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NEWS
Cerebral Palsy Research

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Interventions and Management

1. Arch Med Sci. 2014 Oct 27;10(5):979-84. doi: 10.5114/aoms.2014.46217. Epub 2014 Oct 23.

The effects of botulinum toxin type A on improvement and dynamic spastic equinus correction in children with cerebral palsy - preliminary results.

Colovic H1, Dimitrijevic L2, Stankovic I2, Nikolic D3, Radovic-Janosevic D4, Zivanovic D5.

INTRODUCTION: We evaluated the effects of botulinum toxin type A (BTA) with physical therapy on dynamic foot equinus correction and higher motor functional outcome in children with spastic type of cerebral palsy (CP). MATERIAL AND METHODS: Ankle joint active and passive movement, gastrocnemial muscle spasticity levels (Modified Ashworth Scale (MAS)), and higher motor functional status (Gross Motor Function Classification System (GMFCS) and Gross Motor Function Measure (GMFM) (GMFM-D - standing and GMFM-E - walking) were assessed before treatment and 3, 8, 16 weeks and 6 months after BTA administration in 12 children. RESULTS: There was a significant improvement of active (initial - (-)13.07 ±5.78; 6 months - (-)10.64 ±4.77; $p < 0.001$) and passive (initial - 4.21 ±2.29; 6 months - 4.71 ±2.16; $p < 0.05$) ankle joint foot dorsiflexion. GMFM-D and GMFM-E were significantly higher after 3, 8, 16 weeks ($p < 0.001$) and GMFM-D after 6 months ($p < 0.001$). CONCLUSIONS: Botulinum toxin type A administration and physical therapy in patients with spastic CP improves the motion range of dynamic foot equinus after 3 weeks and higher motor functional outcome (standing and walking).

PMID: 25395950 [PubMed] PMCID: PMC4223142 Free PMC Article

2. Clin Orthop Relat Res. 2014 Nov 14. [Epub ahead of print]

Incidence and Risk Factors of Allograft Bone Failure After Calcaneal Lengthening.

Lee IH1, Chung CY, Lee KM, Kwon SS, Moon SY, Jung KJ, Chung MK, Park MS.

BACKGROUND: Calcaneal lengthening with allograft is frequently used for the treatment of patients with symptomatic planovalgus deformity; however, the behavior of allograft bone after calcaneal lengthening and the risk factors for graft failure are not well documented. QUESTIONS/PURPOSES: (1) What proportion of the patients treated with allograft bone had radiographic evidence of graft failure and what further procedures were performed? (2) What are the risk factors for radiographic graft failure after calcaneal lengthening? (3) What patient factors are associated with the magnitude of correction achieved after calcaneal lengthening? METHODS: Between May 2003 and January 2014, we performed 341 calcaneal lengthenings on 202 patients for planovalgus

deformity, the etiology of which included idiopathic, cerebral palsy, and other neuromuscular disease. Of these, 176 patients (87%) had adequate followup for graft evaluation, defined as lateral radiographs taken before and at least 6 months after the index procedure (mean, 18 months; range, 6-100 months) and 117 patients (58%) had adequate followup for the assessment of the extent of correction, defined as weightbearing anteroposterior and lateral radiographs taken before and at least 1 year after the index procedure (mean, 24 months; range, 12-96 months). These patients' results were evaluated retrospectively. The Goldberg scoring system was chosen for demonstration of allograft behavior. A score lower than 6 at 6 months after surgery was defined as radiographic graft failure; the highest possible score was 7 points, and this represented graft incorporation with excellent reorganization of the graft and no loss of height. The patient age, sex, diagnosis, graft material, ambulatory status, and use of antiseizure medication were evaluated as possible risk factors, and we controlled for the interaction of potentially confounding variables using multivariate analysis. Additionally, six radiographic indices were analyzed for their effects on the extent of correction. RESULTS: The mean estimated Goldberg score was 6 (SD, 1.14) at 6 months after calcaneal lengthening with 11 feet (4%) classified as radiographic graft failure (Goldberg score < 6). Of these, four feet (1%) underwent reoperation using an iliac autograft bone resulting from pain and loss of correction. Multivariate analysis showed that the tricortical iliac crest allograft was superior to the patellar allograft (odds ratio [OR], 3.2; 95% confidence interval [CI], 1.1-9.8; p = 0.038) and the possibility of radiographic graft failure was found to increase along with age (OR, 1.2; 95% CI, 1.0-1.3; p = 0.006). Radiographically, the extent of correction was found to decrease with patient age, as observed at the anteroposterior talus-first metatarsal angle (p < 0.001), lateral talocalcaneal angle (p < 0.001), lateral talus-first metatarsal angle (p < 0.001), and relative calcaneal length (p = 0.041). CONCLUSIONS: Graft failure can occur after calcaneal lengthening using allograft. Our study showed that the tricortical iliac allograft was superior to the patellar allograft, and further studies are warranted to further elucidate the effects of age on radiographic graft failure.

