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Interventions and Management

1. International Conference on Cerebral Palsy and other Childhood-onset Disabilities: Joint Meeting of: 28th Annual Meeting of the European Academy of Childhood Disability (EACD), 5th International Conference of Cerebral Palsy (ICPC) and 1st Meeting of the International Alliance of Academies of Childhood Disability (IAACD). 1-4 June 2016, Stockholm, Sweden. Upper Limb Intervention and Assessments

Dev Med Child Neurol. 2016 Oct;58 Suppl 6:6-63. doi: 10.1111/dmcn.13241.

[PMID: 27917466](#)

2. Transcranial direct current stimulation for children with perinatal stroke and hemiparesis.

Kirton A, Ciecchanski P, Zewdie E, Andersen J, Nettel-Aguirre A, Carlson H, Carsolio L, Herrero M, Quigley J, Mineyko A, Hodge J, Hill M.

Neurology. 2016 Dec 7. pii: 10.1212/WNL.0000000000003518. [Epub ahead of print]

To determine whether the addition of transcranial direct current stimulation (tDCS) to intensive therapy increases motor function in children with perinatal stroke and hemiparetic cerebral palsy. **METHODS:** This was a randomized, controlled, double-blind clinical trial. Participants were recruited from a population-based cohort with MRI-classified unilateral perinatal stroke, age of 6 to 18 years, and disabling hemiparesis. All completed a goal-directed, peer-supported, 2-week after-school motor learning camp (32 hours of therapy). Participants were randomized 1:1 to 1 mA cathodal tDCS over the contralesional primary motor cortex (M1) for the initial 20 minutes of daily therapy or sham. Primary subjective (Canadian Occupational Performance Measure [COPM]), objective (Assisting Hand Assessment [AHA]), safety, and secondary outcomes were measured at 1 week and 2 months after intervention. Analysis was by intention to treat. **RESULTS:** Twenty-four participants were randomized (median age 11.8 ± 2.7 years, range 6.7-17.8). COPM performance and satisfaction scores doubled at 1 week with sustained gains at 2 months ($p < 0.001$). COPM scores increased more with tDCS compared to sham control ($p = 0.004$). AHA scores demonstrated only mild increases at both time points with no tDCS effects. Procedures were safe and well tolerated with no decrease in either arm function or serious adverse events. **CONCLUSION:** tDCS trials appear feasible and safe in hemiparetic children. Lack of change in objective motor function may reflect underdosing of therapy. Marked gains in subjective function with tDCS warrant further study. This study provides Class II evidence that for children with perinatal stroke and hemiparetic cerebral palsy, the addition of tDCS to moderate-dose motor learning therapy does not significantly improve motor function as measured by the AHA.

[PMID: 27927938](#)

3. Effects of lateral electrical surface stimulation on scoliosis in children with severe cerebral palsy: a pilot study.

Ko EJ, Sung IY, Yun GJ, Kang JA, Kim J, Kim GE.

Disabil Rehabil. 2016 Dec 7:1-7. [Epub ahead of print]

To evaluate the effects of lateral electrical surface stimulation (LESS) on scoliosis and trunk balance in children with severe cerebral palsy (CP). Children with severe CP (GMFCS level IV or V) and stationary or progressive scoliosis were enrolled. Children were recommended of two sessions of LESS/day, 1 h/session, for 3 months at home: at 40-80 mA intensity, 200 μ s pulse width, 25 Hz frequency, on for 6 s and then off for 6 s on the convex side of the trunk curve. Radiologic (Cobb's, kyphotic, and sacral angles) and functional [gross motor function measurement (GMFM)-88 sitting score, and trunk control measurement scale (TCMS)] measurements were evaluated at 4 periods: (a) 3 months before, (b) just before, (c) 1 month after, and (d) 3 months after LESS. RESULTS: The median Cobb's angle of 11 children (median age, 9 years) was 25°, and it showed significant improvements after both 1 and 3 months of LESS. The LESS intensity correlated with the improvement of GMFM-88 sitting score. The parents or main caregivers of the children believed LESS had several positive effects without major adverse effects. CONCLUSIONS: LESS is effective in scoliosis in children with severe CP and it may improve trunk balance. Implications for rehabilitation Scoliosis is a very complicated problem for the children with severe CP. They do not have many options for treatments and scoliosis is usually refractory. Lateral electrical surface stimulation (LESS) is effective in scoliosis in children with severe CP and it may improve trunk balance. LESS may be another option of managing stationary or progressive scoliosis in the children with severe CP who are unable to undergo surgery.

