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Interventions and Management

1. Arch Phys Med Rehabil. 2015 May 13. pii: S0003-9993(15)00401-3. doi: 10.1016/j.apmr.2015.05.002. [Epub ahead of print]

Impact of injection-guiding techniques on the effectiveness of botulinum toxin for the treatment of focal spasticity and dystonia: a systematic review.

Grigoriu A, Dinomais M, Rémy-Néris O, Brochard S.

AIM: To conduct a systematic review of the impact of different injection-guiding techniques on the effectiveness of botulinum toxin (BoNT-A) for the treatment of focal spasticity and dystonia. **DATA SOURCES:** MEDLINE via Pubmed, Academic Search Premier, Pascal, the Cochrane Library, Scopus, SpringerLink, Web of Science, EM Premium and PsychINFO. **STUDY SELECTION:** Two reviewers independently selected studies based on pre-determined inclusion criteria. **DATA EXTRACTION:** Data relating to the aim were extracted. Methodological quality was graded independently by 2 reviewers using the Physiotherapy Evidence Database (PEDro) assessment scale for randomized controlled trials (RCTs) and the Downs and Black (D&B) evaluation tool for non-RCTs. Level of evidence was determined using the modified Sackett scale. **DATA SYNTHESIS:** Ten studies were included. Seven were randomized. There was strong evidence (Level 1) that instrumented guiding (Ultrasound (US), Electrical-stimulation (ES) and Electromyography (EMG)) was more effective than manual needle placement for the treatment of spasmodic torticollis, upper limb spasticity and spastic equinus in patients with stroke, and spastic equinus in children with cerebral palsy. Three studies provided strong evidence (Level 1) of similar effectiveness of US and ES for upper and lower limb spasticity in patients with stroke, and spastic equinus in children with cerebral palsy, but there was poor evidence or no available evidence for EMG or other instrumented techniques. **CONCLUSIONS:** These results strongly recommend instrumented guidance of BoNT-A injection for the treatment of spasticity in adults and children (ES or US) and of focal dystonia such as spasmodic torticollis (EMG). No specific recommendations can be made regarding the choice of instrumented guiding technique, except that US appears to be more effective than ES for spastic equinus in adults with stroke.

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2. Gait Posture. 2015 Apr 20. pii: S0966-6362(15)00445-2. doi: 10.1016/j.gaitpost.2015.04.004. [Epub ahead of print]

Gait analysis to guide a selective dorsal rhizotomy program.

Roberts A, Stewart C, Freeman R.

Selective dorsal rhizotomy is a valuable surgical option to manage spasticity in children with bilateral cerebral palsy with the objective of improving function. Choosing the correct patient for rhizotomy requires considerable effort and a comprehensive evaluation. Instrumented three-dimensional gait analysis provides supporting evidence in the selection of the ideal child for SDR as well as enabling quantitative monitoring of outcome and post-operative management up to skeletal maturity.

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3. J Child Neurol. 2015 May 21. pii: 0883073815587030. [Epub ahead of print]

Comparison of Efficacy and Side Effects of Oral Baclofen Versus Tizanidine Therapy with Adjuvant Botulinum Toxin Type A in Children With Cerebral Palsy and Spastic Equinus Foot Deformity.

Dai AI, Aksoy SN, Demiryürek AT.

This retrospective study aimed to compare the therapeutic response, including side effects, for oral baclofen versus oral tizanidine therapy with adjuvant botulinum toxin type A in a group of 64 pediatric patients diagnosed with static encephalopathy and spastic equinus foot deformity. Following botulinum toxin A treatment, clinical improvement led to the gradual reduction of baclofen or tizanidine dosing to one-third of the former dose. Gross Motor Functional Measure and Caregiver Health Questionnaire scores were markedly elevated post-botulinum toxin A treatment, with scores for the tizanidine (Gross Motor Functional Measure: 74.45 ± 3.72 ; Caregiver Health Questionnaire: 72.43 ± 4.29) group significantly higher than for the baclofen group (Gross Motor Functional Measure: 68.23 ± 2.66 ; Caregiver Health Questionnaire: 67.53 ± 2.67 , $P < .001$). These findings suggest that the combined use of botulinum toxin A and a low dose of tizanidine in treating children with cerebral palsy appears to be more effective and has fewer side effects versus baclofen with adjuvant botulinum toxin A.