LEVEL OF EVIDENCE: Level III, therapeutic study.

PMID: 25394963 [PubMed - as supplied by publisher]

3. J Pediatr Orthop. 2014 Nov 12. [Epub ahead of print]

Long-term Outcomes of Triple Arthrodesis in Cerebral Palsy Patients.

Trehan SK1, Ihekweazu UN, Root L.

BACKGROUND: Triple arthrodesis in the appropriately indicated cerebral palsy patient with a painful and/or rigid foot deformity can significantly alleviate pain and improve function. Limited data on long-term outcomes of triple arthrodesis in this patient population exist. In addition, there have been concerns about the long-term consequences of altered biomechanics in these patients on the tibiotalar (ankle) joint. METHODS: We retrospectively reviewed 21 cerebral palsy patients who had undergone triple arthrodesis for a painful and/or rigid foot deformity at our institution with at least 10 years of clinical or radiographic follow-up. Preoperative, and the most recent, clinical evaluations and radiographs were reviewed. In addition, all 21 patients and/or caretakers responded to a questionnaire at the time of this study by means of telephone to assess subjective pain, analgesia use, walking aid necessity, walking distance, and satisfaction with the procedure. RESULTS: In this series of 21 cerebral palsy patients, 5 patients had bilateral surgery, resulting in 26 operative feet. The mean age at the time of surgery was 19.4 years and most recent clinical or radiographic follow-up was 22.1 years postoperatively. Preoperative foot deformity was characterized by hindfoot valgus in 66.7% (14/21) and varus in 33.3% (7/21) of patients. Postoperatively, fusion was achieved in 96.2% (25/26) of feet. At final follow-up, 3 feet (11.5%) demonstrated tibiotalar joint arthritis, 1 (3.8%) had midfoot arthritis, and 10 (38.5%) had residual deformity. Of the total patients, 95.2% (20/21) were satisfied with the outcome and 61.9% (13/21) reported pain-free ambulation. There was no association between eventual functional outcome and preoperative diagnosis, preoperative foot deformity, postoperative tibiotalar joint arthritis, or postoperative residual deformity. CONCLUSIONS: Triple arthrodesis is a surgical option in cerebral palsy patients with painful and/or rigid foot deformities. From this series, successful outcomes can be expected as long as bony union is achieved. The incidence of tibiotalar arthritis is relatively low and not associated with long-term functional outcome. In addition, preoperative and residual postoperative foot deformity is not associated with long-term outcome.

LEVEL OF EVIDENCE: Level IV-Retrospective case series.

PMID: 25393571 [PubMed - as supplied by publisher]

4. Front Hum Neurosci. 2014 Oct 27;8:859. doi: 10.3389/fnhum.2014.00859. eCollection 2014.

The brain's sense of walking: a study on the intertwine between locomotor imagery and internal locomotor models in healthy adults, typically developing children and children with cerebral palsy.

Iosa M1, Zoccolillo L2, Montesi M3, Morelli D2, Paolucci S1, Fusco A1.