[PMID: 27927033](#)

4. Surgical treatment using The Unit Rod in children with neuromuscular scoliosis.

T N, I G, J L, J L, A B, I T.

J Med Life. 2016 Oct-Dec;9(4):399-407.

The article represents a retrospective clinical and radiological study. Objective. To assess the safety and the stability in time of the Unit Rod instrumentation in the treatment of severe neuromuscular scoliosis in children and adolescents. Summary. The treatment of patients with neuromuscular scoliosis always represents a challenge. The patients are debilitated and usual interventions are very long with great loss of blood. Serious complications can compromise the result of the surgery. The technique we used (the Unit Rod) is worldwide recognized, is simple, and gives excellent stability with a low rate of complications. Methods. We conducted a clinical and radiological retrospective study with a follow-up of at least 4 years in 58 patients with serious neuromuscular conditions, most of them being non-walkers. They were surgically treated by using mostly the Unit Rod technique, in the department of Paediatric Orthopaedics of the Rouen University Hospital, France, between 2000 and 2008. The back fusion was generally from T2 to pelvis. We used the Galveston technique for the patients who needed a pelvic fixation. Results. The mean Cobb angle correction was of 67% immediately after surgery; the correction of the curve decreased in time only in 4% of the cases. Pelvic obliquity was also very well corrected: 73% immediately and 70% at the last radiological follow-up. The mean operative time was of 175 minutes compared to 269 minutes for screws and hooks instrumentation. The most common complication for our technique was the radiolucent halo that appeared around the pelvic inserts. There was no significant degradation in time of the correction obtained. Conclusions. The use of this technique is safe, gives excellent results, achieving significant improvements in the postoperative functional status of the patients. The intra- and postoperative complications were minor. The advantage of using this method is the low cost of the material and technical simplicity, the corrective results being the same as the ones obtained with other techniques.

[PMID: 27928445](#)

5. Measuring wearing time of knee-ankle-foot orthoses in children with cerebral palsy: comparison of parent-report and objective measurement.

Maas JC, Dallmeijer AJ, Oudshoorn BY, Bolster EA, Huijting PA, Jaspers RT, Becher JG.

Disabil Rehabil. 2016 Dec 7:1-6. [Epub ahead of print]

Purpose state: Orthotic wearing time may be an important confounder in efficacy studies of treatment in children with spastic cerebral palsy (SCP). Most studies measure parent-reported wearing time (WT_{parent}) with questionnaires, but it is questionable whether this yields valid results. This study aims to compare WT_{parent} with objectively measured wearing time (WT_{obj}) in children with SCP receiving orthotic treatment.

METHOD: Eight children with SCP participated in this observational study. For one year, they received knee-ankle-foot orthosis (KAFO) treatment. WT_{parent} was measured using questionnaires. WT_{obj} was measured using temperature sensor-data-loggers that were attached to the KAFOs. The 2.5th and 97.5th percentiles and median of differences between methods (per participant) were used to calculate limits of agreement and systematic differences. **RESULTS:** There was no systematic difference between WT_{parent} and WT_{obj} (0.1 h per week), but high inter-individual variation of the difference was found, as reflected by large limits of agreement (lower limit/2.5th percentile: -1.7 h/week; upper limit/97.5th percentile: 11.1 h/week). **CONCLUSIONS:** Parent-reported wearing time (WT_{parent}) of a KAFO differs largely from objectively measured wearing time (WT_{obj}) using temperature sensors. Therefore, parent-reported wearing time (WT_{parent}) of KAFOs should be interpreted with utmost care. Implications for Rehabilitation Low wearing time of orthoses may be a cause of inefficacy of orthotic treatment and incorrect reported wearing time may bias results of efficacy studies. Results of this study show that parent-reported wearing time is not in agreement with objectively measured wearing time. Parent-reported wearing time of KAFOs should be interpreted with utmost care. Objective methods are recommended for measuring orthotic wearing time.

