Cerebral Palsy Alliance

NEWS
Cerebral Palsy Research

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Interventions and Management

1. Int Orthop. 2015 Oct 10. [Epub ahead of print]

Hip-joint congruity after Dega osteotomy in patients with cerebral palsy: long-term results.

Braatz F, Staude D, Klotz MC, Wolf SI, Dreher T, Lakemeier S.

INTRODUCTION: Neurogenic hip dislocation is quite common in children with cerebral palsy (CP). The purpose of this study was to evaluate the long-term outcome of single-event multilevel surgery (SEMLS) in combination with hip reconstruction by using a periacetabular osteotomy as described by Dega concerning post-operative remodeling and plasticity of the femoral head post-operatively. METHODS: A total of 72 patients with CP as the primary disease and in whom a complex surgical hip reconstruction was performed during SEMLS between 1998 and 2004 were included in the study. There were 45 men and 27 women, with a median age of 7.6 (4.7-16.3) years at the time SEMLS was performed. The mean follow-up time was 7.7 years (4.9-11.8). X-rays were taken before and after surgery, and Rippstein 1 and 2 were used for follow-up. As the most reliable value for decentration, migration percentage (MP) as described by Reimers was used. To measure hip-joint cover at follow-up, the centre-edge angle was used. The hip was divided into four different categories according to sphericity and congruity. Using this approach, we could evaluate joint remodeling. RESULTS: Pre-operatively, the mean MP measured by X-ray was 68 %. Directly after surgery, this value decreased on average by 12 % and at the long-term follow-up was 16.0 % on average. A high rate of incongruence was observed on X-rays taken directly after surgery: 66 hip joints were classified as incongruent. The number of aspherical and incongruent joints decreased to 54 at the follow-up examination. CONCLUSION: Data of our study with high plasticity of the hip joint suggest that even if the femoral head is deformed and a persistent incongruency after surgery is expected, hip reconstruction can be recommended.

PMID: 26454662

2. Z Orthop Unfall. 2015 Oct 15. [Epub ahead of print]

[Femoral Derotation in Children with Cerebral Palsy - Does the Result Depend on the Age at Operation and the Kind of Surgery?] [Article in German]

Braatz F, Poljuchow J, Klotz MC, Heitzmann DW, Wolf SI, Dreher T.

Introduction: Patients with spastic cerebral palsy GMFCS I-III often develop gait dysfunctions. One of the most prevalent gait dysfunctions is the intoeing gait. Femoral derotation osteotomy is the common treatment for internal

rotation gait in cerebral palsy. We now present 3D-gait analysis data of the hip rotation in gait before and after femoral derotation osteotomy. We analysed the influence of the age at the index operation on the risk of recurrence and the surgical technique. Methods: We included 48 patients treated with femoral derotation osteotomy during a single event of multi-level surgery. Mean hip rotation in standing was measured before and after femoral derotation osteotomy (FDO). The patients were divided into two groups of different age and in a second analysis into two groups with the osteotomy in different locations, either inter-trochanteric (DO proximal) or supracondylar (DO distal). Results: Age at FDO and surgical technique had no influence on the results. However, the variance of the results was very high. Differences were found in the walking speed between the DO proximal and DO distal groups. The walking speed in the group of distal femoral osteotomy was higher. This difference was not significant, but there was a trend to proximal osteotomy in slower walkers. Significant improvements in IRG after FDO were found in our investigation. Our results indicate that FDO as a part of single-event multilevel surgery SEMLS provides a satisfactory mean overall correction of IRG. The results were independent of the age at the index operation and the location of the osteotomy.

PMID: 26468922

3. Ir J Med Sci. 2015 Oct 15. [Epub ahead of print]

Characterisation of the patellar tendon reflex in cerebral palsy children using motion analysis.

O'Sullivan R, Kiernan D, Walsh M, O'Brien T, Elhassan Y.

BACKGROUND: The patellar tendon reflex (PTR) is an important spinal reflex and an important diagnostic tool assessing neurological disturbances. Reflexes are conveniently assessed but quantifying the response can be subjective. Motion analysis is commonly used to assess gait kinematics in a variety of populations. It can be used to objectively assess the PTR with the advantage that standard technique and hammer can be used without the need for bulky apparatus or fixing the subject position. AIM: To compare the PTR in 15 cerebral palsy (CP) children with age and height matched controls. METHODS: EMG reflex latency in the rectus femoris was assessed using a Noraxon 2400T unit. Knee movement latency, knee angular displacement and peak angular velocity were captured using the CODA mpx 30 system. RESULTS: EMG reflex latency was significantly reduced in CP compared to control limbs (13.11 versus 18.11 ms; $p < 0.01$) confirming a 'brisk' response in this population. The kinematic data found that while knee angular displacement was significantly reduced in CP (12.82° versus 20.06°; $p < 0.01$) there was no significant difference in movement latency or peak angular velocity compared to controls. CONCLUSIONS: Subjective evaluation of the PTR relies mostly on change in knee angle. Using motion analysis we have confirmed a difference in this variable in CP compared to controls. We have also shown reduced reflex latency associated with a brisk reflex. Knee movement latency and peak angular velocity did not differentiate CP from normal. Further examination of the knee angular response of the PTR is warranted in CP.

