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Interventions and Management

1. Hip Surveillance in Children With Cerebral Palsy.

Shrader MW, Wimberly L, Thompson R.

J Am Acad Orthop Surg. 2019 Apr 16. doi: 10.5435/JAAOS-D-18-00184. [Epub ahead of print]

Hip dysplasia is common in children with cerebral palsy (CP), especially in those children with notable functional impairment. Severity of hip dysplasia has been shown to correlate with higher Gross Motor Function Classification System levels. Migration percentage measured on AP pelvis radiographs is the key radiographic measure quantifying hip displacement in CP. Hip surveillance programs for children with CP exist in Europe, Australia, and parts of Canada and have been adopted as standard of care. These programs have demonstrated improved detection of hip subluxation and appropriate early intervention with a resultant decrease in the number of painful dislocations. Hip surveillance programs provide healthcare providers with guidance for a schedule of obtaining hip radiographs based on patients' age, Gross Motor Function Classification System level, and migration percentage. Although systematic surveillance programs have yet to be adopted in the United States, several centers and organizations are currently investigating the potential and efficacy of hip screening in CP.

PMID: [30998565](#)

2. Performance of stair negotiation in patients with cerebral palsy and stiff knee gait.

Lewerenz A, Wolf SI, Dreher T, Krautwurst BK.

Gait Posture. 2019 Apr 9;71:14-19. doi: 10.1016/j.gaitpost.2019.04.005. [Epub ahead of print]

BACKGROUND: Due to the limited knee range of motion, achieving adequate foot clearance while walking on level ground constitutes a major problem for patients with cerebral palsy and stiff knee gait. Stair negotiation as an activity of daily life requires a considerably higher knee range of motion than level ground walking, but little is known yet as to whether such patients are able to walk stairs. **RESEARCH QUESTION:** The aim of this study was to investigate how patients with a limited knee range of motion negotiate stairs. Do they increase their peak knee flexion and use the same pattern as in walking on level ground? How do the muscles act during stair negotiation? **METHODS:** In this explorative study, 17 adults with bilateral, spastic cerebral palsy and stiff knee gait and 25 healthy subjects were examined. 3D motion analysis, including electromyography, was performed while walking on level ground, upstairs, and downstairs. A linear mixed model was used for between- and within-group comparisons. **RESULTS:** Walking upstairs and downstairs, patients increased their peak knee flexion by around 30° compared to level walking. Thus, increased knee flexion may be seen as the main mechanism for maintaining foot clearance on stairs. An increased pelvic obliquity (elevation) and hip flexion were also found and involved subjects showed a slight increase in rectus femoris activity when walking on stairs compared to level walking within the phases of high knee flexion. **SIGNIFICANCE:** This study showed that patients with cerebral palsy and stiff knee gait are able

to flex their knees more than would be required for level walking. Hence, the patients are able to adapt their rectus activity to stair walking to some extent. Therefore, further investigations might help to open up new therapeutic options to facilitate level walking and stair negotiation in patients with stiff knee gait.

PMID: [30999269](#)

3. Comparison of gait with and without ankle-foot orthoses after lower limb surgery in children with unilateral cerebral palsy.

Skaaret I, Steen H, Huse AB, Holm I.

J Child Orthop. 2019 Apr 1;13(2):180-189. doi: 10.1302/1863-2548.13.180146.