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4. Dev Med Child Neurol. 2015 May 20. doi: 10.1111/dmcn.12805. [Epub ahead of print]

Construct validity and reliability of the Selective Control Assessment of the Lower Extremity in children with cerebral palsy.

Balzer J, Marsico P, Mitteregger E, van der Linden ML, Mercer TH, van Hedel HJ.

AIM: Assessing impaired selective voluntary movement control in children with cerebral palsy (CP) has gained increasing interest. We investigated construct validity and intra- and interrater reliability of the Selective Control Assessment of the Lower Extremity (SCALE). METHOD: Thirty-nine children (21 males, 18 females) with spastic CP, mean age 12 years 6 months [range 6y 11mo-19y 9mo], Gross Motor Function Classification System (GMFCS) levels I to IV, participated. Differences in SCALE scores were determined on joint levels and between patients categorized according to their limb distribution and GMFCS levels. SCALE scores were correlated with the Fugl-Meyer Assessment, Manual Muscle Test, and Modified Ashworth Scale. To determine reliability, the SCALE was applied once and recorded on video. RESULTS: SCALE scores differed significantly between the less and more affected leg ($p < 0.001$) and between most leg joints. Total SCALE scores differed significantly between GMFCS levels I and II. Correlations with Fugl-Meyer Assessment, Manual Muscle Test, and Modified Ashworth Scale were 0.88, 0.88, and -0.55 respectively. Intraclass correlation coefficients were all above 0.9, with the minimal detectable

change below 2 points. INTERPRETATION: The SCALE appears to be a valid and reliable tool to assess selective voluntary movement control of the legs in children with spastic CP.

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5. Dev Med Child Neurol. 2015 May 17. doi: 10.1111/dmcn.12775. [Epub ahead of print]

Does food and fluid texture consumption relate to dietary intake in preschool children with cerebral palsy?

Gisel E.

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6. Dev Med Child Neurol. 2015 May 15. doi: 10.1111/dmcn.12796. [Epub ahead of print]

Food and fluid texture consumption in a population-based cohort of preschool children with cerebral palsy: relationship to dietary intake.

Benfer KA, Weir KA, Bell KL, Ware RS, Davies PS, Boyd RN.

AIM: To determine the texture constitution of children's diets and its relationship to oropharyngeal dysphagia (OPD), dietary intake, and gross motor function in young children with cerebral palsy (CP). METHOD: A cross-sectional, population-based cohort study comprising 99 young children with CP (65 males, 35 females) aged 18 to 36 months (mean age 27mo; Gross Motor Function Classification System [GMFCS] level I, n=45; II, n=13; III, n=14; IV, n=10; V, n=17). CP subtypes were classified as spastic unilateral (n=35), spastic bilateral (n=49), dyskinetic (n=5), and other (n=10), in accordance with the criteria of the Surveillance of Cerebral Palsy in Europe. Habitual dietary intake of food textures, energy, and water were determined from parent-completed 3-day weighed food records. Parent-reported feeding ability of food textures was reported on the Pediatric Evaluation of Disability Inventory and a feeding questionnaire. OPD was classified based on clinical feeding assessment using the Dysphagia Disorders Survey (rated by a certified assessor, KAB) and a subjective Swallowing Safety Recommendation (classified by a paediatric speech pathologist, KAB). RESULTS: Food/fluid textures were modified for 39% of children. Children with poorer gross motor function tended to receive a greater proportion of energy from fluids (GMFCS levels IV-V: $\beta=0.9$, $p=0.002$) in their diets and fewer chewable foods (level III: $\beta=-0.7$, $p=0.03$; levels IV-V: $\beta=-1.8$, $p<0.001$) compared to level I to II participants. Fluids represented a texture for which children frequently had OPD and the texture most frequently identified as unsafe (or recommended for instrumental assessment). INTERPRETATION: These findings indicate that swallowing safety, feeding efficiency, and energy/water intake should be considered when providing feeding recommendations for children with CP.

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7. J Phys Ther Sci. 2015 Apr;27(4):1279-82. doi: 10.1589/jpts.27.1279. Epub 2015 Apr 30.

