional anisotropy in the cortico-spinal and thalamo-cortical to premotor area fibers, and the corpus callosum. Conclusions: Impairments in motor abilities are present in preterm born adolescents without major neuromotor impairment and in the absence of focal brain injury. Altered microstructure of the corpus callosum microstructure appears a crucial factor, in particular for movement quality.

PMID: [31040815](#)

6. A Novel Intervention Technology for Cerebral Palsy: Brain Stimulation.

Ramezani S, Amiini N, Khodaei F, Safakheil H, Sarveazad A, Mohebbi SL, Brouki Milan P.

Iran J Child Neurol. 2019 Spring;13(2):17-28.

A common pediatric disorder with posture and motor dysfunction in neurological diseases is known as cerebral palsy (CP). Recently, a series of effective techniques have been developed for treatment of CP. These promising methods need high-tech equipment for brain stimulation and mainly classified into invasive and no-invasive approaches. This study aimed to introduce these techniques for treatment of patients who suffer from CP. The potential and performance of currently available brain stimulation techniques have been mentioned in detail. Moreover, the clinical application, safety, efficacy and challenges of these methods have been discussed. Here we review the recent advances in the CP treatment with an emphasis on brain stimulation techniques.

PMID: [31037074](#)

7. Use of whole body vibration therapy in individuals with moderate severity of cerebral palsy- a feasibility study.

Pin TW, Butler PB, Purves S.

BMC Neurol. 2019 May 1;19(1):80. doi: 10.1186/s12883-019-1307-5.

BACKGROUND: This pilot study was to examine the feasibility and tolerance of whole body vibration therapy (WBVT) for children and adults with moderate severity of cerebral palsy (CP) being graded as levels III or IV on the Gross Motor Function Classification Scale (GMFCS). **METHODS:** Study participants received the additional WBVT when standing still on the vibration platform for three 3-min bouts of vibration (20 Hz, 2 mm amplitude), 4 days per week for 4 weeks. In addition to questions relating to feasibility and participants' opinions, assessment at baseline and completion of the intervention included the Gross Motor Function Measure-66 Item Set (GMFM-66 IS), 2-min walk test (2MWT), Timed Up and Go test (TUG) and Pediatric Evaluation of Disability Inventory (PEDI). Wilcoxon Signed Ranks test was used to compare the results. **RESULTS:** Fourteen participants (mean age = 25.25 years SD 3.71; 9 males, 64%; GMFCS level III n = 13, 92%) were recruited and completed the study. The attendance rate was over 90% with no adverse events. All participants tolerated the protocol which was satisfactorily delivered in a clinical setting. **CONCLUSIONS:** The present WBVT protocol was feasible, safe and well-tolerated by the participants with moderate severity of CP, justifying future studies with larger samples and more rigorous study design. **TRIAL REGISTRATION:** The present study has been registered under the ClinicalTrials.gov (NCT03375736) and the date of registration commenced on 18 December 2017.

PMID: [31043157](#)

8. Effects Of Scalp Acupuncture On Functional Deficits Induced By Early Sensorimotor Restriction.

Kemel Zanella A, Martins Gutierrez J, Stigger F.

J Acupunct Meridian Stud. 2019 Apr 24. pii: S2005-2901(18)30044-X. doi: 10.1016/j.jams.2019.03.002. [Epub ahead of print]

The aim of this study was to investigate the effects of scalp acupuncture and electrostimulation, combined or not, in a disuse model consisted of early sensorimotor restriction in rats. Male Wistar pups received sensorimotor restriction from the second postnatal day (P2) until P28. Animals were divided in 5 different groups (n=6): control (CT), sensorimotor restricted (SR), acupuncture (AC), electrostimulation (EL) and electro-acupuncture (AC+EL). Experimental animals received sham, acupuncture or electrical stimulation, combined or not, of two scalp regions for seven days (P29-P35). Previously to treatment period (P29) and after treatment (P36) animals were evaluated with the narrow suspended bar, horizontal ladder and stride length tests. SR animals had worse performance in the narrow suspended and horizontal ladder tasks compared to SR animals at P29 ($p \leq 0.005$). Significant improvements were observed in both tasks in AC, EL and EL+AC groups comparing P29 and P36 ($p < 0.001$). Also, at P35 all treated animals performed significantly better motor tasks compared to SR group ($p < 0.05$). There was no difference between treated groups. Finally, acupuncture and electrical stimulation, combined or not, have beneficial effect on motor performance following early developmental disuse.

