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Interventions and Management

1. Evolution of gait in adolescents and young adults with spastic diplegia after selective dorsal rhizotomy in childhood: A 10 year follow-up study.

Romei M, Oudenhoven LM, van Schie PEM, van Ouwkerk WJR, van der Krogt MM, Buizer AI.

Gait Posture. 2018 Jun 4;64:108-113. doi: 10.1016/j.gaitpost.2018.06.002. [Epub ahead of print]

Short-term benefit on gait of selective dorsal rhizotomy (SDR) surgery, which relieves spasticity of the lower extremities has been demonstrated in children with cerebral palsy (CP). However very little is known of the evolution of gait when patients become adolescents and young adults. How does the gait pattern evolve in adolescents and young adults who underwent SDR during childhood? A longitudinal study was performed including 19 ambulant patients with spastic diplegia due to CP or other causes (mean age at SDR: 6.6 ± 1.6 years) who were assessed four times: pre-SDR, 2 years post-SDR, 5 years post-SDR and at least 10 years post-SDR. From 2D video recordings, Edinburgh Visual Gait Score and lower limb joint kinematic parameters were calculated. Our data show that the improvement in the gait pattern obtained short-term after SDR continues during into adolescence and adulthood. Ten years after SDR all patients improved compared to baseline. Considering the lower limb joint kinematics, most notable improvements were found at knee and ankle joints. Compared to the evaluation before SDR, the range of motion of the knee increased: the knee was more extended at initial contact and knee flexion in midswing improved. Excessive ankle plantar flexion was reduced during the entire gait cycle. Only minor changes were found at hip and pelvis. Eight patients underwent additional orthopaedic surgery in the years after SDR, and the present findings should be considered as a combination of SDR, development and additional treatment. We demonstrate lasting improvement of gait quality in ambulant patients with spastic diplegia who underwent SDR during childhood when they become adolescents and young adults.

[PMID: 29894977](#)

2. Hippotherapy on postural balance in the sitting position of children with cerebral palsy - Longitudinal study.

Moraes AG, Copetti F PhD, Ângelo VR BS, Chiavoloni L BS, de David AC PhD.

Physiother Theory Pract. 2018 Jun 11:1-8. doi: 10.1080/09593985.2018.1484534. [Epub ahead of print]

To verify the effects of 12, 24, 36 hippotherapy sessions over time on postural balance while sitting in children with cerebral palsy as well the effects of treatment after one interruption period of 45 days. Hippotherapy program with a twice-weekly treatment with a total of 13 children aged 5-10 years old. Measurements of postural balance during sitting were performed using the AMTI AccuSway Plus platform. There was a statistically significant reduction in mediolateral and anteroposterior sway after the first 12 hippotherapy sessions, and further significant sway reduction occurred as the treatment progressed. Changes in the center of pressure displacement velocity variable began to occur after 24 sessions.

Seated postural balance improved in children with cerebral palsy, as evidenced by lower COP displacement, particularly after a greater number of sessions. After the last evaluations, when completing 36 sessions of hippotherapy, it was verified that the improvements to the postural balance continued to occur. Therefore, further studies with a longer treatment period may help to clarify if, at some point, there is stabilization in the improvement of postural balance. Furthermore, it is important to analyze the impact of hippotherapy on functional activities over time.

[PMID: 29889590](#)

3. The effects of soft tissue procedures for internal hip rotation in cerebral palsy.

de Morais Filho MC.

Dev Med Child Neurol. 2018 Jun 14. doi: 10.1111/dmcn.13933. [Epub ahead of print]

This commentary is on the original article by Niklasch et al. To view this paper visit <https://doi.org/10.1111/dmcn.13910>

[PMID: 29904906](#)

4. Long-term outcomes over 10 years after femoral derotation osteotomy in ambulatory children with cerebral palsy.

Sung KH, Kwon SS, Chung CY, Lee KM, Cho GH, Park MS.