PMID: 26472096

4. BMC Pediatr. 2015 Oct 12;15(1):154. doi: 10.1186/s12887-015-0472-y.

The orthotic and therapeutic effects following daily community applied functional electrical stimulation in children with unilateral spastic cerebral palsy: a randomised controlled trial.

Pool D, Valentine J, Bear N, Donnelly CJ, Elliott C, Stannage K.

BACKGROUND: The purpose of this study was to determine the orthotic and therapeutic effects of daily community applied FES to the ankle dorsiflexors in a randomized controlled trial. We hypothesized that children receiving the eight-week FES treatment would demonstrate orthotic and therapeutic effects in gait and spasticity as well as better community mobility and balance skills compared to controls not receiving FES. METHODS: This randomized controlled trial involved 32 children (mean age 10 yrs 3 mo, SD 3 yrs 3 mo; 15 females, 17 males) with unilateral spastic cerebral palsy and a Gross Motor Function Classification System of I or II randomly assigned to a FES treatment group (n = 16) or control group (n = 16). The treatment group received eight weeks of daily FES (four hours per day, six days per week) and the control group received usual orthotic and therapy treatment. Children

were assessed at baseline, post FES treatment (eight weeks) and follow-up (six weeks after post FES treatment). Outcome measures included lower limb gait mechanics, clinical measures of gastrocnemius spasticity and community mobility balance skills. RESULTS: Participants used the FES for a mean daily use of 6.2 (SD 3.2) hours over the eight-week intervention period. With FES, the treatment group demonstrated a significant ($p < 0.05$) increase in initial contact ankle angle (mean difference 11.9° 95 % CI 6.8° to 17.1°), maximum dorsiflexion ankle angle in swing (mean difference 8.1° 95 % CI 1.8° to 14.4°) normalized time in stance (mean difference 0.27 95 % CI 0.05 to 0.49) and normalized step length (mean difference 0.06 95 % CI 0.003 to 0.126) post treatment compared to the control group. Without FES, the treatment group significantly increased community mobility balance scores at post treatment (mean difference 8.3 units 95 % CI 3.2 to 13.4 units) and at follow-up (mean difference 8.9 units 95 % CI 3.8 to13.9 units) compared to the control group. The treatment group also had significantly reduced gastrocnemius spasticity at post treatment ($p = 0.038$) and at follow-up (dynamic range of motion mean difference 6.9°, 95 % CI 0.4° to 13.6°; $p = 0.035$) compared to the control group. CONCLUSION: This study documents an orthotic effect with improvement in lower limb mechanics during gait. Therapeutic effects i.e. without FES were observed in clinical measures of gastrocnemius spasticity, community mobility and balance skills in the treatment group at post treatment and follow-up. This study supports the use of FES applied during daily walking activities to improve gait mechanics as well as to address community mobility issues among children with unilateral spastic cerebral palsy. TRIAL REGISTRATION:
Australian New Zealand Clinical Trials Register ACTRN12614000949684 . Registered 4 September 2014.

PMID: 26459358

5. Rehabil Res Pract. 2015;2015:812348. doi: 10.1155/2015/812348. Epub 2015 Sep 17.

Effect of a Home-Based Virtual Reality Intervention for Children with Cerebral Palsy Using Super Pop VR Evaluation Metrics: A Feasibility Study.

Chen Y, Garcia-Vergara S, Howard AM.

Objective. The purpose of this pilot study was to determine whether Super Pop VR, a low-cost virtual reality (VR) system, was a feasible system for documenting improvement in children with cerebral palsy (CP) and whether a home-based VR intervention was effective. Methods. Three children with CP participated in this study and received an 8-week VR intervention (30 minutes × 5 sessions/week) using the commercial EyeToy Play VR system. Reaching kinematics measured by Super Pop VR and two fine motor tools (Bruininks-Oseretsky Test of Motor Proficiency second edition, BOT-2, and Pediatric Motor Activity Log, PMAL) were tested before, mid, and after intervention. Results. All children successfully completed the evaluations using the Super Pop VR system at home where 85% of the reaches collected were used to compute reaching kinematics, which is compatible with literature using expensive motion analysis systems. Only the child with hemiplegic CP and more impaired arm function improved the reaching kinematics and functional use of the affected hand after intervention. Conclusion. Super Pop VR proved to be a feasible evaluation tool in children with CP.

