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Interventions and Management

1. Dev Med Child Neurol. 2015 Oct 28. doi: 10.1111/dmcn.12939. [Epub ahead of print]

Psychometric properties of a revised version of the Assisting Hand Assessment (Kids-AHA 5.0).

Holmefur M, Krumlinde-Sundholm L.

AIM: The aim of this study was to scrutinize the Assisting Hand Assessment (AHA) version 4.4 for possible improvements and to evaluate the psychometric properties regarding internal scale validity and aspects of reliability of a revised version of the AHA. **METHOD:** In collaboration with experts, scoring criteria were changed for four items, and one fully new item was constructed. Twenty-two original, one new, and four revised items were scored for 164 assessments of children with unilateral cerebral palsy aged 18 months to 12 years. Rasch measurement analysis was used to evaluate internal scale validity by exploring rating-scale functioning, item and person goodness-of-fit, and principal component analysis. Targeting and scale reliability were also evaluated. **RESULTS:** After removal of misfitting items, a 20-item scale showed satisfactory goodness-of-fit. Unidimensionality was confirmed by principal component analysis. The rating scale functioned well for the 20 items, and the item difficulty was well suited to the ability level of the sample. The person reliability coefficient was 0.98, indicating high separation ability of the scale. A conversion table of AHA scores between the previous version (4.4) and the new version (5.0) was constructed. **INTERPRETATION:** The new, 20-item version of the Kids-AHA (version 5.0), demonstrated excellent internal scale validity, suggesting improved responsiveness to changes and shortened scoring time. For comparison of scores from version 4.4 to 5.0, a transformation table is presented.

[PMID: 26507383](#)

2. Disabil Rehabil. 2015 Oct 30:1-7. [Epub ahead of print]

Effects of the standing program with hip abduction on hip acetabular development in children with spastic diplegia cerebral palsy.

Macias-Merlo L, Bagur-Calafat C, Girabent-Farrés M, A Stenberg W4

PURPOSE: Early identification and intervention with conservative measures is important to help manage hip dysplasia in children with a high adductor and iliopsoas tone and delay in weight bearing. The effect of a daily standing program with hip abduction on hip acetabular development in ambulatory children with cerebral palsy was studied. **METHOD:** The participants were 26 children with spastic diplegia cerebral palsy (CP), classified at Level III according to the Gross Motor Function Classification System (GMFCS). Thirteen children stood with hip abduction at least 1 h daily from 12 to 14 months of age to 5 years with an individually fabricated standing frame

with hip abduction. RESULTS: At the age of 5 years, radiologic results of the study group were compared with a comparison group of 13 children with spastic diplegia CP who had not taken part in a standing program. The migration percentage in all children who stood with abduction remained within stable limits (13-23%) at 5 years of age, in comparison to children who did not stand in abduction (12-47%) ($p < 0.01$). CONCLUSIONS: The results indicate that a daily standing program with hip abduction in the first 5 years may enhance acetabular development in ambulatory children with spastic diplegia CP. Implications for Rehabilitation Abnormal acetabular development is a problem related to mobility problems and spasticity muscles around the hip. The literature suggests that postural management and standing programs could reduce levels of hip subluxation and increase function in children with cerebral palsy. A standing program with hip abduction can be a beneficial to develop more stable hips in children with spastic diplegic GMFCS level III.

PMID: 26517269

3. J Child Orthop. 2015 Oct 26. [Epub ahead of print]

Is percutaneous proximal gracilis tenotomy as effective and safe as the open procedure?

Hachache B, Eid T, Ghosn E, Sebaaly A, Kharrat K, Ghanem I.