Gait Posture. 2018 Jun 4;64:119-125. doi: 10.1016/j.gaitpost.2018.06.003. [Epub ahead of print]

Femoral derotation osteotomy (FDO) is generally reported to be excellent for correcting the hip rotation and foot progression angles in children with cerebral palsy (CP). However, it is unclear how long the favorable outcomes are maintained. This study was performed to evaluate the long-term outcomes at more than 10 years after FDO in children with CP. FDO, as part of single event multilevel surgery to improve gait function, was performed at the intertrochanteric level with the patient in the prone position. The goal of the index surgery was femoral anteversion of 15°, measured using a modified trochanteric prominence angle test intraoperatively. All patients underwent three-dimensional gait analysis preoperatively and at 1 year and over 10 years postoperatively. Thirty-four ambulatory patients (53 hips) with CP undergoing FDO were included. The mean age at surgery was 7.8 years (SD=3.0 years) and mean follow-up duration was 12.9 years (SD=2.7 years). The mean hip rotation decreased significantly from 9.6° preoperatively to 3.1° at 1 year postoperatively ($p=0.004$), and decreased significantly to -5.9° at the final follow-up ($p<0.001$). The mean foot progression in stance decreased from 7.9° preoperatively to -7.4° at 1 year postoperatively ($p<0.001$), and was maintained at -10.9° at the final follow-up. The GDI significantly improved from 68.2 preoperatively to 83.4 1 year postoperatively ($p<0.001$), and was maintained at 82.3 at the final follow-up. No patients underwent revision surgery due to recurrence of rotation deformity. Proximal FDO performed in the prone position provides favorable long-term outcomes at more than 10 years postoperatively, without recurrence of rotation deformity. To avoid under-correction or recurrence due to insufficient derotation, surgeons should consider not only dynamic gait analysis findings but also the measurement of anatomic femoral anteversion during intraoperative derotation.

[PMID: 29902714](#)

5. Anterior distal femoral hemiepiphysiodesis can reduce fixed flexion deformity of the knee: a retrospective study of 83 knees.

Stiel N, Babin K, Vettorazzi E, Breyer S, Ebert N, Rupprecht M, Stuecker R, Spiro AS.

Acta Orthop. 2018 Jun 14:1-5. doi: 10.1080/17453674.2018.1485418. [Epub ahead of print]

Background and purpose - Fixed knee flexion deformity in children is a common problem in various diseases including myelomeningocele and cerebral palsy. Until now, only a few studies focusing on the surgical procedure of anterior distal femoral hemiepiphysiodesis have been published. We analyzed outcome and correction rate in the largest case series to date of patients treated by staples or 8-plates. **Patients and methods** - We reviewed the medical records of all patients with fixed knee flexion deformity who were treated with anterior distal femoral hemiepiphysiodesis using either staples or 8-plates between the years 2002 and 2017 (73 patients; 130 knees). 49 patients (83 knees) had completed treatment with implant removal at the time of full correction of the deformity or at skeletal maturity and were included. The average age at operation was 12 years (6-20). Patients were assigned to 3 different groups based on their diagnosis: cerebral palsy, myelomeningocele, and the "other" group. **Results** - Mean fixed knee flexion deformity improved from 21° (10-60°) to 8° (0-50°) ($p<0.001$) with an average correction rate of 0.44° per month (range -2.14° to 1.74°).

The correction rate per month was lowest for patients with cerebral palsy (0.20°), followed by the myelomeningocele group (0.50°), and the "other" group (0.58°). Implant loosening occurred in 10% of the treated knees with consecutive re-implantation in 5% of the cases. Interpretation - Anterior distal femoral hemiepiphyodesis is an effective and safe method for the treatment of fixed knee flexion deformity in children. The optimal timing depends on the remaining individual growth potential, the underlying disease, and the extent of the deformity.

[PMID: 29902104](#)

6. Factors associated with health and oral health-related quality of life of children and adolescents with cerebral palsy.

Cardoso AMR, de Medeiros MMD, Gomes LN, Martins ML, Padilha WWN, Cavalcanti AL.