[PMID: 27927029](#)

6. Correction of Pelvic Obliquity After Spinopelvic Fixation in Children With Cerebral Palsy: A Comparison Study With Minimum Two-Year Follow-up.

Abousamra O, Nishnianidze T, Rogers KJ, Bayhan IA, Yorgova P, Shah SA.

Spine Deform. 2016 May;4(3):217-224. doi: 10.1016/j.jspd.2015.11.001. Epub 2016 Apr 16.

Single institution cohort data were collected prospectively and reviewed retrospectively. **OBJECTIVES:** This study aims to compare outcomes among three different instrumentation types: unit rod, iliac screws, and sacral alar iliac (SAI) screws in terms of pelvic obliquity correction in children with cerebral palsy (CP). **SUMMARY OF BACKGROUND DATA:** The optimal choice for spinopelvic fixation in CP scoliosis with pelvic obliquity is controversial. **METHODS:** Patients with minimum 2 years' follow-up were divided into three groups according to instrumentation type and matched based on preoperative pelvic obliquity and coronal major curve magnitude.

Radiographic measurements included horizontal pelvic obliquity angle (PO), spinopelvic angle (SPA), coronal and sagittal Cobb angles, and T1 pelvic angle. Procedures were performed in one pediatric institution between 2004 and 2012. All measurements were performed by a single independent reviewer who was not involved in the procedures. **RESULTS:** Seventy-seven patients (42 unit rod, 14 iliac screw, and 21 SAI screw) were included. Gender and age distribution was similar across all groups (56% males, 44% females, mean age 13.5 years). Mean follow-up was 3.6 years. Comparing pre- and postoperative measurements, there was a significant decrease ($p < .05$) in PO, SPA, and coronal major Cobb angle in all groups. No significant loss of correction occurred during follow-up. Postoperatively, TPA improved in all groups. Nonsymptomatic loosening was noted in 59% of unit rods, 57% of iliac screws, and 52% of SAI screws. One prominent iliac screw needed removal. One nonsymptomatic rod fracture, one infected pseudarthrosis, and one rod malposition occurred in unit rod group. **CONCLUSIONS:** This study suggests that for correction of pelvic obliquity in cerebral palsy scoliosis, iliac and SAI screws were similar to the unit rod in comparative effectiveness and implant safety profile. **LEVEL OF EVIDENCE:** Therapeutic study, Level III.

[PMID: 27927506](#)

7. Evaluation of a Novel Method for Determining Transverse Plane Pelvic Obliquity.

Torretti JA, Segal LS, Brenneman RE, Shrader MW, Chinchilli VM, Vanderhave KL.

Spine Deform. 2014 Jan;2(1):48-54. doi: 10.1016/j.jspd.2013.09.006. Epub 2014 Jan 11.

This was a retrospective review of neuromuscular scoliosis radiographs evaluating interobserver and intra-observer error for a novel method of transverse plane pelvic obliquity. **OBJECTIVES:** To evaluate the utility of a previously described method by Lucas et al. of determining transverse plane pelvic obliquity using standard radiographs in patients with cerebral palsy and neuromuscular scoliosis. **SUMMARY OF BACKGROUND DATA:** Evaluation of pelvic obliquity in the transverse plane has not been thoroughly studied. The pelvis has been noted to function as intercalary vertebra in neuromuscular scoliosis, resulting in marked obliquity in all 3 planes. **METHODS:** Forty radiographs were chosen from 10 patients with cerebral palsy and neuromuscular scoliosis who had had a posterior spine arthrodesis and Galveston spino-pelvic fixation. Four observers independently examined the radiographs at different levels of training on 2 dates 1 week apart. Measurements recorded by each observer were described by