PURPOSE: There is currently an increasing trend for percutaneous surgical interventions mainly in children with cerebral palsy (CP). The purpose of this study was to evaluate the effectiveness and safety of percutaneous proximal gracilis tenotomy (PPGT) in children with CP scheduled for hip adductor tenotomy. METHODS: This is a prospective study of 59 hips in 31 consecutive patients with CP scheduled for hip adductor tenotomy in the setting of multilevel tenotomies or hip osteotomy (femoral or Dega). A pediatric orthopedic surgeon conducted a percutaneous adductor longus and gracilis tenotomy through the same stab wound. Another surgeon extended the wound to explore what had been cut during the PPGT, and completed the tenotomy if necessary (open proximal gracilis tenotomy; OPGT). Hip abduction with the hip and knee extended (HA) was assessed by a third surgeon (1) immediately before PPGT, i.e., directly after percutaneous adductor longus tenotomy (prePPGT), (2) after PPGT (postPPGT), and (3) following OPGT (postOPGT), using a goniometer, in a standardized reproducible manner. All three surgeons were blinded to each other's findings. Primary end-points included the percentage of muscle portion sectioned percutaneously and the improvement of HA angle. Comparison between HA before and after PPGT was performed using a paired t test with 95 % confidence interval (CI), and comparison between HA after PPGT and OPGT was performed using a Student's t-test with 95 % CI. The bleeding was assessed and other iatrogenic lesions were identified. The relationship between HA after PPGT and the percentage of muscle portion sectioned percutaneously was evaluated by calculating the Pearson correlation coefficient ($p < 0.01$). RESULTS: Mean HA measured 33.71 degrees prePPGT and increased to 45.90 degrees postPPGT ($p < 0.0001$). The postOPGT HA averaged 48.71 degrees with no statistically significant gain compared with postPPGT ($p = 0.21$). The muscular portion of gracilis origin was cut to an average of 91.95 %; completely in only 14 hips, between 90 and 100 % in 35 hips, between 70 and 90 % in 9 hips, and between 60 and 70 % in 1 hip. The gain in HA did not correlate with the extent of the muscular portion sectioned percutaneously ($R = -0.043$). Minimal accidental section of adductor brevis postPPGT was encountered in 39 hips. Considerable bleeding postPPGT with hematoma formation requiring hemostasis during the open control procedure occurred in 30 hips. Partial iatrogenic injury of the anterior branch of the obturator nerve was encountered in one patient bilaterally with severe adductor contracture, due to an anatomic too medial variant. CONCLUSIONS: This is the only prospective study concerning the outcome of PPGT. Although PPGT is fast, simple and effective, it is not as safe as the open procedure even when performed correctly by an experienced surgeon, mainly because of the increased risk of bleeding. The findings of the current study do not support its use as a 'standard-of-care' technique in children with hip adductor contracture. LEVEL OF EVIDENCE: Level II therapeutic study-prospective comparative study.

[PMID: 26499454](#)

4. Dev Med Child Neurol. 2015 Oct 28. doi: 10.1111/dmcn.12950. [Epub ahead of print]

Muscle growth is reduced in 15-month-old children with cerebral palsy.

Herskind A, Ritterband-Rosenbaum A, Willerslev-Olsen M, Lorentzen J, Hanson L, Lichtwark G, Nielsen JB.

AIM: Lack of muscle growth relative to bone growth may be responsible for development of contractures in children with cerebral palsy (CP). Here, we used ultrasonography to compare growth of the medial gastrocnemius muscle in children with and without CP. METHOD: Twenty-six children with spastic CP (15 males, 11 females; mean age 35mo, range 8-65mo) and 101 typically developing children (47 males, 54 females; mean age 29mo, range 1-69mo) were included. Functional abilities of children with CP equalled levels I to III in the Gross Motor Function Classification System. Medial gastrocnemius muscle volume was constructed from serial, transverse, two-dimensional ultrasonography images. RESULTS: In typically developing children, medial gastrocnemius volume increased linearly with age. Among children with CP, medial gastrocnemius volume increased less with age and deviated significantly from typically developing children at 15 months of age ($p < 0.05$). Bone length increased with age without significant difference ($p = 0.49$). INTERPRETATION: Muscle growth in children with CP initially follows that of typically developing children, but decreases at 15 months of age. This may be related to reduced physical activity and neural activation of the muscle. Interventions stimulating muscle growth in young children with CP may be important to prevent contractures.

[PMID: 26510820](#)

5. J Can Chiropr Assoc. 2015 Sep; 59(3):245-52.

Whole body vibration and cerebral palsy: a systematic review.

Duquette SA, Guiliano AM, Starmer DJ.