PURPOSE: Children with spastic unilateral cerebral palsy (SUCP) frequently undergo lower limb surgery to improve gait. Postoperatively, ankle-foot orthoses (AFOs) are used to maintain the surgical corrections and provide adequate mechanical support. Our aim was to evaluate changes in gait and impacts of AFOs one-year postoperatively. **METHODS:** In all, 33 children with SUCP, 17 girls and 16 boys, mean age 9.2 years (5 to 16.5) were measured by 3D gait analysis walking barefoot preoperatively and walking barefoot and with AFOs one-year postoperatively. Changes in Gait Profile Scores (GPS), kinematic, kinetic and temporal spatial variables were examined using linear mixed models, with gender, gross motor function and AFO type as fixed effects. **RESULTS:** The results confirm significant gait improvements in the GPS, kinematics and kinetics walking barefoot one year after surgery. Comparing AFOs with barefoot walking postoperatively, there was additionally reduced ankle plantarflexion by an average of 5.1° and knee flexion by 4.7° at initial contact, enhanced ankle moments during loading response, increased velocity, longer steps and inhibited push-off power generation. Stance and swing phase dorsiflexion increased in children walking with hinged AFOs versus children walking with ground reaction AFOs. Changes in the non-affected limbs indicated less compensatory gait postoperatively. **CONCLUSION:** Major changes were found between pre- and postoperative barefoot conditions. The main impact of AFOs was correction of residual drop foot and improved prepositioning for initial contact, which could be considered as indications for continued use after the one-year follow-up. **LEVEL OF EVIDENCE:** Level II - Therapeutic.

PMID: [30996743](#)

4. Virtual Reality Enhances Gait in Cerebral Palsy: A Training Dose-Response Meta-Analysis.

Ghai S, Ghai I.

Front Neurol. 2019 Mar 26;10:236. doi: 10.3389/fneur.2019.00236. eCollection 2019.

Virtual-reality-based training can influence gait recovery in children with cerebral palsy. A consensus concerning its influence on spatiotemporal gait parameters and effective training dosage is still warranted. This study analyzes the influence of virtual-reality training (relevant training dosage) on gait recovery in children with cerebral palsy. A search was performed by two reviewers according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines on nine databases: PEDro, EBSCO, PubMed, Cochrane, Web of Science, EMBASE, ICI, Scopus, and PROQUEST. Of 989 records, 16 studies involving a total of 274 children with cerebral palsy met our inclusion criteria. Eighty-eight percent of the studies reported significant enhancements in gait performance after training with virtual reality. Meta-analyses revealed positive effects of virtual-reality training on gait velocity (Hedge's $g = 0.68$), stride length (0.30), cadence (0.66), and gross motor function measure (0.44). Subgroup analysis reported a training duration of 20-30 min per session, ≤ 4 times per week across ≥ 8 weeks to allow maximum enhancements in gait velocity. This study provides preliminary evidence for the beneficial influence of virtual-reality training in gait rehabilitation for children with cerebral palsy.

PMID: [30984095](#)

5. Effect of dance on lower-limb range of motion in young people with cerebral palsy: a blinded randomized controlled clinical trial.

Teixeira-Machado L, DeSantana JM.

Adolesc Health Med Ther. 2019 Mar 27;10:21-28. doi: 10.2147/AHMT.S177867. eCollection 2019.

PURPOSE: One of the most limiting conditions in cerebral palsy (CP) is the impairment in musculoskeletal mobility. CP may

impair the ability to perform efficient movements. The aim of this trial was to investigate the effect of dance on the range of motion (ROM) of lower limbs in young people with CP. **PATIENTS AND METHODS:** the randomized clinical trial consisted of two groups: dance group (DG) and control group (CG). Both of them underwent a 1-hour treatment, twice a week, for 2 months. Sanny® pendulum fleximeter was used to measure ROM in pre- and posttreatment. The applied procedures in both groups were conducted at suitable locations. Twenty-six participants were allocated to these two groups of study. **RESULTS:** In DG, the sampling variances showed improvements in all lower limb joints and axes of movements ($P < 0.05$). In CG, there was increase in passive ROM in some lower limb joints ($P \leq 0.05$). **CONCLUSION:** Physical intervention is imperative to improve ROM. It seems dance practice can contribute to CP corporal mobility in a positive way. **CLINICAL TRIAL NUMBER:** N° CAAE-06154012.4.0000.0058-12, number 98.993.

PMID: [30988649](#)

6. Effect of Positioning on Tonic Labyrinthine Reflex in Cerebral Palsy: A Single-centre Study from Lahore.

Sarmad S, Khan I, Sadiq S, Noor R.