The effects of vestibular stimulation on a child with hypotonic cerebral palsy.

An SJ.

[Purpose] The purpose of this case report is to present the effects of vestibular stimulation on a child with hypotonic cerebral palsy through the use of swings. [Case Description] The subject was a 19-month-old boy with a diagnosis of hypotonic cerebral palsy (CP) and oscillating nystagmus. The subject had received both physical therapy and occupational therapy two times per week since he was 5 months old but showed little to no improvement. [Methods] Pre and post-intervention tests were completed by the researcher using the Bayley Scales of Infant and Toddler Development II. The subject was provided with vestibular stimulation 3 times per week for 10 weeks in 1 hour sessions conducted by his mother as instructed by the researcher. During this research all other therapies were

stopped to determine the effects of the vestibular stimulation and to exclude the effects of other therapies. [Results] The subject demonstrated improvement of 4 months in motor skills and of 3 months in mental skills as shown by the Bayley Scales of Infant and Toddler Development II. [Conclusion] Vestibular stimulation was effective in improving postural control, movement, emotional well-being, and social participation of a child with hypotonic cerebral palsy.

[PMID: 25995606](#) [PubMed] PMCID: PMC4434027

8. Stud Health Technol Inform. 2015;210:339-43.

Planning, execution and monitoring of physical rehabilitation therapies with a robotic architecture.

González JC, Pulido JC, Fernández F, Suárez-Mejías C.

Traditional methods of rehabilitation require continuous attention of therapists during the therapy sessions. This is a hard and expensive task in terms of time and effort. In many cases, the therapeutic objectives cannot be achieved due to the overwork or the difficulty for therapists to plan accurate sessions according to the medical criteria. For this purpose, a wide range of studies is opened in order to research new ways of rehabilitation, as in the field of social robotics. This work presents the current state of the THERAPIST project [1]. Our main goal is to develop a cognitive architecture which provides a robot with enough autonomy to carry out an upper-limb rehabilitation therapy for patients with physical impairments, such as Cerebral Palsy and Obstetric Brachial Plexus Palsy.

[PMID: 25991162](#) [PubMed - in process]

9. Int J Environ Res Public Health. 2015 May 12;12(5):5046-60. doi: 10.3390/ijerph120505046.

Dog-assisted therapies and activities in rehabilitation of children with cerebral palsy and physical and mental disabilities.

Elmacı DT, Cevizci S.

The aim of the present study was to evaluate dog-assisted therapies and activities in the rehabilitation of children with cerebral palsy and physical and mental disabilities who have difficulties in benefiting from well-being and health-improving services. This descriptive-explanatory study was conducted in disabled children of various ages between 2008 and 2011 by an experienced team in a private training and rehabilitation center in Antalya (Turkey). In this study, five study groups were formed among the children with physical and mental disabilities. During the therapy studies, three dogs were used. For each therapy group, the goals for the children and therapist were defined, and the activities were determined according to these goals. The entire study process was followed using audio-records and photographs of patients. The expected targets were reached in all study groups. The children who experienced fear, anxiety and difficulties due to their disabilities in daily life learned to cope with their anxieties and fears, set goals and make plans to achieve their aims. During this study, the children improved their abilities to use their bodies according to their capabilities. Accordingly, they improved their ability to develop empathy between themselves and a therapy dog, to receive and present help, and to communicate. The results of the present study revealed that dog-assisted therapies and activities can be a supportive method for routine treatment procedures in the rehabilitation of children with cerebral palsy and physical and mental disabilities.

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Prevention and Cure

10. Brain. 2015 May 16. pii: awv117. [Epub ahead of print]

De novo point mutations in patients diagnosed with ataxic cerebral palsy.

Parolin Schnekenberg R, Perkins EM, Miller JW, Davies WI, D'Adamo MC, Pessia M, Fawcett KA, Sims D, Gillard E, Hudspith K, Skehel P, Williams J, O'Regan M, Jayawant S, Jefferson R, Hughes S11, Lustenberger A, Ragoussis J, Jackson M, Tucker SJ, Németh AH.