PURPOSE: The goal of this review is to evaluate the effects of whole body vibration on outcomes in patients with cerebral palsy. The findings in this review may help clinicians make evidence informed decisions on the use of whole body vibration for cerebral palsy. METHODS: A systematic search was conducted on April 29, 2014. The following search terms were used to search of several databases: (whole body vibration OR whole-body vibration OR whole body-vibration OR WBV) AND (cerebral palsy). Articles that met the inclusion criteria were assessed using the Scottish intercollegiate guidelines network (SIGN) rating system to assess the methodology and bias of the articles for randomized control trials. RESULTS: The search produced 25 articles, of which 12 duplicates were identified and removed. Another seven articles were not considered since they did not fit the inclusion criteria, leaving a total of five studies for review. Four of the articles analyzed the effects of WBV in children while the other study focused on adults with cerebral palsy. There was one low quality article, four acceptable quality articles and one high quality article when assessed using the SIGN criteria. CONCLUSIONS: It appears that whole body vibration has the potential to provide symptomatic relief for patients with cerebral palsy. Whole body vibration may improve spasticity, muscle strength and coordination. There is a lack of research to conclusively determine whether it does alter bone mineral density. KEYWORDS: cerebral palsy; chiropractic; whole body vibration

[PMID: 26500358](#)

6. J Phys Ther Sci. 2015 Sep;27(9):3023-5. doi: 10.1589/jpts.27.3023. Epub 2015 Sep 30.

Whole-body vibration training improves the walking ability of a moderately impaired child with cerebral palsy: a case study.

Yabumoto T, Shin S, Watanabe T, Watanabe Y, Naka T, Oguri K, Matsuoka T.

Purpose: Strength training is recommended for children with cerebral palsy. However, it is difficult for moderately impaired children with cerebral palsy, who require crutches for ambulation, to participate in this type of training. The purpose of this study was to investigate whether whole-body vibration training is an effective method of strengthening in a moderately impaired child with cerebral palsy. [Subject and Methods] This report describes an 8-year-old Japanese boy with cerebral palsy, who was ambulatory with crutches. The subject participated in physical therapy twice a week for 5 weeks. Whole-body vibration training was selected to complement the standing practice. The patient's crutch-walking ability, gross motor function, and spasticity were evaluated. [Results] The number of

steps and walking duration were reduced in a 5-m walk test with crutches and gross motor function was improved. Further, the spasticity was reduced. [Conclusion] Whole-body vibration training is an effective physical therapy intervention in moderately impaired children with cerebral palsy, who are unable to walk without crutches.

[PMID: 26504349](#)

7. Neuromodulation. 2015 Oct 30. doi: 10.1111/ner.12361. [Epub ahead of print]

Intrathecal Baclofen Dosing Regimens: A Retrospective Chart Review.

Clearfield JS, Nelson ME, McGuire J, Rein LE, Tarima S.

OBJECTIVES: To examine dosing patterns in patients receiving baclofen via intrathecal baclofen pumps to assess for common patterns by diagnosis, ambulation ability, and affected limbs distribution. **MATERIALS AND METHODS:** This trial study included 25 patients with baclofen pumps selected from the 356 patients enrolled in our center's baclofen pump program. Selection was done by splitting all patients into diagnostic categories of stroke, multiple sclerosis, traumatic/anoxic brain injury, cerebral palsy, and spinal cord injury, and then, five patients were randomly selected from each diagnosis. A systematic chart review was then conducted for each patient from Jan 1, 2008, through September 16, 2013, to look at factors including mean daily dose at end of study, and among those implanted during the study mean initial stable dose and time to initial stable dose. **RESULTS:** Analysis of mean daily dose across diagnoses found significant differences, with brain injury, cerebral palsy, and spinal cord injury patients having higher doses while multiple sclerosis and stroke patients required lower doses. Nonambulatory patients strongly trended to have higher daily doses than ambulatory patients. Similar trends of mean initial stable dose being higher in a similar pattern as that of end mean daily dose were seen according to diagnoses and ambulatory status, although statistical significance could not be achieved with the small sample size. **CONCLUSION:** Significant differences in dosing were found between diagnoses and trended to differ by ambulatory status at the end of the study, and similar trends could be observed in achieving initial stable dose.

[PMID: 26517855](#)

8. PM R. 2015 Oct 20. pii: S1934-1482(15)01065-5. doi: 10.1016/j.pmrj.2015.10.005. [Epub ahead of print]

Intrathecal versus Oral Baclofen; a Matched Cohort Study of Spasticity, Pain, Sleep, Fatigue and Quality of Life.