J Pak Med Assoc. 2019 Apr;69(4):478-482.

OBJECTIVE: To evaluate the effect of positioning on tonic labyrinthine reflex in children with cerebral palsy. **METHODS:** The quasi-experimental study was conducted at the Institute of Psychological Services and Physical Rehabilitation, Lahore, from July 2016 to June 2017, and comprised children with spastic and athetoid cerebral palsy aged six months to three years. Gross Motor Functional Classification Scale level V was taken as baseline measure. Data was obtained and functional motor abilities were assessed by Motor Function Measure-20 Scale. Participants received intervention in the form of positioning in hammock for 10 hours, in-between sitting in cerebral palsy chair with harness along with sensory motor integration techniques. The readings were compared before the intervention and after the treatment strategies. SPSS 21 was used to analyse the data. **RESULTS:** Of the 30 subjects, 18(60%) were boys, and 7(23%) had athetoid cerebral palsy. The overall mean age was 18.13 ± 7.33 months. Motor function variables significantly improved post-intervention ($p < 0.05$). **CONCLUSIONS:** Positioning provided significant improvement and positive effect in tonic labyrinthine reflex of spastic and athetoid cerebral palsy children.

PMID: [31000848](#)

7. Aneurysmal Bone Cyst after Femoral Derotational Osteotomy: A Case Report.

Sahin K, Demirel M, Turgut N, Arzu U, Polat G.

Malays Orthop J. 2019 Mar;13(1):45-48. doi: 10.5704/MOJ.1903.009.

Aneurysmal bone cysts rather than local aggressive lesions of the bone which may arise in any part of the axial or appendicular skeleton. Although several theories are available in the literature, the pathogenesis is still conflicting. We report an exceptional case of an aneurysmal bone cyst in the distal femur of a female cerebral palsy patient who underwent bilateral distal femoral derotational osteotomy and plate-screw fixation operations when she was 11 years old. Twenty-four months after the operation, radiographs showed a cystic lesion in the distal portion of the right femur around the osteotomy site. The diagnosis of Aneurysmal Bone Cyst (ABC) was made and the lesion was treated by curettage with cement application. After 36 months of follow-up, there was no recurrence. This is the first case reported in literature which raises the possibility that an osteotomy could be a cause in the development of an aneurysmal bone cyst.

PMID: [31001384](#)

8. Impact of tranexamic acid use on blood loss and transfusion rates following femoral varus derotational osteotomy in children with cerebral palsy.

Nazareth A, Shymon SJ, Andras L, Goldstein RY, Kay RM.

J Child Orthop. 2019 Apr 1;13(2):190-195. doi: 10.1302/1863-2548.13.180143.

PURPOSE: Previous studies have established the safety and efficacy of tranexamic acid (TXA) in reducing blood loss after total joint arthroplasty and spinal fusion surgery; however, literature regarding the effectiveness of intraoperative TXA in children with cerebral palsy (CP) is limited. The aim of this study was to investigate the safety and efficacy of intraoperative TXA in reducing blood loss and transfusion requirements for children with CP undergoing a proximal femoral varus

derotational osteotomy (VDRO). **METHODS:** This is a retrospective review of 258 children with CP who underwent VDRO performed at the author's institution between 2004 and 2017. In all, 36 subjects underwent VDRO surgery with administration of intravenous TXA and 222 subjects underwent VDRO without administration of TXA. Outcome measures including blood loss, transfusion requirements and venous thromboembolic events were compared between groups using t-tests and chi-squared tests. **RESULTS:** No significant differences were seen in the rates of transfusion between groups for the entire hospitalization (TXA group: 11.1% versus No TXA group: 19.8%), intraoperatively (TXA: 2.8% versus No TXA: 9.0%) or postoperatively (TXA: 8.3% versus No TXA: 14.4%). Intraoperative estimated blood loss (TXA: 144.4 mL versus No TXA: 159.0 mL) and percentage blood loss (TXA: 8.9% versus No TXA: 9.2%) were similar between groups. No major thromboembolic complications events occurred in either group. **CONCLUSION:** The use of TXA was not associated with thromboembolic complications in this series of children with CP undergoing VDRO surgery. Though there was a trend toward lower rates of intraoperative and postoperative blood transfusion with TXA use in these patients, the differences were not significant, possibly due to low estimated blood loss in both groups and sample size. **LEVEL OF EVIDENCE:** III- retrospective comparative study.