PMID: 26457202

6. Rev Neurol. 2015 Oct 16;61(8):337-43.

[Relationship between executive functioning and behaviour in children with cerebral palsy]. [Article in Spanish]

Muriel V, Garcia-Molina A, Aparicio-Lopez C, Ensenat A, Roig-Rovira T.

INTRODUCTION: Cerebral palsy is defined as a group of developmental disorders of movement and posture that causes social and cognitive deficits, emotional, and behavior disturbances. AIM: To study the relationship between executive functioning and behavior in children with cerebral palsy from the answers given by parents and teachers on the Behavior Rating Inventory of Executive Function (BRIEF) and on the System Assessment Adaptive Behavior (ABAS-II). PATIENTS AND METHODS: The sample consisted on 46 children with CP with a mean age of 10.26 ± 2.95 years. Forty-four of the 46 children were distributed in Gross Motor Function Classification System (GMFCS) into level I (n = 16), level II (n = 3), level III (n = 11), level IV (n = 10) and level V (n = 4). RESULTS: The results

showed a relationship between BRIEF and ABAS-II. Furthermore, discrepancies between the responses from parents and teachers, both in the ABAS-II and in the BRIEF, were obtained. CONCLUSIONS: We found a significant relationship between executive functioning in children with cerebral palsy and adaptive behavior. We found discrepancies in the answers given by parents and teachers. Finally, the data showed that the higher motor impairment increases difficulties at home.

PMID: 26461126

7. Epilepsy Behav. 2015 Oct 12;52(Pt A):239-243. doi: 10.1016/j.yebeh.2015.09.009. [Epub ahead of print]

Quality of life in children with epilepsy: How does it compare with the quality of life in typical children and children with cerebral palsy?

Mezgebe M, Akhtar-Danesh GG, Streiner DL, Fayed N, Rosenbaum PL, Ronen GM.

Our objective was to compare the quality of life (QoL) of children with epilepsy to that of typical children and children with cerebral palsy (CP). We measured self- and proxy-reported QoL of children with epilepsy and contrasted that with data for typical children (European KIDSCREEN project) and children with CP (SPARCLE study). Children ages 8-12years with epilepsy were recruited from six Canadian sites. Same-aged children with CP and children in the general population aged 8-11years came from several European countries. All participants completed the KIDSCREEN-52 questionnaire. Our results showed no clinically important differences (>0.5 SD) between self-reported QoL in 345 children with epilepsy compared with 489 children with CP or 5950 children in the general population. However, parents reported clinically important differences between the epilepsy and the other groups in five KIDSCREEN-52 domains. Compared with the CP group, parents of children with epilepsy reported better QoL in physical well-being (Cohen d=0.81), social support (d=0.80), and autonomy (d=0.72). Parents reported poorer QoL in the domains of mood and emotions compared with both contrast groups (d=-0.72 and d=-0.53), and in the domain of bullying compared with the CP group (d=-0.51). Families should find comfort in the results, which indicate that children with epilepsy do not perceive any important differences in QoL compared with their typical peers. The comparisons of parental reports detect their group-specific observations and worries that need to be addressed by the health-care providers and may require specifically designed assessment batteries followed by appropriate interventions.

PMID: 26469801

8. Rev Chil Pediatr. 2015 Oct 12. pii: S0370-4106(15)00181-3. doi: 10.1016/j.rchipe.2015.07.015. [Epub ahead of print]

[Effect of supplementation with a single dose of vitamin D in children with cerebral palsy. Preliminary randomised controlled study]. [Article in Spanish]

Le Roy C, Meier M, Witting S, Pérez-Bravo F, Solano C, Castillo-Durán C.

INTRODUCTION: Children with cerebral palsy (CP) have an increased risk of vitamin D (VD) deficiency. Although there are many studies on VD and CP, there is limited information about VD supplementation in these patients. OBJECTIVE: To evaluate the effect of supplementation with a single dose of VD on the plasma concentrations of 25-hydroxy-vitamin-D (25OHD) in children with CP. PATIENTS AND METHOD: Prospective-randomised-controlled-trial, including 30 Chilean children (19 males) with CP, median age 9.9 years (6.2-13.5). Clinical and biochemical variables including 25OHD, were recorded (time 0 and 8 weeks). Patients were allocated to the supplemented (S) group receiving 100,000 IU oral D3 at baseline, and compared with the placebo (P) group. RESULTS: Among clinical features are highlighted: gastrostomy (60%), underweight (30%), bed-ridden (93.3%), antiepileptic drugs (70%), and 43.3% used VD metabolism inducing antiepileptics. Baseline biochemical measurements were normal. The 25OHD was insufficient in 4/30 and deficient in 6/30. 25OHD levels were not associated with the variables studied. Eight patients completed the study in the S group, and 10 in P group. The placebo and supplementation groups had no significant difference in baseline variables. Serum calcium, phosphate, and alkaline phosphatase levels at 8 weeks were normal in both groups, with no statistically significant differences. 25OHD in the P group was normal in 6/10, and insufficient+deficient in 4/10, and the S group was normal in all (8/8) (exact Fisher test