PMID: [31028972](#)

9. Examination of touch-coordinate errors of adolescents with unilateral spastic cerebral palsy at an aiming-tapping task.

Kara OK, Yardımcı BN, Livanelioglu A, Soylu AR/

J Back Musculoskelet Rehabil. 2019 Apr 11. doi: 10.3233/BMR-181385. [Epub ahead of print]

BACKGROUND/OBJECTIVE: This study aimed to investigate performance (touch-coordinate errors, inter-touch interval) of touch screen technology in adolescents with unilateral spastic cerebral palsy (USCP) and healthy peers. **MATERIALS AND METHODS:** This prospective case-control study included 31 adolescents. The participants consisted of 15 adolescents with CP in the USCP group and 16 age-matched healthy peers in the control group. All participants performed an aiming-tapping task with an Android tablet. Four sessions were randomly applied: visual feedback (VF) and no VF with the dominant hand's index finger (DHF), and VF and no VF with the non-dominant hand's index finger (NDHF). Inter-touch interval (ITI) and touch-coordinate errors (TCE) were calculated. **RESULTS:** There were significant differences between the groups for VF and no VF-NDHF TCE and ITI (respectively $p = 0.001$, $p = 0.01$, $p = 0.001$, $p = 0.004$) and VF and no VF-DHF TCE values (respectively $p = 0.01$, $p = 0.008$). When comparing the dominant and non-dominant hand in the USCP group, there was a significant difference on TCE with no VF ($p = 0.01$). **CONCLUSION:** This study provided insight into the touch screen performance of adolescents with USCP, who performed an aiming-tapping task with a tablet. Results showed that both affected and unaffected hand performance of touch screen tasks was impaired in adolescents with USCP.

PMID: [31033458](#)

10. Diet Quality Profile of Track & Field Paralympic Athletes.

Joaquim DP, Juzwiak CR, Winckler C.

Int J Sport Nutr Exerc Metab. 2019 Apr 29:1-23. doi: 10.1123/ijsnem.2018-0361. [Epub ahead of print]

This study aimed to assess the diet quality of Brazilian Paralympic track & field team sprinters and its variation between-days. All (n=28) sprinters were invited and 20 (13 men and 7 women) accepted the invitation consisting of 13 athletes with visual impairment (VI), 4 with cerebral palsy (CP) and 3 with limb deficiency (LD). The dietary intake was recorded by photographic register on four consecutive days and diet quality was determined using a revised version of the Healthy Eating Index for the Brazilian population (HEI-R). Physical activity was assessed using an accelerometer and MET information was used to classify exercise intensity. Variance Analysis Model and Bonferroni multiple comparisons were used to assess relationships between variables. The correlations between variables used Pearson's linear correlation coefficient. The results show that HEI-R score was classified as "needs to be modified" for all athletes. The maximum score for the components "Whole fruits", "Total vegetables", and "Dark green and orange vegetables and legumes" was achieved by 23.1% and 14.3%; 7.7% and 14.3%; 46.2% and 57.8% of male and female athletes, respectively. Only 38.5% of the male athletes achieved the maximum score for the "Total cereal" component. Female athletes achieved higher scores than male athletes for the "Milk and dairy products" component ($p = 0.03$). Intake of wholegrain cereals, dairy products, vegetables and whole fruits need modifications, in order to improve adequate intake of vitamins and antioxidants, highlighting the need of continuous actions of nutrition education for this population.

PMID: [31034250](#)

11. The nature of rehabilitation services provided to children with cerebral palsy: a population-based nationwide study.

Kim SW, Jeon HR, Youk T, Kim J.

BMC Health Serv Res. 2019 May 2;19(1):277. doi: 10.1186/s12913-019-4111-4.