McCormick ZL, Chu SK, Binler D, Neudorf D, Mathur SN, Lee J, Marciniak C.

BACKGROUND: Baclofen is commonly used to manage spasticity due to central nervous system lesions or dysfunction. While both intrathecal and oral delivery routes are possible, no study has directly compared clinical outcomes associated with these two routes of treatment. **OBJECTIVE:** To compare spasticity levels, pain, sleep, fatigue, and quality of life between individuals receiving treatment with intrathecal versus oral baclofen. **DESIGN:** Cross-sectional matched cohort survey study **SETTING:** Urban academic rehabilitation outpatient clinics **PARTICIPANTS:** Adult patients with spasticity, treated with intrathecal or oral baclofen for at least 1 year, matched 1:1 for age, gender, and diagnosis. **METHODS:** Standardized surveys were administered during clinic appointments or by telephone. **MAIN OUTCOME MEASURES:** Surveys included the Penn Spasm Frequency Scale (PSFS), Brief Pain Inventory, Epworth Sleepiness Scale, Fatigue Severity Scale, Life Satisfaction Questionnaire, Diener Satisfaction with Life Scale. **RESULTS:** 62 matched subjects were enrolled. The mean (standard deviation (SD)) age was 46 (11) years with a mean duration of intrathecal baclofen or oral baclofen treatment of 11 (6) and 13 (11) years, respectively. There were 40 (64%) males and 22 (36%) females. Primary diagnoses included spinal cord injury (SCI) (n=38), cerebral palsy (n=10), stroke (n=10) and multiple sclerosis (n=4). The mean (SD) dose of intrathecal and oral baclofen at the time of survey were 577 (1429) mcg/day and 86 (50) mg/day, respectively. Patients receiving intrathecal compared to oral baclofen experienced significantly fewer [1.44 (0.92) vs. 2.37 (1.12)] and less severe [1.44 (0.92) vs. 2.16 (0.83)] spasms, respectively as measured by the PSFS ($p < .01$; $p < .01$). There were no significant differences in pain, sleep, fatigue and quality of life between groups. Subanalysis of patients with SCI mirrored results of the entire study sample, with significant decreases in spasm frequency and severity associated with intrathecal compared to oral baclofen ($p < .01$; $p < .01$), but no other between group differences. The mean (SD) percent change in dose of oral (21% [33%]) compared to intrathecal (3% [28%]) baclofen was significantly larger two years prior to the date of survey ($p = .02$). **CONCLUSIONS:** Long-term treatment with

intrathecal compared to oral baclofen is associated with reduced spasm frequency and severity as well as greater dose stability. These benefits must be weighted against the risks of internal pump and catheter placement in patients considering intrathecal baclofen therapy. Copyright © 2015 American Academy of Physical Medicine and Rehabilitation. Published by Elsevier Inc. All rights reserved.

[PMID: 26498518](#)

9. J Urol. 2015 Oct 20. pii: S0022-5347(15)05025-9. doi: 10.1016/j.juro.2015.10.085. [Epub ahead of print]

Neurogenic lower urinary tract dysfunction in adults with cerebral palsy: outcomes following a conservative management approach.

Goldfarb RA, Pisansky A, Fleck J, Hoversten P, Cotter KJ, Katorski J, Liberman D, Elliott SP.

INTRODUCTION: Cerebral palsy (CP) is characterized by motor impairment following injury to the developing brain. Neurogenic lower urinary tract dysfunction (NLUTS) is estimated to affect at least one-third of children with CP, however, there is limited data as patients transition to adulthood. We sought to describe the symptoms, sequela, and management of NLUTS in adults with CP. **MATERIALS AND METHODS:** We performed a retrospective chart review of adult CP patients between 2011 and 2014. Patients with prior bladder reconstruction or catheterization-based bladder drainage were excluded. Severity of CP was determined using the Gross Motor Function Classification System (GMFCS). A conservative evaluation and treatment paradigm was utilized. Non-invasive treatments were encouraged; specifically, clean intermittent catheterization (CIC), which is often not feasible, is avoided unless patients develop urinary retention, hydronephrosis, or refractory lower urinary tract symptoms (LUTS). **RESULTS:** There were 121 patients included in final analysis. Median age was 25 and 50% (61/121) had GMFCS level V. There were 28/121 (23%) patients who failed non-invasive management as defined by hydronephrosis (9), persistent urinary retention (10), and refractory LUTS/incontinence (9); urethral CIC was poorly tolerated. 25% of all patients had evidence of urolithiasis during study period. Surgical intervention was rare and associated with significant morbidity. **CONCLUSIONS:** Adults with cerebral palsy may present with variable signs and symptoms of NLUTS. Conservative management was successful in over 75% of patients. CIC was poorly tolerated in patients who failed conservative treatment. Surgical intervention was rarely indication and should be reserved for select individuals.