Cerebral palsy is a sporadic disorder with multiple likely aetiologies, but frequently considered to be caused by birth asphyxia. Genetic investigations are rarely performed in patients with cerebral palsy and there is little proven evidence of genetic causes. As part of a large project investigating children with ataxia, we identified four patients in our cohort with a diagnosis of ataxic cerebral palsy. They were investigated using either targeted next generation sequencing or trio-based exome sequencing and were found to have mutations in three different genes, KCNC3, ITPR1 and SPTBN2. All the mutations were de novo and associated with increased paternal age. The mutations were shown to be pathogenic using a combination of bioinformatics analysis and in vitro model systems. This work is the first to report that the ataxic subtype of cerebral palsy can be caused by de novo dominant point mutations, which explains the sporadic nature of these cases. We conclude that at least some subtypes of cerebral palsy may be caused by de novo genetic mutations and patients with a clinical diagnosis of cerebral palsy should be genetically investigated before causation is ascribed to perinatal asphyxia or other aetiologies.

[PMID: 25981959](#) [PubMed - as supplied by publisher] Free full text

11. Obstet Gynecol. 2015 Jun;125(6):1385-96. doi: 10.1097/AOG.0000000000000748.

Neurodevelopmental Outcome After a Single Course of Antenatal Steroids in Children Born Preterm: A Systematic Review and Meta-analysis.

Sotiriadis A, Tsiami A, Papatheodorou S, Baschat AA, Sarafidis K, Makrydimas G.

OBJECTIVE: To systematically review and integrate data on the neurodevelopmental outcome of children after administration of a single course of antenatal corticosteroids for threatened preterm labor. **DATA SOURCES:** MEDLINE, Scopus, CENTRAL, and www.clinicaltrials.gov (inception to August 2014) using combinations of the terms "prenatal," "antenatal," "cortico*," "*steroid*," "betamethasone," "dexamethasone," "neurodevelopment*," "*development*," and "follow-up." We perused the references of the retrieved articles. **METHODS OF STUDY SELECTION:** We included randomized and nonrandomized trials reporting on the neurodevelopmental outcomes of children whose mothers were administered a single course of betamethasone or dexamethasone antenatally for threatened preterm birth as opposed to placebo or no treatment. **TABULATION, INTEGRATION, AND RESULTS:** Summary risk ratio (RR) was calculated for dichotomous data; standardized mean difference was calculated for trials that measured the same outcome but used different methods. Heterogeneity was assessed using the I statistic. Sensitivity and subgroup analyses were planned according to study design, specific steroid, and mean gestational age at birth. A single course of antenatal corticosteroids was associated with reduced risk for cerebral palsy (seven studies; treated: 390 of 5,199, untreated: 146 of 1,379; RR 0.678, 95% confidence interval [CI] 0.564-0.815), psychomotor development index less than 70 (two studies; treated: 783 of 3,049, untreated: 258 of 969; RR 0.829, 95% CI 0.737-0.933), and severe disability (five studies; treated: 1,567 of 4,840, untreated: 475 of 1,211; RR 0.787, 95% CI 0.729-0.850). Steroid treatment increased the rates of intact survival (six studies; treated: 1,082 of 2,013, untreated: 273 of 561; RR 1.186, 95% CI 1.056-1.332). Betamethasone was found to significantly decrease the risk for severe disability and increase the rate of intact survival. Dexamethasone increased the rate of intact survival; however, data for dexamethasone and the other planned subgroup analyses were limited (fewer than 1,000 children at most). The major limitations involved inclusion of nonrandomized studies and scarcity of data on finer neurodevelopmental outcomes. **CONCLUSION:** A single course of antenatal corticosteroids in women at high risk for preterm birth appears to improve most neurodevelopmental outcomes in offspring born before 34 weeks of gestation.

[PMID: 26000510](#) [PubMed - in process]

12. Arch Gynecol Obstet. 2015 May 20. [Epub ahead of print]**Long-term outcomes of antenatal corticosteroids treatment in very preterm infants after chorioamnionitis.**

Miyazaki K, Furuhashi M, Ishikawa K, Tamakoshi K, Hayashi K, Kai A, Ishikawa H, Murabayashi N, Ikeda T, Kono Y, Kusuda S, Fujimura M.