Motor imagery and internal motor models have been deeply investigated in literature. It is well known that the development of motor imagery occurs during adolescence and it is limited in people affected by cerebral palsy. However, the roles of motor imagery and internal models in locomotion as well as their intertwine received poor attention. In this study we compared the performances of healthy adults (n = 8, 28.1 ± 5.1 years old), children with typical development (n = 8, 8.1 ± 3.8 years old) and children with cerebral palsy (CCP) (n = 12, 7.5 ± 2.9 years old), measured by an optoelectronic system and a trunk-mounted wireless inertial magnetic unit, during three different tasks. Subjects were asked to achieve a target located at 2 or 3 m in front of them simulating their walking by stepping in place, or actually walking blindfolded or normally walking with open eyes. Adults performed a not significantly different number of steps ($p = 0.761$) spending not significantly different time between tasks ($p = 0.156$). Children with typical development showed task-dependent differences both in terms of number of steps ($p = 0.046$) and movement time ($p = 0.002$). However, their performance in simulated and blindfolded walking (BW) were strictly correlated ($R = 0.871$ for steps, $R = 0.673$ for time). Further, their error in BW was in mean only of -2.2% of distance. Also CCP showed significant differences in number of steps ($p = 0.022$) and time ($p < 0.001$), but neither their number of steps nor their movement time recorded during simulated walking (SW) were found correlated with those of blindfolded and normal walking (NW). Adults used a unique strategy among different tasks. Children with typical development seemed to be less reliable on their motor predictions, using a task-dependent strategy probably more reliable on sensorial feedback. CCP showed less efficient performances, especially in SW, suggesting an altered locomotor imagery.

PMID: 25386131 [PubMed] PMCID: PMC4209890 Free PMC Article

5. Eur J Neurol. 2014 Nov 10. doi: 10.1111/ene.12596. [Epub ahead of print]

Pallidal stimulation for acquired dystonia due to cerebral palsy: beyond 5 years.

Romito LM1, Zorzi G, Marras CE, Franzini A, Nardocci N, Albanese A.

BACKGROUND AND PURPOSE: There is increasing evidence that deep brain stimulation (DBS) of the globus pallidus internus (GPi) is effective in patients with idiopathic or inherited generalized dystonia. There is comparatively less experience about the effects of GPi DBS on acquired dystonia, particularly dystonia due to cerebral palsy (DCP). Clinical and demographic outcome predictors for DBS in dystonia syndromes are also poorly defined. Our aim was to examine the efficacy and safety of GPi DBS for the treatment of generalized DCP. METHODS: Fifteen patients with DCP up to 6.2 years after DBS surgery were studied. Only mild limb spasticity or mild static brain magnetic resonance imaging abnormalities were acceptable for inclusion. Dystonia severity and disability were assessed by the Burke-Fahn-Marsden dystonia rating scale (BFMDRS), and health-related quality of life was assessed by the Short Form General Health Survey (SF-36) scale. The amount of energy delivered was calculated, and adverse events and side effects were collected. RESULTS: At last follow-up, BFMDRS motor score improved on average by 49.5%, and the disability score improved by 30%. Health-related quality of life improved in most patients. Age at implant, age at onset and disease duration did not correlate to outcome, whilst higher pre-operative dystonia severity and occurrence of spasticity were associated with poorer outcome. The patients received a stable amount of energy after the first 2 years post-implant and throughout all the observation period. There were few serious adverse events or side effects. CONCLUSIONS: The outcome was encouraging in the majority of DCP patients, with a stable outlook and a good safety profile.

PMID: 25382808 [PubMed - as supplied by publisher]

6. Zh Nevrol Psikhiatr Im S S Korsakova. 2014;114(8):88-93.

Pathophysiological aspects of the use of botulinum toxin dysport in the upper motor neuron lesion [Article in Russian]

[No authors listed]

The most frequent causes of disability of patients with neurological diseases are motor disorders in the upper motor neuron lesion caused by the damage of the brain and/or the spinal cord that resulted in the formation of spastic paresis and paralysis. The correct understanding of the pathophysiological basis of clinical presentations of the upper motor neuron lesion will allow to chose the most adequate and prognostically successful methods of treatment. Currently, treatment with botulotoxin can be considered as such a method. This method in the combination with non-pharmacological rehabilitation decreases the activity of phasic and tonic stretching reflexes, associated contractions, synkinesia, spastic dystonia and spasticity that leads to the increase in muscle elasticity, mobility of extremities, reduction of pain, joint stiffness and soft tissue deformation that, in its turn, can increase the independence of the patient from any help.