[PMID: 26498055](#)

10. Pediatr Exerc Sci. 2015 Oct 23. [Epub ahead of print]

Acute Physical Exercise Affects Cognitive Functioning in Children With Cerebral Palsy.

Maltais DB, Gane C, Dufour SK, Wyss D, Bouyer L, McFadyen BJ, Zabjek K, Andrysek J, Voisen J. Little is known about the effects of acute exercise on the cognitive functioning of children with cerebral palsy (CP). Selected cognitive functions were thus measured using a paediatric version of the Stroop test before and after maximal, locomotor based aerobic exercise in 16 independently ambulatory children (8 children with CP), 6-15 years old. Intense exercise had: 1) a significant, large, positive effect on reaction time (RT) for the CP group (pre-exercise: 892 ± 56.5 ms vs. post-exercise: 798 ± 45.6 ms, $p < 0.002$, $d = 1.87$) with a trend for a similar but smaller response for the typically developing (TD) group (pre-exercise: 855 ± 56.5 ms vs. post-exercise: 822 ± 45.6 ms, $p < 0.08$, $d = 0.59$), and 2) a significant, medium, negative effect on the interference effect for the CP group (pre-exercise: 4.5 ± 2.5 %RT vs. post-exercise: 13 ± 2.9 %RT, $p < 0.04$, $d = 0.77$) with no significant effect for the TD group (pre-exercise: 7.2 ± 2.5 %RT vs. post-exercise: 6.9 ± 2.9 %RT, $p > 0.4$, $d = 0.03$). Response accuracy was high in both groups pre- and post-exercise (>96%). In conclusion, intense exercise impacts cognitive functioning in children with CP, both by increasing processing speed and decreasing executive function.

[PMID: 26502458](#)

11. Dev Med Child Neurol. 2015 Oct 28. doi: 10.1111/dmcn.12943. [Epub ahead of print]

Parent-reported pain in non-verbal children and adolescents with cerebral palsy.

Jayanath S, Ong LC, Marret MJ, Fauzi AA.

AIM: This cross-sectional study aimed to determine the prevalence, frequency, and intensity of parent-reported pain among non-verbal children with cerebral palsy (CP) and explore associations with medical, demographic, and parental psychosocial factors. **METHOD:** Participants were parents of non-verbal outpatients (aged 2-20y) with CP at University of Malaya Medical Centre, Kuala Lumpur and two community centres. Parents answered the Caregiver Priorities and Child Health Index of Life with Disabilities Questionnaire and a pro forma regarding parent-reported frequency and intensity of pain during the preceding 4 weeks. Parental psychosocial well-being was assessed via the Depression, Anxiety and Stress Scale and Multidimensional Scale of Perceived Social Support. **RESULTS:** The response rate was 94%; 104 children (54 males, 50 females) were studied. The majority (51%) were in Gross Motor Function Classification System level V and 65% had spastic quadriplegia. Parents reported pain in 65%, intense pain in 17%, and daily pain in 28%. Intense and frequent pain was reported during physiotherapy. More intense pain was reported in older children ($p=0.016$) and those with spastic quadriplegia ($p=0.020$). **INTERPRETATION:** Caregivers of non-verbal children with CP report a high frequency of pain. Pain intensity is associated with patient factors but not parental psychosocial factors.

[PMID: 26510627](#)

12. J Phys Ther Sci. 2015 Sep;27(9):2963-4. doi: 10.1589/jpts.27.2963. Epub 2015 Sep 30.

Relationships between problematic behaviors and motor abilities of children with cerebral palsy.

Uesugi M, Miyamoto A, Nanba Y, Otani Y, Takemasa S, Hujii S.