PURPOSE: To evaluate the effect of antenatal corticosteroids (AC) therapy on short- and long-term outcomes among very low birth weight preterm infants after histologic chorioamnionitis (HCA). **METHODS:** We performed a retrospective analysis of 5240 single very low birth weight (VLBW) infants born at 22 + 0 and 33 + 6 weeks of gestation between 2003 and 2007, who registered to the Neonatal Research Network Japan. The effects of AC therapy on mortality, neurodevelopmental outcomes at 3 years of age and neonatal morbidities were analyzed in the groups with or without HCA using logistic regression analysis. **RESULTS:** In the study subjects, 840 were with HCA, 2734 were without HCA, and 1666 were excluded without data for HCA. AC therapy was significantly associated with decreasing mortality before 3 years of age; [0.52 (0.32-0.86)], [odds ratio (95 % confidence intervals)]. There were no differences between the two groups regarding neurodevelopmental outcomes, including cerebral palsy [0.90 (0.41-1.99)], development quotient <70 [0.93 (0.48-1.81)], visual impairment [0.46 (0.04-5.18)], and severe hearing impairment [4.00 (0.30-53.4)] in the group with HCA as well as without HCA. Regarding neonatal morbidities, AC therapy was associated with a lower incidence of respiratory distress syndrome [0.67 (0.50-0.91)], sepsis [0.62 (0.41-0.94)], late-onset adrenal insufficiency [0.62 (0.39-0.98)] and an increased incidence of chronic lung disease [1.62 (1.18-2.24)] in the group with HCA. In the group without HCA, AC therapy was associated with decreasing respiratory distress syndrome [0.60 (0.43-0.84)] and increasing chronic lung disease [1.34 (1.11-1.62)]. **CONCLUSION:** AC therapy is significantly associated with reduced mortality before 3 years of age in VLBW infants with HCA, but not with neurodevelopmental outcomes, which was same as the results found in infants without HCA. AC therapy is recommended for women with suspected chorioamnionitis, as well as those without chorioamnionitis.

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13. Syst Rev. 2015 May 17;4(1):71. doi: 10.1186/s13643-015-0058-7.**Predicting developmental outcomes in premature infants by term equivalent MRI: systematic review and meta-analysis.**

Van't Hooft, van der Lee JH, Opmeer BC, Aarnoudse-Moens CS, Leenders AG, Mol BW, de Haan TR.

BACKGROUND: This study aims to determine the prognostic accuracy of term MRI in very preterm born (≤ 32 weeks) or low-birth-weight (≤ 1500 g) infants for long-term (>18 months) developmental outcomes. **METHODS:** We performed a systematic review searching Central, Medline, Embase, and PsycInfo. Two independent reviewers performed study selection, data extraction, and quality assessment. We documented sensitivity and specificity for three different MRI findings (white matter abnormalities (WMA), brain abnormality (BA), and diffuse excessive high signal intensity (DEHSI)), related to developmental outcomes including cerebral palsy (CP), visual and/or hearing problems, motor, neurocognitive, and behavioral function. Using bivariate meta-analysis, we estimated pooled sensitivity and specificity and plotted summary receiver operating characteristic (sROC) curves for different cut-offs of MRI. **RESULTS:** We included 20 papers published between 2000 and 2013. Quality of included studies varied. Pooled sensitivity and specificity values (95 % confidence interval (CI)) for prediction of CP combining the three different MRI findings (using normal/mild vs. moderate/severe cut-off) were 77 % (53 to 91 %) and 79 % (51 to 93 %), respectively. For prediction of motor function, the values were 72 % (52 to 86 %) and 62 % (29 to 87 %), respectively. Prognostic accuracy for visual and/or hearing problems, neurocognitive, and/or behavioral function was poor. sROC curves of the individual MRI findings showed that presence of WMA provided the best prognostic accuracy whereas DEHSI did not show any potential prognostic accuracy. **CONCLUSIONS:** This study shows that presence of moderate/severe WMA on MRI around term equivalent age can predict CP and motor function in very preterm or low-birth-weight infants with moderate sensitivity and specificity. Its ability to predict other long-term outcomes such as neurocognitive and behavioral impairments is limited. Also, other white matter related tests as BA and DEHSI demonstrated limited prognostic value.

SYSTEMATIC REVIEW REGISTRATION: PROSPERO CRD42013006362.

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