P=.07). CONCLUSIONS: A single dose of 100,000 IU VD could normalise the concentrations of 25OHD after 8 weeks of supplementation in Children with CP, but more studies are required to confirm these results.

PMID: 26471311

Prevention and Cure

9. Neurobiol Dis. 2015 Oct 9. pii: S0969-9961(15)30061-9. doi: 10.1016/j.nbd.2015.10.001. [Epub ahead of print]

mTOR Pathway Inhibition Prevents Neuroinflammation and Neuronal Death in a Mouse Model of Cerebral Palsy.

Srivastava IN, Shperdheja J, Baybis M, Ferguson T, Crino PB.

BACKGROUND AND PURPOSE: Mammalian target of rapamycin (mTOR) pathway signaling governs cellular responses to hypoxia and inflammation including induction of autophagy and cell survival. Cerebral palsy (CP) is a neurodevelopmental disorder linked to hypoxic and inflammatory brain injury however, a role for mTOR modulation in CP has not been investigated. We hypothesized that mTOR pathway inhibition would diminish inflammation and prevent neuronal death in a mouse model of CP. METHODS: Mouse pups (P6) were subjected to hypoxia-ischemia and lipopolysaccharide-induced inflammation (HIL), a model of CP causing neuronal injury within the hippocampus, periventricular white matter, and neocortex. mTOR pathway inhibition was achieved with rapamycin (an mTOR inhibitor; 5mg/kg) or PF-4,708,671 (an inhibitor of the downstream p70S6kinase, S6K, 75mg/kg) immediately following HIL, and then for 3 subsequent days. Phospho-activation of the mTOR effectors p70S6kinase and ribosomal S6 protein and expression of hypoxia inducible factor 1 (HIF-1α) were assayed. Neuronal cell death was defined with Fluoro-Jade C (FJC) and autophagy was measured using Beclin-1 and LC3II expression. Iba-1 labeled, activated microglia were quantified. RESULTS: Neuronal death, enhanced HIF-1α expression, and numerous Iba-1 labeled, activated microglia were evident at 24 and 48h following HIL. Basal mTOR signaling, as evidenced by phosphorylated-S6 and -S6K levels, was unchanged by HIL. Rapamycin or PF-4,708,671 treatment significantly reduced mTOR signaling, neuronal death, HIF-1α expression, and microglial activation, coincident with enhanced expression of Beclin-1 and LC3II, markers of autophagy induction. CONCLUSIONS: mTOR pathway inhibition prevented neuronal death and diminished neuroinflammation in this model of CP. Persistent mTOR signaling following HIL suggests a failure of autophagy induction, which may contribute to neuronal death in CP. These results suggest that mTOR signaling may be a novel therapeutic target to reduce neuronal cell death in CP.

PMID: 26459113

10. Stem Cell Rev. 2015 Oct 10. [Epub ahead of print]

In the Know and in the News: How Science and the Media Communicate About Stem Cells, Autism and Cerebral Palsy.

Sharpe K, Di Pietro N, Illes J.

Stem cell research has generated considerable attention for its potential to remediate many disorders of the central nervous system including neurodevelopmental disorders such as autism spectrum disorder (ASD) and cerebral palsy (CP) that place a high burden on individual children, families and society. Here we characterized messaging about the use of stem cells for ASD and CP in news media articles and concurrent dissemination of discoveries through conventional science discourse. We searched LexisNexis and Canadian Newsstand for news articles from the US, UK, Canada and Australia in the period between 2000 and 2014, and PubMed for peer reviewed articles for the same 10 years. Using in-depth content analysis methods, we found less cautionary messaging about stem cells for ASD and CP in the resulting sample of 73 media articles than in the sample of 87 science papers, and a privileging of benefits over risk. News media also present stem cells as ready for clinical application to treat these neurodevelopmental disorders, even while the science literature calls for further research. Investigative news reports that explicitly quote researchers, however, provide the most accurate information to actual science news.

The hope, hype, and promise of stem cell interventions for neurodevelopmental disorders, combined with the extreme vulnerability of these children and their families, creates a perfect storm in which journalists and stem cell scientists must commit to a continued, if not even more robust, partnership to promote balanced and accurate messaging.

PMID: 26454430