Purpose: This study aimed to examine whether motor abilities of children with cerebral palsy are related to their problematic behaviors. **[Subjects]** The subjects were children with mental retardation who were undergoing physical therapy. **[Methods]** Twenty-one examiners, 13 physical therapists, and 8 occupational therapists treated and examined the subjects by using the Japanese version of the Aberrant Behavior Checklist. The Japanese version of the Aberrant Behavior Checklist scores were compared between the Gross Motor Function Classification System I to III (12 subjects) and Gross Motor Function Classification System IV and V groups (17 subjects). **[Results]** Lethargy and stereotypy scores significantly differed between the groups, proving that patients with Gross Motor Function Classification System levels IV and V have more severe problematic behaviors. **[Conclusion]** In this study, only five types of problematic behaviors, namely irritability, lethargy, stereotypy, hyperactivity, and inappropriate speech, were examined. Despite this limitation, the study clarifies that problematic behaviors of children with cerebral palsy, except lethargy and stereotypy, have little relationship with their motor abilities.

[PMID: 26504335](#)

Prevention and Cure

13. Hum Brain Mapp. 2015 Sep 10. doi: 10.1002/hbm.22950. [Epub ahead of print]

Long term motor function after neonatal stroke: Lesion localization above all.

Dinomais M, Hertz-Pannier L, Groeschel S, Chabrier S, Delion M, Husson B, Kossorotoff M, Renaud C, Nguyen The Tich S; AVCnn Study Group.

Motor outcome is variable following neonatal arterial ischemic stroke (NAIS). We analyzed the relationship between lesion characteristics on brain MRI and motor function in children who had suffered from NAIS. Thirty eight full term born children with unilateral NAIS were investigated at the age of seven. 3D T1- and 3D FLAIR-weighted MR images were acquired on a 3T MRI scanner. Lesion characteristics were compared between patients with and without cerebral palsy (CP) using the following approaches: lesion localization either using a category-based analysis, lesion mapping as well as voxel-based lesion-symptom mapping (VLSM). Using diffusion-weighted imaging the microstructure of the cortico-spinal tract (CST) was related to the status of CP by measuring DTI parameters. Whereas children with lesions sparing the primary motor system did not develop CP, CP was always present when extensive lesions damaged at least two brain structures involving the motor system. The VLSM approach provided a statistical map that confirmed the cortical lesions in the primary motor system and revealed that CP was highly correlated with lesions in close proximity to the CST. In children with CP, diffusion parameters indicated microstructural changes in the CST at the level of internal capsule and the centrum semiovale. White matter damage of the CST in centrum semiovale was a highly reproducible marker of CP. This is the first description of the implication of this latter region in motor impairment after NAIS. In conclusion, CP in childhood was closely linked to the location of the infarct in the motor system. Hum Brain Mapp, 2015.

[PMID: 26512551](#)

14. Int J Mol Sci. 2015 Oct 21;16(10):25050-66. doi: 10.3390/ijms161025050.

Abnormal Paraplegin Expression in Swollen Neurites, τ - and α -Synuclein Pathology in a Case of Hereditary Spastic Paraplegia SPG7 with an Ala510Val Mutation.

Thal DR, Züchner S, Gierer S, Schulte C, Schöls L, Schüle R, Synofzik M.

Mutations in the SPG7 gene are the most frequent cause of autosomal recessive hereditary spastic paraplegias and spastic ataxias. Ala510Val is the most common SPG7 mutation, with a frequency of up to 1% in the general population. Here we report the clinical, genetic, and neuropathological findings in a homozygous Ala510Val SPG7 case with spastic ataxia. Neuron loss with associated gliosis was found in the inferior olivary nucleus, the dentate nucleus of the cerebellum, the substantia nigra and the basal nucleus of Meynert. Neurofilament and/or paraplegin accumulation was observed in swollen neurites in the cerebellar and cerebral cortex. This case also showed sub-cortical τ -pathology in a unique distribution pattern largely restricted to the brainstem. α -synuclein containing Lewy bodies (LBs) were observed in the brainstem and the cortex, compatible with a limbic pattern of Braak LB-Disease stage 4. Taken together, this case shows that the spectrum of pathologies in SPG7 can include neuron loss of the dentate nucleus and the inferior olivary nucleus as well as neuritic pathology. The progressive supranuclear palsy-like brainstem predominant pattern of τ pathology and α -synuclein containing Lewy bodies in our SPG7 cases may be either coincidental or related to SPG7 in addition to neuron loss and neuritic pathology.