BACKGROUND: Cerebral palsy (CP) is a serious neurodevelopmental disorder that occurs in childhood and requires a range of treatments over a person's lifetime. The aims of this study were to investigate the nature of the rehabilitation treatments provided to children with CP and to determine if there were any changes in patterns over time. **METHODS:** From 2003 to 2013, the nature of rehabilitation treatment was analyzed for children diagnosed with CP. In addition, the medical data of rehabilitation treatments over a 10-year period (from birth to nine years of age) were analyzed for children born in 2004 diagnosed with CP. Furthermore, we analyzed whether there was a difference in the costs of medical expenditures according to family income. All studies were based on data from the Korean National Health Information Database. **RESULTS:** It was found that, in recent years, rehabilitation therapy and spasticity treatment of children with CP have started being performed at a younger age than in the past. Among the children with CP born in 2004, 28.6% had physical therapy and 25.4% had occupational therapy on an inpatient basis; 81.3% had physical therapy and 62.2% had occupational therapy on an outpatient basis. Additionally, 22.2% of children received botulinum toxin injection therapy at least once. The numbers of children receiving rehabilitation therapy and botulinum toxin injection were highest at 1-5 years of age and 6-7 years of age, respectively. The expenditure on rehabilitation therapy was not affected by the economic level of the family. **CONCLUSION:** This study investigated the nature of rehabilitation services provided to children with CP. More recently, the treatment of children with CP has started to be performed earlier than in the past. In addition, it was confirmed that the nature of rehabilitation treatment for children with CP changed according to age. Based on these results, services and health policies may need to be better organized to enhance the benefits to children with CP.

PMID: [31046762](#)**12. Assessment priorities in cerebral palsy using ICF core set by Iranian occupational therapists.**

Raji P, Mehraban AH, Ahmadi M, Schiariti V.

Can J Occup Ther. 2019 May 2;8417419833400. doi: 10.1177/0008417419833400. [Epub ahead of print]

BACKGROUND: International Classification of Functioning, Disability and Health (ICF) core set for cerebral palsy allows for the description of the levels of functioning in cerebral palsy. It is not exactly clear which of these levels is more important for evaluation from the perspective of occupational therapists in Iran. By identifying these priorities, we can establish a better plan for intervention. **PURPOSE:** This study defines assessment priorities in children with cerebral palsy (<6 years). **METHOD:** Sixty-two Iranian occupational therapists studied the priorities of assessment based on the Iranian ICF core set. The therapists were asked to rate the code categories from 1 to 3. The results are presented as mean values. **FINDINGS:** Occupational therapists first focus on body functions assessment, then activities/participation, and ultimately, environmental factors. **IMPLICATIONS:** Occupational therapists in Iran have a bottom-up approach toward clients with cerebral palsy. It may be necessary to revise the educational curriculum, prepare a training course, and provide more supervision for practising occupational therapists.

PMID: [31046435](#)**13. Associations between impairments and activity limitations components of the international classification of functioning and the gross motor function and subtypes of children with cerebral palsy.**

Saleh M, Almasri NA, Malkawi SH, Abu-Dahab S.

J Phys Ther Sci. 2019 Apr;31(4):299-305. doi: 10.1589/jpts.31.299. Epub 2019 Apr 1.

[Purpose] Cerebral palsy (CP) encompasses a group of disorders of movement and posture with wide ranges of impairments, activity limitations and participation restrictions. Guiding management of children with CP by the ICF model is important to deliver quality services. This study aimed to explore relationship between CP subtypes and the Gross Motor Function Classification System-Expanded and Revised (GMFCS-E&R) and to examine differences in distribution of impairments and activity limitations across CP subtypes and GMFCS-E&R levels. [Participants and Methods] 70 children with CP (mean age: 6.5 ± 2.9 years) were classified using CP subtypes and GMFCS-E&R. Research assistants examined impairments including: scoliosis, scissoring, and inability to bear weight. Parents described their children's transfers and functional mobility. [Results] CP subtypes and GMFCS-E&R levels were significantly associated. Scissoring and scoliosis were predominant in children in

levels IV and V of the GMFCS-E&R. Only scoliosis was predominant in children with quadriplegia. Transfer activities and functional mobility were more limited in children with quadriplegia and in level V of the GMFCS-E&R. [Conclusion] Impairments and activity limitations components of the ICF can be differentiated by CP subtypes and GMFCS-E&R. Clinicians can use the two classification in providing comprehensive and individualized services for children with CP and their families.

PMID: [31036999](#)

14. The effect of intrathecal baclofen in dyskinetic cerebral palsy: the IDYS trial.

Bonouvrié LA, Becher JG, Vles JSH, Vermeulen RJ, Buizer AI; IDYS study group.