Lucas et al.: E (the distance measured on lateral radiographs between the ilium at the inferior part of the sacro-iliac joint and the lateral edge of the anterior superior iliac spine), FR and FL (the coronal plane linear distance between the same 2 landmarks, measured from a posteroanterior radiograph, where F was measured for both the left (FL) and right (FR) sides of the pelvis, respectively), and β (the transverse plane rotation of the pelvis). Reproducibility of the measurements were analyzed using the concordance correlation coefficient (CCC). A CCC of 0.80 or higher was considered excellent agreement.

RESULTS: The CCC between the first and second sets of measurements was lowest for E and highest for the calculated β , although none of the CCC calculations was statistically significant, demonstrating poor agreement. CONCLUSIONS: The ability to reliably measure and calculate the degree of transverse plane rotation by radiographs in cerebral palsy patients with spino-pelvic deformity by the method described by Lucas et al. is poor, likely because of difficulty in consistently identify pelvic landmarks.

[PMID: 27927442](#)

8. Surgical Treatment of Scoliosis in Non-Ambulatory Spastic Quadriplegic Cerebral Palsy Patients: A Matched Cohort Comparison of Unit Rod Technique and All-Pedicle Screw Constructs.

Fuhrhop SK, Keeler KA, Oto M, Miller F, Dabney KW, Bridwell KH, Lenke LG, Luhmann SJ.

Spine Deform. 2013 Sep;1(5):389-394. doi: 10.1016/j.jspd.2013.07.006. Epub 2013 Sep 25.

Matched cohort. OBJECTIVE: To compare the unit rod instrumentation (UR) technique with all-pedicle screw (PS) constructs in the surgical care of scoliosis in Gross Motor Function Classification System IV/V non-ambulatory spastic quadriplegic cerebral palsy patients. SUMMARY OF BACKGROUND DATA: Over the past 20 years, there has been a transition from the UR technique to the use of pedicle screws and iliac screws in neuromuscular scoliosis. To date, no head-to-head comparative analysis has been reported between the UR technique and PS constructs for posterior segmental spinal instrumentation and fusion in cerebral palsy patients. METHODS: A matched cohort study was performed between 2 tertiary-care pediatric centers: 1 using UR technique and the other PS constructs. Minimum follow-up was 2 years postoperatively (PS 2.5 years, UR 4.6 years, not significant). Fourteen patients were matched from each center based on age (mean age: PS 15.4 years, UR 15.5 years), preoperative pelvic obliquity (mean: PS 33.8°, UR 29.1°) and major coronal Cobb angle (mean: PS 100.9°, UR 100.1°). RESULTS: There was posterior-only surgery in 14 of 14 PS and 11 of 14 UR surgeries. The final follow-up Cobb angle was lower in the PS group (13.5° vs. 34.3°, $p < .05$), with 86.5% correction in the PS group and 65.7% in the UR group. Final follow-up pelvic obliquity was similar (PS 8.5° vs. UR 3.3°; not significant). There were no major complications in the PS group. In the UR group, there was 1 deep infection and 1 reoperation for removal of a prominent sublaminar wire. CONCLUSIONS: This is the first study to directly compare UR with PS constructs using matched patient cohorts in this patient population. All-pedicle screw constructs had better correction of coronal Cobb angle, lower blood loss, and shorter hospital stays. There was no difference in the correction of pelvic obliquity, complications, or reoperations.

[PMID: 27927398](#)

9. The Relationship of Gross Motor Functional Classification Scale Level and Hip Dysplasia on the Pattern and Progression of Scoliosis in Children With Cerebral Palsy.

Garg S, Engelman G, Yoshihara H, McNair B, Chang F.