[PMID: 26506339](#)

15. *J Child Neurol.* 2015 Oct 23. pii: 0883073815610430. [Epub ahead of print]

The Role of Prematurity in Patients with Hemiplegic Cerebral Palsy.

Zelnik N, Lahat E, Heyman E, Livne A, Schertz M, Sagie L, Fattal-Valevski A.

A multicentre retrospective study was conducted to investigate the perinatal factors, imaging findings and clinical characteristics of hemiplegic cerebral palsy with a particular focus on children born prematurely. Our cohort included 135 patients of whom 42% were born prematurely; 16% were extreme premature infants who were born at 30 weeks or earlier. Nineteen (14%) were twins. Right hemiplegia was slightly more common and accounted for 59% of the patients. Imaging findings of intraventricular haemorrhage and periventricular leukomalacia were more prevalent in premature children whereas stroke, porencephaly, cerebral haemorrhage and cerebral atrophy were more evenly distributed in both term-born and prematurely-born children ($p < 0.01$). The overall prevalence of epilepsy in the cohort was 26% with no differences in full-term compared to prematurely-born children. Regardless of the gestational birth age, intellectual deficits were more common in the presence of comorbidity of both hemiplegia and epilepsy ($p < 0.05$).

[PMID: 26500242](#)

16. *Neuroimage Clin.* 2015 Sep 6; 9:322-37. doi: 10.1016/j.nicl.2015.08.021. eCollection 2015.

Regional vulnerability of longitudinal cortical association connectivity: Associated with structural network topology alterations in preterm children with cerebral palsy.

Ceschin R, Lee VK, Schmithorst V, Panigrahy A.

Preterm born children with spastic diplegia type of cerebral palsy and white matter injury or periventricular leukomalacia (PVL), are known to have motor, visual and cognitive impairments. Most diffusion tensor imaging (DTI) studies performed in this group have demonstrated widespread abnormalities using averaged deterministic tractography and voxel-based DTI measurements. Little is known about structural network correlates of white matter topography and reorganization in preterm cerebral palsy, despite the availability of new therapies and the need for brain imaging biomarkers. Here, we combined novel post-processing methodology of probabilistic tractography data in this preterm cohort to improve spatial and regional delineation of longitudinal cortical association tract abnormalities using an along-tract approach, and compared these data to structural DTI cortical network topology analysis. DTI images were acquired on 16 preterm children with cerebral palsy (mean age 5.6 ± 4) and 75 healthy controls (mean age 5.7 ± 3.4). Despite mean tract analysis, Tract-Based Spatial Statistics (TBSS) and voxel-based morphometry (VBM) demonstrating diffusely reduced fractional anisotropy (FA) reduction in all white matter tracts, the along-tract analysis improved the detection of regional tract vulnerability. The along-tract map-structural network topology correlates revealed two associations: (1) reduced regional posterior-anterior gradient in FA of the longitudinal visual cortical association tracts (inferior fronto-occipital fasciculus, inferior longitudinal fasciculus, optic radiation, posterior thalamic radiation) correlated with reduced posterior-anterior gradient of intra-regional (nodal efficiency) metrics with relative sparing of frontal and temporal regions; and (2) reduced regional FA within frontal-thalamic-striatal white matter pathways (anterior limb/anterior thalamic radiation, superior longitudinal fasciculus and cortical spinal tract) correlated with alteration in eigenvector centrality, clustering coefficient (inter-regional) and participation co-efficient (inter-modular) alterations of frontal-striatal and fronto-limbic nodes suggesting re-organization of these pathways. Both along tract and structural topology network measurements correlated strongly with motor and visual clinical outcome scores. This study shows the value of combining along-tract analysis and structural network topology in depicting not only selective parietal occipital regional vulnerability but also reorganization of frontal-striatal and frontal-limbic pathways in preterm children with cerebral palsy. These findings also support the concept that widespread, but selective posterior-anterior neural network connectivity alterations in preterm children with cerebral palsy likely contribute to the pathogenesis of neurosensory and cognitive impairment in this group.

[PMID: 26509119](#)