Ann Neurol. 2019 May 2. doi: 10.1002/ana.25498. [Epub ahead of print]

OBJECTIVE: Intrathecal baclofen treatment is used for the treatment of dystonia in patients with severe dyskinetic cerebral palsy, however, the current level of evidence for the effect is low. The primary aim of this study was to provide evidence for the effect of intrathecal baclofen treatment on individual goals in patients with severe dyskinetic cerebral palsy. **METHODS:** This multi-centre, randomized, double-blind, placebo-controlled trial was performed at two University Medical Centres in the Netherlands. Patients with severe dyskinetic cerebral palsy (Gross Motor Functioning Classification System level IV-V), aged 4 to 24, eligible for intrathecal baclofen, were included. Patients were assigned by block randomization (2:2) for treatment with intrathecal baclofen or placebo during three months via an implanted micro-infusion pump. The primary outcome was Goal Attainment Scaling of individual treatment goals (GAS T-score). A linear regression model was used for statistical analysis with study site as a covariate. Safety analyses were done for number and type of (serious) adverse events. **RESULTS:** Thirty-six patients were recruited from January 1st 2013 to March 31st 2018. Data for final analysis were available for 17 in the intrathecal baclofen group and 16 patients in the placebo group. Mean (SD) GAS T-score at three months was 38.9 (13.2) for intrathecal baclofen and 21.0 (4.6) for placebo (regression coefficient 17.8, 95% CI 10.4 to 25.0, $p < 0.001$). Number and types of (serious) adverse events were similar between groups. **INTERPRETATION:** Intrathecal baclofen treatment is superior to placebo in achieving treatment goals in patients with severe dyskinetic cerebral palsy. This article is protected by copyright. All rights reserved.

PMID: [31050023](#)

15. School-age outcomes of children without cerebral palsy cooled for neonatal hypoxic-ischaemic encephalopathy in 2008-2010.

Lee-Kelland R, Jary S, Tonks J, Cowan FM, Thoresen M, Chakkarapani E.

Arch Dis Child Fetal Neonatal Ed. 2019 Apr 29. pii: fetalneonatal-2018-316509. doi: 10.1136/archdischild-2018-316509. [Epub ahead of print]

OBJECTIVE: Since therapeutic hypothermia became standard care for neonatal hypoxic-ischaemic encephalopathy (HIE), even fewer infants die or have disability at 18-month assessment than in the clinical trials. However, longer term follow-up of apparently unimpaired children is lacking. We investigated the cognitive, motor and behavioural performances of survivors without cerebral palsy (CP) cooled for HIE, in comparison with matched non-HIE control children at 6-8 years. **DESIGN:** Case-control study. **PARTICIPANTS:** 29 case children without CP, cooled in 2008-2010 and 20 age-matched, sex-matched and social class-matched term-born controls. **MEASURES:** Wechsler Intelligence Scales for Children, Fourth UK Edition, Movement Assessment Battery for Children, Second Edition (MABC-2) and Strengths and Difficulties Questionnaire. **RESULTS:** Cases compared with controls had significantly lower mean (SD) full-scale IQ (91 [10.37] vs 105 [13.41]; mean difference (MD): -13.62, 95% CI -20.53 to -6.71) and total MABC-2 scores (7.9 [3.26] vs 10.2 [2.86]; MD: -2.12, 95% CI -3.93 to -0.3). Mean differences were significant between cases and controls for verbal comprehension (-8.8, 95% CI -14.25 to -3.34), perceptual reasoning (-13.9, 95% CI -20.78 to -7.09), working memory (-8.2, 95% CI -16.29 to -0.17), processing speed (-11.6, 95% CI -20.69 to -2.47), aiming and catching (-1.6, 95% CI -3.26 to -0.10) and manual dexterity (-2.8, 95% CI -4.64 to -0.85). The case group reported significantly higher median (IQR) total (12 [6.5-13.5] vs 6 [2.25-10], $p = 0.005$) and emotional behavioural difficulties (2 [1-4.5] vs 0.5 [0-2.75], $p = 0.03$) and more case children needed extra support in school (34% vs 5%, $p = 0.02$) than the control group. **CONCLUSIONS:** School-age children without CP cooled for HIE still have reduced cognitive and motor performance and more emotional difficulties than their peers, strongly supporting the need for school-age assessments.

PMID: [31036702](#)

16. Heart rate variability in children with cerebral palsy.

Katz-Leurer M, Amichai T.

Dev Med Child Neurol. 2019 Jun;61(6):730-731. doi: 10.1111/dmcn.14095.