Spine Deform. 2013 Jul;1(4):266-271. doi: 10.1016/j.jspd.2013.05.002. Epub 2013 Aug 2.

The primary aim of the study was to determine whether progression and magnitude of scoliosis were related to the Gross Motor Functional Classification Scale (GMFCS) and whether laterality (and associated pelvic obliquity) of the spinal curvature affected severity of recurrent hip subluxation in patients with cerebral palsy who had undergone varus derotational osteotomy (VDRO). METHODS: A total 115 patients underwent VDRO surgery at a single institution between 1980 and 2001. Adequate radiographs were available for 98 patients. Average age at time of VDRO was 6.5 years and follow-up post-VDRO was 8.2 years. Children were divided into lower severity (GMFCS 1-3; 13 patients), high severity (GMFCS 4; 42 patients), and highest severity (GMFCS 5; 43 patients). A single observer measured all spine radiographs using standardized technique. A separate observer measured hip migration index on all pelvis radiographs. RESULTS: There was a significant increase in coronal deformity over time in each GMFCS category ($p < .0001$). The GMFCS 1-3 and GMFCS 4 groups had nearly identical time trends, each increasing at roughly 1° to 2° annually, whereas the GMFCS 5 group increased by 3.5°/year ($p = .0153$). Increasing Cobb angle was not a significant predictor of severity of recurrent subluxation. Furthermore, there was no significant difference in severity of recurrent hip subluxation when hips were evaluated based on whether they were on the same side as the concavity or convexity of the scoliosis (ie, high or low side of pelvic obliquity).

CONCLUSIONS: The relationship between GMFCS and rate of scoliosis progression differed between groups. Severity of hip subluxation did not increase significantly over time after VDRO, nor was it significantly related to magnitude or laterality of scoliosis in children in this cohort. **SIGNIFICANCE:** Treatment decisions regarding hip subluxation and scoliosis in patients with cerebral palsy may be made independent of each other.

[PMID: 27927357](#)

10. Both pharyngeal and esophageal phases of swallowing are associated with recurrent pneumonia in pediatric patients.

Serel Arslan S, Demir N, Karaduman AA.

Clin Respir J. 2016 Dec 7. doi: 10.1111/crj.12592. [Epub ahead of print]

One of the underlying causes of recurrent pneumonia in children is swallowing dysfunction, with aspiration syndrome. Swallowing dysfunction should be considered not only a problem of the oropharyngeal phase but also a problem of the esophageal phase. **OBJECTIVES:** This study aimed to determine the relationship between findings from a swallowing study and a history of recurrent pneumonia in pediatric patients. **METHODS:** A videofluoroscopic swallowing study of 274 pediatric patients who had swallowing dysfunction was conducted. Information on a history of recurrent pneumonia during a 1-y period was obtained from hospital files. **RESULTS:** The median age of the participants was 33 months (min =1 0, max=180), of whom 51.8% were females. In the study, 83.2% of the patients had cerebral palsy, 7.7% had syndromic symptoms, 3.6% had muscular dystrophy, and 5.5% were classified as "other." During the 1-y period, 67.9% of the participants had a history of recurrent pneumonia history. Furthermore, 66.4% had oral dysfunction, 32.5% had laryngeal penetration, 46.4% had aspiration, 45.3% had abnormal esophageal body function, and 35.8% had reflux symptoms. There was no correlation between oral dysfunction and recurrent pneumonia ($p=0.902$), but there was a positive correlation between recurrent pneumonia and laryngeal penetration ($p<0.001$, $r=0.26$), aspiration ($p<0.001$, $r=0.49$), abnormal esophageal body function ($p=0.002$, $r=0.18$), and reflux ($p<0.001$, $r=0.22$). **CONCLUSION:** Both pharyngeal swallowing disorders, such as penetration and aspiration, and esophageal disorders and reflux may result in recurrent pneumonia in pediatric patients. Thus, all phases of deglutition should be considered and followed up during swallowing evaluation.