Spec Care Dentist. 2018 Jun 12. doi: 10.1111/scd.12301. [Epub ahead of print]

To verify factors associated with impact on Health-Related Quality of Life (HRQoL) and Oral Health-Related Quality of Life (OHRQoL) of children and adolescents with cerebral palsy (CP). Sample of 149 individuals with CP aged 2 to 18 years and their caregivers, who provided information regarding HRQoL (PedsQL 4.0), OHRQoL (PedsQL 3.0 Oral Health, and socioeconomic factors. A calibrated investigator performed dental examinations, with dental caries, traumatic dental injury, periodontal, and occlusal evaluation. HRQoL and OHRQoL scores were transformed into a 0 to 100 scale, dichotomized in absence or presence of impact (score < 50) and analyzed by Mann-Whitney test and Poisson regression ($\alpha = .05$). The mean HRQoL score was 50.3 ± 10.2 . Impact on HRQoL was observed in 51.7% and associated with gender, general health perception, and communication skills. The mean OHRQoL score was 78.0 ± 24.6 . The presence of impact on OHRQoL (12.1%) was associated with age, presence of gastroesophageal reflux, dental caries, and periodontal diseases. scores. The impact on HRQoL was shown to be associated with gender, health perception. and communication skills. Regarding OHRQoL, the presence of impact was associated with age, gastroesophageal reflux, dental caries. and periodontal diseases.

[PMID: 29893998](#)

7. Evaluating pain in cerebral palsy: comparing assessment tools using the International Classification of Functioning, Disability and Health.

Schiariti V, Oberlander TF.

Disabil Rehabil. 2018 Jun 11:1-8. doi: 10.1080/09638288.2018.1472818. [Epub ahead of print]

Pain is prevalent and affects functioning and quality of life of children with cerebral palsy (CP). However, pain in CP is under recognized. The International Classification of Functioning, Disability and Health (ICF) guides the selection of comprehensive chronic pain assessment tools. Our objectives were to identify measures addressing pain in children with CP, characterize the content of each measure using the ICF, and identify gaps and overlaps. Measures were identified from: (1) a systematic review of outcome measures (1998-2012) and (2) a scan of chronic pain measures (2013-2015). Included measures were those published in English, used in children and youth with CP, and contained an item/domain addressing pain. Constructs of the measures were linked to the ICF. Overall, 31 measures addressing chronic pain in CP were included. Considerable variability was found in the degree to which their content represented the ICF. Most of pain measures address pain intensity and pain location (body functions) as opposed to functional impact of pain (activities and participation). Functional dimensions are poorly represented in pain measures. Our findings may guide the selection of measures for research and clinical needs for comprehensive chronic pain management in children with CP. Implications for Rehabilitation Chronic pain is prevalent among children with cerebral palsy and significantly interfere with functional activities. To effectively manage chronic pain in children with cerebral palsy, measures capturing functional-based information need to be part of routine chronic pain assessment.

[PMID: 29888977](#)

8. Use of non-invasive ventilation in cerebral palsy.

Grychtol R, Chan EY.

Arch Dis Child. 2018 Jun 9. pii: archdischild-2017-313959. doi: 10.1136/archdischild-2017-313959. [Epub ahead of print]

Patients with cerebral palsy (CP), especially those at the severe end of the spectrum (Gross Motor Function Classification System levels IV-V equivalent), frequently suffer from sleep disturbance and sleep-disordered breathing (SDB). Non-invasive ventilation (NIV) is increasingly used in this patient group, albeit with little published evidence of its effectiveness in CP. This article aims to review the current evidence in the use of NIV in children with CP, highlighting areas of uncertainties, as well as the balance of potential risks, challenges and benefits. We would also share our experience and practical considerations in using NIV to manage SDB in this group of patients. Between January 2010 and December 2016, 21 patients (median age 11.1 (range 1.7-16.1) years) with CP were initiated on NIV at Great Ormond Street Hospital for Children following diagnosis of moderate to severe SDB on cardiorespiratory polygraphy. Over half of our patients with CP (n=11) failed to establish on NIV either due to intolerance of mask and/or ventilation pressure at the initial trial in hospital, or poor adherence during follow-up, in contrast to the overall failure rate of 8.7% among total patient population commenced on NIV. Children with CP constitute a relatively small but challenging group of patients. Decision to undertake NIV should be individualised, based on benefit outweighing the risk and burden of the treatment.

[PMID: 29886412](#)

9. Utilization of Physical Therapy Services During Transition for Young People With Cerebral Palsy: A Call for Improved Care Into Adulthood.

Liljenquist K, O'Neil ME, Bjornson KF.