PMID: 25389539 [PubMed - in process]

7. Dev Med Child Neurol. 2014 Nov 7. doi: 10.1111/dmcn.12616. [Epub ahead of print]

Validity and reproducibility of measures of oropharyngeal dysphagia in preschool children with cerebral palsy.

Benfer KA1, Weir KA, Bell KL, Ware RS, Davies PS, Boyd RN.

AIM: The aim of the study was to determine the best measure to discriminate between those with oropharyngeal dysphagia (OPD) and those without OPD, among young children with cerebral palsy (CP). METHOD: We carried out a cross-sectional population-based study involving 130 children with CP aged between 18 months and 36 months (mean 27.4mo; 81 males, 49 females) classified according to the Gross Motor Function Classification Scale (GMFCS) as level I (n=57), II (n=15), III (n=23), IV (n=12), or V (n=23). Forty children with CP (mean 28.5mo; 21 males,19 females, eight for each GMFCS level) were included in the reproducibility sub-study, and 40 children with typical development (mean 26.2mo; 18 males, 22 females) were included in the validity sub-study. OPD was assessed using the Dysphagia Disorders Survey (DDS), Pre-Speech Assessment Scale (PSAS), and Schedule for Oral Motor Assessment (SOMA). We analysed reproducibility using inter- and intrarater agreement (percentage) and reliability (kappa values and intraclass correlation coefficients). Construct validity was assessed as concordance between measures (SOMA, DDS, and PSAS). In the absence of a criterion standard measure for OPD, prevalence was estimated using latent class variable analysis. Data from the children with typical development were used to propose modified OPD cut-points for discriminative validity. RESULTS: All measures had strong agreement (>85%) for inter- and intrarater reliability. The SOMA had the best specificity (100.0%), but lacked sensitivity (53.0%), whereas the DDS and PSAS had high sensitivity (each 100.0%) but lacked specificity (47.1% and 70.6% respectively). OPD prevalence when calculated using the web-based estimation was 65.4%, which was similar to the estimate from the modified cut-points. INTERPRETATION: Using the sample of children with typical development and modified cut-points, OPD prevalence was lower than estimates with standard scoring. We propose using these modified cut-points when administering the DDS, PSAS or SOMA in young children with CP.

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8. Dev Med Child Neurol. 2014 Nov 12. doi: 10.1111/dmcn.12631. [Epub ahead of print]

Predicting functional communication ability in children with cerebral palsy at school entry.

Coleman A1, Weir K, Ware RS, Boyd R.

AIM: To explore the value of demographic, environmental, and early clinical characteristics in predicting functional communication in children with cerebral palsy (CP) at school entry. METHOD: Data are from an Australian prospective longitudinal study of children with CP. Children assessed at 18 to 24 and 48 to 60 months corrected age were included in the study. Functional communication was classified at 48 to 60 months using the Communication Function Classification System (CFCS). Predictive variables included communication skills at 18 to 24 months, evaluated using the Communication and Symbolic Behavioural Scales Developmental Profile (CSBS-DP) Infant-Toddler Checklist. Early Gross Motor Function Classification System (GMFCS), Manual Ability Classification System, and motor type and distribution were evaluated by two physiotherapists. Demographic and comorbid variables were obtained through parent interview with a paediatrician or rehabilitation specialist. RESULTS: A total of 114 children (76 males, 38 females) were included in the study. At 18 to 24 months the mean CSBS-DP was 84.9 (SD 19.0). The CFCS distribution at 48 to 60 months was I=36(32%), II=25(22%), III=20(18%), IV=19(17%), and V=14(12%). In multivariable regression analysis, only CSBS-DP ($p<0.01$) and GMFCS ($p<0.01$) at 18 to 24 months were predictors of functional communication at school entry. INTERPRETATION: Body structure and function and not environmental factors impact functional communication at school entry in children with CP. This provides valuable guidance for early screening, parent education, and future planning of intervention programs to improve functional communication.

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