PMID: [31049945](#)**17. MRPS25 mutations impair mitochondrial translation and cause encephalomyopathy.**

Bugiardini E, Mitchell AL, Rosa ID, Horning-Do HT, Pitmann A, Poole OV, Holton JL, Shah S, Woodward C, Hargreaves I, Quinlivan R, Amunts A, Wiesner RJ, Houlden H, Holt IJ, Hanna MG, Pitceathly RDS, Spinazzola A.

Hum Mol Genet. 2019 Apr 30. pii: ddz093. doi: 10.1093/hmg/ddz093. [Epub ahead of print]

Mitochondrial disorders are clinically and genetically heterogeneous, and are associated with a variety of disease mechanisms. Defects of mitochondrial protein synthesis account for the largest subgroup of disorders manifesting with impaired respiratory chain capacity; yet, only a few have been linked to dysfunction in the protein components of the mitochondrial ribosomes. Here, we report a subject presenting with dyskinetic cerebral palsy and partial agenesis of the corpus callosum, while histochemical and biochemical analyses of skeletal muscle revealed signs of mitochondrial myopathy. Using exome sequencing, we identified a homozygous variant, c.215C>T, in MRPS25, which encodes for a structural component of the 28S small subunit of the mitochondrial ribosome (mS25). The variant segregates with the disease, and substitutes a highly conserved proline residue with leucine (p.P72L) that, based on the high resolution structure of the 28S ribosome, is predicted to compromise inter-protein contacts and destabilize the small subunit. Concordant with the in silico analysis, patient's fibroblasts showed decreased levels of MRPS25 and other components of the 28S subunit. Moreover, mutant fibroblasts showed a dearth of the 28S assembly accompanied by impaired mitochondrial translation and decreased levels of multiple respiratory chain subunits. Crucially, these abnormalities were rescued by transgenic expression of wild-type MRPS25 in the mutant fibroblasts. Collectively, our data demonstrate the pathogenicity of the p.P72L variant, and identified MRPS25 as a new cause of mitochondrial translation defect.

PMID: [31039582](#)**18. Myoclonus-dystonia caused by GNB1 mutation responsive to deep brain stimulation.**

Jones HF, Morales-Briceño H, Barwick K, Lewis J, Sanchis-Juan A, Raymond FL, Stewart K, Waugh MC, Mahant N, Kurian MA, Dale RC, Mohammad SS.

Mov Disord. 2019 Apr 29. doi: 10.1002/mds.27708. [Epub ahead of print]

PMID: [31034681](#)**19. Correction to: Can Neonatal Systemic Inflammation and Hypoxia Yield a Cerebral Palsy-Like Phenotype in Periadolescent Mice?**

Fragopoulou AF, Qian Y, Diaz Heijtz R, Forssberg H.

Mol Neurobiol. 2019 Apr 30. doi: 10.1007/s12035-019-1610-6. [Epub ahead of print]

The original version of this article unfortunately contained a mistake in Author name. In Rochellys Diaz Heijtz, "Diaz" should be classified as Familyname. Erratum for Can Neonatal Systemic Inflammation and Hypoxia Yield a Cerebral Palsy-Like Phenotype in Periadolescent Mice? [Mol Neurobiol. 2019]

PMID: [31041654](#)

Prevention and Cure

20. Obstetric factors associated with uterine rupture in mothers who deliver infants with cerebral palsy.

Hasegawa J, Ikeda T, Toyokawa S, Jojima E, Satoh S, Ichizuka K, Tamiya N, Nakai A, Fujimori K, Maeda T, Takeda S, Suzuki H, Ueda S, Iwashita M, Ikenoue T.

J Matern Fetal Neonatal Med. 2019 Apr 28;1-241. doi: 10.1080/14767058.2019.1611775. [Epub ahead of print]