Phys Ther. 2018 Jun 8. doi: 10.1093/ptj/pzy068. [Epub ahead of print]

Many young adults with cerebral palsy (CP) face limited participation in activities, including employment and independent living. Physical therapy during the transition period can help to support participation through promotion of self-care, ambulation, and functional mobility. Thus, ensuring appropriate access to physical therapy services for young people who can benefit from them before, during, and after transition is imperative. The objective of this study was to identify factors contributing to the utilization of physical therapy services for youth with CP both during and after secondary school. The design was a deidentified secondary analysis of the National Longitudinal Transition Study 2 (NLTS2). Multivariate regression models were run to examine demographic and disability characteristics influencing utilization of physical therapy services for youth with CP both during and after secondary school. The total weighted population sample included 35,290 young people with CP. When all youth were in secondary school, 59.4% of the youth utilized physical therapy services; however, once all youth were out of school, only 33.7% of them were reported to have utilized physical therapy since leaving secondary school. For young people with difficulties accessing general disability support services, demographic characteristics, including sex, race, income, and parent education status, influenced use of physical therapy services in addition to disability characteristics. This population sample includes only young people in special education with Individual Education Plans (IEPs) and may not generalize to young people with CP in general education settings. Frequency of physical therapy services decreases drastically once young adults with CP leave secondary school. Future work should examine this trend in more depth to identify therapy intervention strategies to optimize participation in young adult life for persons with CP.

[PMID: 29893905](#)

10. "If I had been given that information back then": An interpretive description exploring the information needs of adults with cerebral palsy looking back on their transition to adulthood.

Freeman M, Stewart D, Cunningham CE, Gorter JW.

Child Care Health Dev. 2018 Jun 11. doi: 10.1111/cch.12579. [Epub ahead of print]

Young people with cerebral palsy (CP) and their families have identified lack of information received during the transition to adulthood as a barrier to successful outcomes. To date, few studies have explored the information needs, preferences, timing, and method of provision from the perspective of individuals with CP. The methodological approach to this qualitative study was interpretive description. Nine adults living with CP, between the ages of 20 and 40, were purposively recruited in Ontario, Canada, to explore, retrospectively, their information needs during the transition to adulthood. Participants completed a 1-hour interview that explored their experiences seeking and receiving information. Interviews were transcribed verbatim, and data were analysed to create a thematic description of adults' experiences with information.

Three themes emerged: (a) "Recognizing and supporting information needs," which highlighted the importance of support systems to assist young people in receiving and seeking information throughout the transition; (b) "Getting creative," which highlighted strategies young people use when confronted with environmental barriers when seeking information; and (c) "Gaps and advice for the future," which highlighted the need for real-life opportunities, during the transition to adulthood, to experience some of the responsibilities of adult life. Clinicians assisting young people with CP need purposefully to foster knowledge and skills during the transition to adulthood. They should be not only providers of information but also enablers of opportunities for immersion in real-life experiences to prepare for adult life. It is important for young people to have the opportunity to discuss challenges and exchange information with their peers.

[PMID: 29888473](#)

11. Malignant Peritoneal Mesothelioma in the setting of a Ventriculo-Peritoneal Shunt: A novel clinical presentation.

Haque M, Hameed N, Perry CT, Carter E, Mneimneh WS.

Clin Med Insights Oncol. 2018 Jun 5;12:1179554918779583. doi: 10.1177/1179554918779583. eCollection 2018.

We report a case of malignant peritoneal mesothelioma (MPM) in a 31-year-old male with history of cerebral palsy, hydrocephalus, and ventriculoperitoneal shunt (VPS) placed since infancy. He presented with fever, abdominal pain and distension. Computed tomography scan revealed a thick-walled rim-enhancing fluid collection, interpreted as pseudocyst. Intraoperatively, diffuse nodular peritoneal thickening with adhesions was demonstrated. The resection specimen consisted of multiple membranous fragments displaying firm nodules. Microscopic examination revealed a tumefactive malignant-appearing epithelioid proliferation involving the peritoneum, focally invading the underlying fat. Immunohistochemically, the tumor cells expressed keratin AE1/AE3, CK7, CK5/6, Calretinin, WT1 and D2-40, and were negative for CEA and MOC31. The findings were consistent with MPM, epithelioid type. The patient's condition continued to decline with increasing abdominal distension during the month following the original diagnosis. While atypical mesothelial hyperplasia has been described in association with long standing VPS, well-documented cases of MPM have not been previously reported in such context.

[PMID: 29899672](#)

12. Stability of three classification systems for cerebral palsy: benefits from multicenter collaboration.

Gisel EG.