PMID: [30996744](#)

9. Does nuchal cord at birth increase the risk for cerebral palsy?

Gutvirtz G, Wainstock T, Masad R, Landau D, Sheiner E.

Early Hum Dev. 2019 Apr 13;133:1-4. doi: 10.1016/j.earlhumdev.2019.04.006. [Epub ahead of print]

BACKGROUND: Nuchal cord is a common finding in pregnancy. It is unclear whether a nuchal cord at birth causes birth asphyxia and raises the risk for developing cerebral palsy of the offspring. **AIM:** To evaluate the incidence of cerebral palsy in children born with and without nuchal cord. **STUDY DESIGN:** A population-based cohort analysis including all singleton deliveries over >20 years at a single tertiary medical center was conducted. The incidence of cerebral palsy in children up to 18 years of age was evaluated. Kaplan-Meier survival curve was used to compare cumulative incidence between the groups, and a Cox proportional hazards model was used to control for confounders. **RESULTS:** During the study period, 243,682 singleton deliveries met the inclusion criteria. Of them, 14.1% (n = 34,332) were diagnosed with nuchal cord at birth. Rates of cerebral palsy were comparable between the groups (0.1% vs. 0.1%, OR = 1.03, 95% CI 0.69-1.52, p = 0.89). The Kaplan-Meier survival curve demonstrated no significant differences in cumulative incidence of cerebral palsy for children born with or without nuchal cord (log rank p = 0.92, Fig. 1). The Cox proportional hazards model, controlled for preterm delivery, maternal age, diabetes and hypertensive disorders, showed no association between nuchal cord and cerebral palsy (adjusted HR = 1.06; 95% CI 0.71-1.57; p = 0.77). **CONCLUSION:** In our population, nuchal cord at birth was not associated with higher risk for cerebral palsy.

PMID: [30991236](#)

10. Vaccination Status of Children With Epilepsy or Cerebral Palsy in Hunan Rural Area and a Relative KAP Survey of Vaccinators.

Yang L, Peng J, Deng J, He F, Chen C, Yin F, Zhang S.

Front Pediatr. 2019 Mar 26;7:84. doi: 10.3389/fped.2019.00084. eCollection 2019.

Background: In China, the vaccination of children with epilepsy (EP) and cerebral palsy (CP) has no specific protocol. Parents are often concerned that vaccination of their children may cause complications due to negative recommendations from vaccinators, resulting in a decline in vaccination. It is therefore essential to investigate the vaccination status of these specific populations, and the knowledge, attitudes, and practices (KAP) of vaccinators. **Methods:** This study contains two parts. For the vaccination status survey, residency- and age-matched children whose medical expenditure were covered by the New Rural Cooperative Medical System in Hunan Province were enrolled. Children who were diagnosed with EP or CP were included as the case group, while children without any chronic disease were enrolled as the control group. The vaccination rates of the two groups were compared. For the KAP survey, vaccinators who registered in Hunan CDC were recruited as respondents, and questions were asked related to their experience and attitudes toward vaccinating children with EP or CP. **Results:** The vaccination rates of the case group were significantly lower than the control group (P < 0.001), with the exception of BCG and Hep B1. Nine measles and two mumps cases were diagnosed in the case group, while there were no Vaccine Preventable Disease (VPD) cases in the control group. The vaccinators' knowledge of the issues related to the vaccination of children with EP or CP was weaker than their knowledge of general vaccination issues. Furthermore, when making a vaccination decision, seizure-free periods and EEG status were their main concerns. **Conclusion:** The vaccination status of rural children with EP and CP is in jeopardy in Hunan, China, and there are several misunderstandings regarding the contraindications of vaccines among vaccinators. We suggest that measures are taken to improve this situation.