OBJECTIVE: The aim of present study was to clarify the obstetric factors associated with uterine rupture in mothers who deliver infants with cerebral palsy (CP) in Japan. **METHODS:** This retrospective case-cohort study reviewed the obstetric characteristics and clinical courses of mothers who experienced uterine rupture and compared those who delivered an infant with CP (cases) with those who delivered an infant without CP (cohort). Data were obtained from the Japan Obstetric Compensation System for CP database (27 cases) and the perinatal database of the Japan Society of Obstetrics and Gynecology (312 cohorts). The subjects included live singleton infants delivered between 2009 and 2014 with a birth weight ≥ 2000 g and gestation ≥ 33 weeks. **RESULTS:** Augmentation was performed 33% in cases and 8% in cohorts ($p < 0.001$). The amount of bleeding during surgery were 1819 g in cases, and 1096 g in cohorts ($p < 0.001$). Length of gestational weeks and neonatal birth weight were significantly higher and Apgar scores and umbilical arterial pH were lower in cases compared to cohorts ($p < 0.001$). In cases with CP, 11 cases of uterine rupture involved scarred uteruses. Seven were trial of labor after previous cesarean. On hand, sixteen cases occurred in unscarred uteruses. Five of uterine fundal pressure maneuver and four of tachysystole due to excessive augmentation were reported in association with uterine rupture. **CONCLUSION:** Two-third of the relevant obstetric factors for CP associated with uterine rupture were iatrogenic. At least, to reduce CP resulting from delivery-related uterine rupture, reckless delivery management should be avoided.

PMID: [31032674](#)

21. Deep Learning/Artificial Intelligence and Blood-Based DNA Epigenomic Prediction of Cerebral Palsy.

Bahado-Singh RO, Vishweswaraiyah S, Aydas B, Mishra NK, Guda C, Radhakrishna U.

Int J Mol Sci. 2019 Apr 27;20(9). pii: E2075. doi: 10.3390/ijms20092075.

The etiology of cerebral palsy (CP) is complex and remains inadequately understood. Early detection of CP is an important clinical objective as this improves long term outcomes. We performed genome-wide DNA methylation analysis to identify epigenomic predictors of CP in newborns and to investigate disease pathogenesis. Methylation analysis of newborn blood DNA using an Illumina HumanMethylation450K array was performed in 23 CP cases and 21 unaffected controls. There were 230 significantly differentially-methylated CpG loci in 258 genes. Each locus had at least 2.0-fold change in methylation in CP versus controls with a FDR p -value ≤ 0.05 . Methylation level for each CpG locus had an area under the receiver operating curve (AUC) ≥ 0.75 for CP detection. Using Artificial Intelligence (AI) platforms/Machine Learning (ML) analysis, CpG methylation levels in a combination of 230 significantly differentially-methylated CpG loci in 258 genes had a 95% sensitivity and 94.4% specificity for newborn prediction of CP. Using pathway analysis, multiple canonical pathways plausibly linked to neuronal function were over-represented. Altered biological processes and functions included: neuromotor damage, malformation of major brain structures, brain growth, neuroprotection, neuronal development and de-differentiation, and cranial sensory neuron development. In conclusion, blood leucocyte epigenetic changes analyzed using AI/ML techniques appeared to accurately predict CP and provided plausible mechanistic information on CP pathogenesis.

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22. Exosomes Derived From Pericytes Improve Microcirculation and Protect Blood-Spinal Cord Barrier After Spinal Cord Injury in Mice.

Yuan X, Wu Q, Wang P, Jing Y, Yao H, Tang Y, Li Z, Zhang H, Xiu R.

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Spinal cord injury (SCI) often leads to severe and permanent paralysis and places a heavy burden on individuals, families, and society. Until now, the therapy of SCI is still a big challenge for the researchers. Transplantation of mesenchymal stem cells (MSCs) is a hot spot for the treatment of SCI, but many problems and risks have not been resolved. Some studies have reported

that the therapeutic effect of MSCs on SCI is related to the paracrine secretion of cells. The exosomes secreted by MSCs have therapeutic potential for many diseases. There are abundant pericytes which possess the characteristics of stem cells in the neurovascular unit. Due to the close relationship between pericytes and endothelial cells, the exosomes of pericytes can be taken up by endothelial cells more easily. There are fewer studies about the therapeutic potential of the exosomes derived from pericytes on SCI now. In this study, exosomes of pericytes were transplanted into the mice with SCI to study the restoration of motor function and explore the underlying mechanism. We found that the exosomes derived from pericytes could reduce pathological changes, improve the motor function, the blood flow and oxygen deficiency after SCI. In addition, the exosomes could improve the endothelial ability to regulate blood flow, protect the blood-spinal cord barrier, reduce edema, decrease the expression of HIF-1 α , Bax, Aquaporin-4, and MMP2, increase the expression of Claudin-5, bcl-2 and inhibit apoptosis. The experiments in vitro proved that exosomes derived from pericytes could protect the barrier of spinal cord microvascular endothelial cells under hypoxia condition, which was related to PTEN/AKT pathway. In summary, our study showed that exosomes of pericytes had therapeutic prospects for SCI.

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