Dev Med Child Neurol. 2018 Jun 14. doi: 10.1111/dmcn.13937. [Epub ahead of print]

This commentary is on the original article by Palisano et al. To view this paper visit <https://doi.org/10.1111/dmcn.13903>

[PMID: 29904920](#)

Prevention and Cure

13. Bone marrow fat physiology in relation to skeletal metabolism and cardiometabolic disease risk in children with cerebral palsy.

Whitney DG, Peterson MD, Devlin MJ, Caird MS, Hurvitz EA, Modlesky CM.

Am J Phys Med Rehabil. 2018 Jun 12. doi: 10.1097/PHM.0000000000000981. [Epub ahead of print]

Individuals with cerebral palsy (CP) exhibit neuromuscular complications and low physical activity levels. Adults with CP exhibit a high prevalence of chronic diseases, which is associated with musculoskeletal deficits. Children with CP have poor musculoskeletal accretion accompanied by excess bone marrow fat, which may lead to weaker bones. Mechanistic studies to determine the role of bone marrow fat on skeletal growth and maintenance, and how it relates to systemic energy metabolism among individuals with CP, are lacking. In this review, we highlight the skeletal status in children with CP and analyze the existing literature on the interactions among bone marrow fat, skeletal health, and cardiometabolic disease risk in the general population.

Clinically vital questions are proposed, including: (1) Is the bone marrow fat in children with CP metabolically distinct from typically developing children in terms of its lipid and inflammatory composition? (2) Does the bone marrow fat suppress skeletal acquisition? (3) Or, does it accelerate chronic disease development in children with CP? (4) If so, what are the mechanisms? In conclusion, while inadequate mechanical loading may initiate poor skeletal development, subsequent expansion of bone marrow fat may further impede skeletal acquisition and increase cardiometabolic disease risk in those with CP.

[PMID: 29894311](#)

14. A commentary on a case of new PCDH12 gene variants presented as dyskinetic cerebral palsy with epilepsy. Dos Santos-Junior EF, de Oliveira JRM.

J Hum Genet. 2018 Jun 14. doi: 10.1038/s10038-018-0475-2. [Epub ahead of print]

This commentary is on the original article by Sato Suzuki-Muromoto et al. To view this paper visit <https://doi.org/10.1038/s10038-018-0432-0>

[PMID: 29904113](#)

15. Outcomes After Acute Symptomatic Seizures in Children Admitted to a Neonatal Neurocritical Care Service.

Glass HC, Numis AL, Gano D, Bali V, Rogers EE.

Pediatr Neurol. 2018 Apr 20. pii: S0887-8994(17)31230-4. doi: 10.1016/j.pediatrneurol.2018.03.016. [Epub ahead of print]

Neonatal seizures due to acute brain injury are associated with high rates of death, disability, and epilepsy. Our objective was to examine incidence of and risk factors for epilepsy among survivors of acute symptomatic neonatal seizures who were cared for by a neonatal neurocritical care service. Neonates with acute symptomatic seizures who were admitted to UCSF Benioff Children's Hospital Neuro-Intensive Care Nursery from July 2008 to June 2014 were considered for inclusion. A total of 144 children with acute symptomatic seizures met study criteria and 37 (26%) died before age one. Eighty-seven children (85% of eligible survivors) were followed up to one year or longer. Epilepsy was diagnosed in eight children at median age 4.9 (interquartile range 1.7, 6.1) years. The cumulative incidence risk of epilepsy at one year was 2% (95% confidence interval 0.6% to 9%) and at five years was 7% (95% confidence interval 3% to 20%). Cerebral palsy was diagnosed in 21%. Bayley-III cognitive subscale less than 85 was present in 13%. Children with epilepsy were more likely to be preterm, have brain injury, and be discharged home on antiseizure medication, although the results were not significant after adjusted analysis. The risk of epilepsy was lower and age at onset was older than in previous reports, which may be related to multiple factors including a neurocritical care approach, treatment of hypoxic-ischemic encephalopathy with hypothermia, high rate of neonatal transition to palliative care, and the exclusion of neonatal onset epilepsies. Continuation of antiseizure medications in infancy did not decrease the risk of epilepsy. Long-term, multicenter studies are needed to understand whether neonatal seizure management can alter the risk of epilepsy.

[PMID: 29886041](#)