PMID: [30984716](#)

11. Outcomes in adults with cerebral palsy: systematic review using the International Classification of Functioning, Disability and Health.

Benner JL, Noten S, Limsakul C, Van Der Slot WMA, Stam HJ, Selb M, Van Den Berg-Emons RJG, Roebroeck ME.

Dev Med Child Neurol. 2019 Apr 15. doi: 10.1111/dmcn.14247. [Epub ahead of print]

AIM: In the context of the development of an International Classification of Functioning, Disability and Health (ICF) Core Set for adults with cerebral palsy (CP), this systematic review sought to identify the outcome measures used in studies on adults with CP, to examine their content using the ICF as a reference, and to demonstrate the most studied areas in this population. **METHOD:** Embase, MEDLINE, Web of Science, PsycINFO, CINAHL, Cochrane, and Google Scholar were searched for studies on adults with CP published between 2000 and 2017. Meaningful concepts of commonly used outcome measures were linked to the ICF, and frequencies of resultant ICF categories were explored. **RESULTS:** In 274 included articles, 332 outcome measures were identified of which 155 were commonly used. In total, 4409 meaningful concepts were linked to the ICF. The component 'Activities and participation' included the most frequent categories, followed by 'Body functions'. The most frequent categories were b280 'Sensation of pain' (37.6%), d450 'Walking' (33.3%), and d850 'Remunerative employment' (27.5%). **INTERPRETATION:** The broad range of ICF categories identified in this systematic review emphasizes the heterogeneity of functioning and disability in adults with CP. The current results specifically reflect the researchers' perspective and will serve as candidate categories to consider in the development of an ICF Core Set for adults with CP. **WHAT THIS PAPER ADDS:** Outcomes studied in adults with cerebral palsy are captured in varying International Classification of Functioning, Disability and Health (ICF) categories. Activities and participation were studied more frequently than body functions and structures. Mobility, employment, and self-care were most frequent within ICF's 'Activities and participation' component. Pain and neuromusculoskeletal and movement-related functions were most frequent within 'Body functions'.

PMID: [30985004](#)

12. Novel approaches to measuring community integration in adults with cerebral palsy.

Chan DV, Thorpe DE, Trost SG, Boyd RN, Faldowski RA, Barber L, Levin I, Carroll A, Bagatell N.

Disabil Rehabil. 2019 Apr 17:1-12. doi: 10.1080/09638288.2019.1577500. [Epub ahead of print]

PURPOSE: Rehabilitation goals often focus on increasing community integration for adults with disabilities and are measured by objective assessments. Research methods have lagged behind in capturing current conceptualizations of community integration as a multidimensional construct that incorporates participation, social supports, and feelings of belonging in the community. This paper addresses this challenge by describing a multi-method approach to assessing community integration for adults with cerebral palsy. **METHODS:** Measures include standardized questionnaires, qualitative methods, measures of function and physical activity, and geospatial measures using Geographic Information System mapping and Global Positioning System tracking. These objective and subjective data are used to determine where adults spend time and are most active, and which activities and social connections are associated with feeling integrated into the community. **RESULTS:** Two case examples highlight the importance of using a multi-method approach to assess community integration for adults with cerebral palsy. Results of objective clinical measures were comparable among case examples; however, actual experiences of feeling connected to the community were vastly different. **CONCLUSIONS:** Multiple measures are required to capture the complexity of community integration. Relying solely on objective measures may not provide a complete picture of community integration. **IMPLICATIONS FOR REHABILITATION:** Community integration is a complex construct that incorporates participation, socialization, and feelings of belonging in the community. New methods and measures are needed to assess the many aspects of community integration in adults with disabilities. A multi-method approach is recommended to provide a richer characterization of community integration in individuals with disabilities. A combination of quantitative and qualitative measures addressing the physical, social and psychological aspects of community integration should be used.