[PMID: 27925397](#)

11. Risk factors for dental caries among children with cerebral palsy in a low-resource setting.

Akhter R, Hassan NM, Martin EF, Muhit M, Rahman R, Smithers-Sheedy H, Jones C, Badawi N, Khandaker G.

Dev Med Child Neurol. 2016 Dec 9. doi: 10.1111/dmcn.13359. [Epub ahead of print]

To describe the oral health status and investigate factors affecting dental caries experience among children with cerebral palsy (CP) in rural Bangladesh. **METHOD:** A cross-sectional study was conducted among children with CP who are part of the Bangladesh Cerebral Palsy Register (BCPR) study. Caries experience was measured by identifying decayed, missing, and filled teeth for deciduous and permanent teeth (dmft/DMFT). Clinical periodontal index, body mass index, oral hygiene behaviour, masticatory ability, and dietary habits were recorded. CP motor types and severity of functional mobility (Gross Motor Function Classification System [GMFCS]) were assessed. **RESULTS:** Of 90 children with CP (mean age 9y 7mo, range 2-17y, 37.8% female and 62.2% male), 35% of 2 to 6 year olds, and 70% of 7 to 11 year olds ($p=0.014$) experienced caries (dmft+DMFT>0). The mean values (standard deviation [SD]) of dmft and DMFT were 2.46 (3.75) and 0.72 (1.79) respectively. After adjusting for age and sex, binary logistic regression analysis showed a significant relationship with dental caries for children who had quadriplegia (odds ratio [OR] 5.56, $p=0.035$), tooth cleaning less than one time/day (OR 0.08, $p=0.016$), using toothpowder or charcoal for cleaning (OR 7.63, $p=0.015$), and snacking between meals more than one time/day (OR 6.93, $p=0.012$). **INTERPRETATION:** Early oral health preventive care is required for children with CP because dental caries is highly prevalent in these children.

[PMID: 27935024](#)

12. Physical activity and walking performance: Influence on quality of life in ambulatory children with cerebral palsy (CP).

Mann K, Tsao E, Bjornson KF.

Pediatr Rehabil Med. 2016 Dec 2;9(4):279-286.

To examine the relationship of physical activity (PA) and walking performance to QOL in ambulatory children with CP, as function is not consistently associated with QOL in this population. METHODS: A secondary analysis of a cross-sectional cohort of 128 ambulatory children with CP, ages 2.2-9.9 years and GMFCS levels I-III, was employed. Individual multivariate regression models were developed for physical, psychosocial, and total domains of QOL as measured by the Pediatric Quality of Life Inventory (PedsQL) controlling for physical activity and walking performance, participation level and frequency, topography of CP, walking capacity, age, and satisfaction with participation. RESULTS: Physical, psychosocial and total QOL averaged 52.2, 60.9, and 56.5 respectively. PA was positively associated with physical (0.64, $p < 0.01$) and total QOL (0.54, $p < 0.01$). Walking performance was associated with physical QOL (0.16, $p = 0.05$), participation level was positively related to psychosocial (0.44, $p < 0.01$), and age negatively for all QOL domains (> -0.43 , $p < 0.01$). CONCLUSIONS: Physical activity, walking performance, and level of participation in daily life are associated with varying domains of QOL. Future work should explore factors that influence the relationship of daily physical/walking activity and participation to QOL in children with ambulatory CP as they age.

[PMID: 27935563](#)

Prevention and Cure

13. Effect of early intervention in infants at very high risk of cerebral palsy: a systematic review.

Hadders-Algra M, Boxum AG, Hielkema T, Hamer EG.

Dev Med Child Neurol. 2016 Dec 7. doi: 10.1111/dmcn.13331. [Epub ahead of print]

First, to systematically review the evidence on the effect of intervention applied during the first postnatal year in infants with or at very high risk of cerebral palsy (CP) on child and family outcome. Second, to assess whether type and dosing of intervention modify the effect of intervention. METHOD: Relevant literature was identified by searching the PubMed, Embase, and CINAHL databases. Selection criteria included infants younger than 12 months corrected age with or at very high risk of CP. Methodological quality including risk of bias was scrutinized.