PMID: [30994013](#)

13. School Age Neurological and Cognitive Outcomes of Fetal Growth Retardation or Small for Gestational Age Birth Weight.

Vollmer B, Edmonds CJ.

Front Endocrinol (Lausanne). 2019 Mar 28;10:186. doi: 10.3389/fendo.2019.00186. eCollection 2019.

Children who were growth restricted in utero (FGR) and are born small for gestational age (SGA) may experience poorer long

term neurological and cognitive outcomes. Those also born preterm may have particular difficulties. The objective of this paper was to review the literature on school age neurocognitive outcome for term and preterm children that was published in the last 15 years. Considering term born children first, there is evidence that these children are at higher risk for Cerebral Palsy (CP) than those born appropriate for gestational age (AGA); information on neuromotor function in the absence of CP is somewhat contradictory. With regards to cognitive outcome, the most common finding was that being born SGA and/or FGR at term does not impact negatively on general intellectual functioning, commonly assessed by IQ scores. There was some indication that they may experience particular problems with attention. With regards to children born preterm, the risk of CP appears not to be increased compared to those preterms born AGA. For preterm children who do not develop CP, motor outcome is more affected by post-natal and post-neonatal brain growth than intrauterine growth. In contrast to term born children, preterm SGA and/or FGR children are at increased risk of cognitive and behavioral difficulties, and in common with term born children, are at higher risk than their AGA counterparts of difficulties with attentional control. In conclusion, preterm born SGA and/or FGR children are at higher risk of neurodevelopmental problems in the school years. It is important to continue to follow up children into the school age years because these difficulties may take time to emerge, and may be more visible in the more demanding school environment.

PMID: [30984109](#)

14. Systematic Review: Long-term cognitive and behavioural outcomes of neonatal hypoxic-ischaemic encephalopathy in children without cerebral palsy.

Schreglmann M, Ground A, Vollmer B, Johnson MJ.

Acta Paediatr. 2019 Apr 19. doi: 10.1111/apa.14821. [Epub ahead of print]

AIM: To evaluate long-term cognitive and behavioural outcomes of children with neonatal hypoxic-ischaemic encephalopathy in the absence of cerebral palsy. METHODS: A systematic search was performed on five databases (EMBASE, Medline, PubMed, Web of Science, PsycInfo). Randomised-controlled trials, non-randomised controlled trials, or observational studies, published between 1990-2017, that reported long-term (age ≥ 4 years) cognitive and/or behavioural outcomes of neonatal hypoxic-ischaemic encephalopathy without cerebral palsy were included. RESULTS: Seven articles met the inclusion criteria (n=352 total participants, n=53 treated with therapeutic hypothermia). Studies reporting cognitive outcome demonstrate impairment of general cognitive abilities in 25-63% of participants with hypoxic-ischaemic encephalopathy without cerebral palsy. Specific cognitive difficulties were reported in two studies for attention, executive functioning, memory function, and language. Results regarding behavioural outcome possibly indicate a higher risk of difficulties. CONCLUSION: A substantial proportion of children with neonatal HIE who survive without cerebral palsy are at increased risk of general and/or specific cognitive impairments. Behavioural problems may be more common, but evidence is limited. Results highlight the importance of comprehensive long-term follow-up to identify difficulties and enable intervention to optimise educational achievement and behavioural adjustment. This article is protected by copyright. All rights reserved.

PMID: [31002422](#)

15. Human Brain/Cloud Interface.

Martins NRB, Angelica A, Chakravarthy K, Svidinenko Y, Boehm FJ, Opris I, Lebedev MA, Swan M, Garan SA, Rosenfeld JV, Hogg T, Freitas RA Jr.

Front Neurosci. 2019 Mar 29;13:112. doi: 10.3389/fnins.2019.00112. eCollection 2019.