RESULTS: Thirteen papers met the inclusion criteria. Seven studies with moderate to high methodological quality were analysed in detail; they evaluated neurodevelopmental treatment only ($n=2$), multisensory stimulation ($n=1$), developmental stimulation ($n=2$), and multifaceted interventions consisting of a mix of developmental stimulation, support of parent-infant interaction, and neurodevelopmental treatment ($n=2$). The heterogeneity precluded conclusions. Yet, two suggestions emerged: (1) dosing may be critical for effectiveness; (2) multifaceted intervention may offer best opportunities for child and family. INTERPRETATION: The literature on early intervention in very high-risk infants with sufficient methodological quality is limited, heterogeneous, and provides weak evidence on the effect. More studies are urgently needed. Suggestions for future research are provided.

PMID: 27925172

14. Inter-observer agreement of the General Movements Assessment with infants following surgery.

Crowle C, Galea C, Morgan C, Novak I, Walker K, Badawi N.

Early Hum Dev. 2016 Nov 30;104:17-21. doi: 10.1016/j.earlhumdev.2016.11.001. [Epub ahead of print]

The General Movements Assessment (GMA) is a validated and reliable method of identifying infants at risk of adverse neurodevelopmental outcomes, however there is minimal data available on the use of the GMA with infants following surgery. AIMS: The aim of this study was to investigate the inter-observer agreement for the GMA with this infant population. STUDY DESIGN: Reliability and agreement study.

SUBJECTS: This was a prospective cohort study of 190 infants (male n=112) born at term (mean 38weeks, SD 2weeks).
OUTCOME MEASURES: A GMA was conducted in the Neonatal Intensive Care Unit (NICU) following either cardiac surgery (n=92), non-cardiac surgery (n=93) or both types of surgery (n=5), and then again at three months of age. All videos were independently assessed by three advanced trained clinicians. Agreement and reliability statistics were calculated between each pair. **RESULTS:** We found moderate to substantial levels of agreement in the writhing period (66-77%, AC1=0.53-0.69). For fidgety general movements, agreement was classified as almost perfect, ranging from 86 to 89% (AC1=0.84-0.88).
CONCLUSIONS: The GMA has high levels of inter-observer agreement when used with infants who have undergone surgery in the neonatal period, making it a valid, complementary assessment tool. Research is now underway to determine the ability of the GMA to predict neurodevelopmental outcomes in this population.

PMID: 27914275

15. Neuroinflammation in intrauterine growth restriction.

Wixey JA, Chand KK, Colditz PB, Bjorkman ST.

Placenta. 2016 Nov 25. pii: S0143-4004(16)30642-7. doi: 10.1016/j.placenta.2016.11.012. [Epub ahead of print]

Disruption to the maternal environment during pregnancy from events such as hypoxia, stress, toxins, inflammation, and reduced placental blood flow can affect fetal development. Intrauterine growth restriction (IUGR) is commonly caused by chronic placental insufficiency, interrupting supply of oxygen and nutrients to the fetus resulting in abnormal fetal growth. IUGR is a major cause of perinatal morbidity and mortality, occurring in approximately 5-10% of pregnancies. The fetal brain is particularly vulnerable in IUGR and there is an increased risk of long-term neurological disorders including cerebral palsy, epilepsy, learning difficulties, behavioural difficulties and psychiatric diagnoses. Few studies have focused on how growth restriction interferes with normal brain development in the IUGR neonate but recent studies in growth restricted animal models demonstrate increased neuroinflammation. This review describes the role of neuroinflammation in the progression of brain injury in growth restricted neonates. Identifying the mediators responsible for alterations in brain development in the IUGR infant is key to prevention and treatment of brain injury in these infants.

[PMID: 27916232](#)