The Internet comprises a decentralized global system that serves humanity's collective effort to generate, process, and store data, most of which is handled by the rapidly expanding cloud. A stable, secure, real-time system may allow for interfacing the cloud with the human brain. One promising strategy for enabling such a system, denoted here as a "human brain/cloud interface" ("B/CI"), would be based on technologies referred to here as "neuralnanorobotics." Future neuralnanorobotics technologies are anticipated to facilitate accurate diagnoses and eventual cures for the ~ 400 conditions that affect the human brain. Neuralnanorobotics may also enable a B/CI with controlled connectivity between neural activity and external data storage and processing, via the direct monitoring of the brain's $\sim 86 \times 10^9$ neurons and $\sim 2 \times 10^{14}$ synapses. Subsequent to navigating the human vasculature, three species of neuralnanorobots (endoneurobots, gliabots, and synaptobots) could traverse the blood-brain barrier (BBB), enter the brain parenchyma, ingress into individual human brain cells, and autoposition themselves at the axon initial segments of neurons (endoneurobots), within glial cells (gliabots), and in intimate proximity to synapses (synaptobots). They would then wirelessly transmit up to $\sim 6 \times 10^{16}$ bits per second of synaptically processed and encoded human-brain electrical information via auxiliary nanorobotic fiber optics (30 cm³) with the capacity to handle up to 1018 bits/sec and provide rapid data transfer to a cloud based supercomputer for real-time brain-state monitoring and data

extraction. A neuralnanorobotically enabled human B/CI might serve as a personalized conduit, allowing persons to obtain direct, instantaneous access to virtually any facet of cumulative human knowledge. Other anticipated applications include myriad opportunities to improve education, intelligence, entertainment, traveling, and other interactive experiences. A specialized application might be the capacity to engage in fully immersive experiential/sensory experiences, including what is referred to here as "transparent shadowing" (TS). Through TS, individuals might experience episodic segments of the lives of other willing participants (locally or remote) to, hopefully, encourage and inspire improved understanding and tolerance among all members of the human family.

PMID: [30983948](#)

Prevention and Cure

16. Emerging Roles of miRNAs in Brain Development and Perinatal Brain Injury.

Cho KHT, Xu B, Blenkiron C, Fraser M.

Front Physiol. 2019 Mar 28;10:227. doi: 10.3389/fphys.2019.00227. eCollection 2019.

In human beings the immature brain is highly plastic and depending on the stage of gestation is particularly vulnerable to a range of insults that if sufficiently severe, can result in long-term motor, cognitive and behavioral impairment. With improved neonatal care, the incidence of major motor deficits such as cerebral palsy has declined with prematurity. Unfortunately, however, milder forms of injury characterized by diffuse non-cystic white matter lesions within the periventricular region and surrounding white matter, involving loss of oligodendrocyte progenitors and subsequent axonal hypomyelination as the brain matures have not. Existing therapeutic options for treatment of preterm infants have proved inadequate, partly owing to an incomplete understanding of underlying post-injury cellular and molecular changes that lead to poor neurodevelopmental outcomes. This has reinforced the need to improve our understanding of brain plasticity, explore novel solutions for the development of protective strategies, and identify biomarkers. Compelling evidence exists supporting the involvement of microRNAs (miRNAs), a class of small non-coding RNAs, as important post-transcriptional regulators of gene expression with functions including cell fate specification and plasticity of synaptic connections. Importantly, miRNAs are differentially expressed following brain injury, and can be packaged within exosomes/extracellular vesicles, which play a pivotal role in assuring their intercellular communication and passage across the blood-brain barrier. Indeed, an increasing number of investigations have examined the roles of specific miRNAs following injury and regeneration and it is apparent that this field of research could potentially identify protective therapeutic strategies to ameliorate perinatal brain injury. In this review, we discuss the most recent findings of some important miRNAs in relation to the development of the brain, their dysregulation, functions and regulatory roles following brain injury, and discuss how these can be targeted either as biomarkers of injury or neuroprotective agents.

PMID: [30984006](#)