Movement Disorders Special Interest Group &
The Cerebral Palsy International Research Foundation
Symposium

Sensorimotor, cognitive and emotional integration
in movement disorders in children
and the influence of neuromodulation

Organised by Dr Jean-Pierre Lin

London, Monday 20 May 2013

Approved and supported by BMBS COST Action BM1101 European network for the study of dystonia syndromes
Dear Colleagues

On behalf of the BPNA MDSIG and the CPIRF, welcome to this exciting international meeting on movement disorders in children focussing on important integrative pathways and the current knowledge and experience of using neuromodulation to improve motor comfort, function and independence.

All of the speakers and chairs are themselves attending to share their experience and to learn from each other. As with our 2012 meeting there will be an opportunity to hear about the latest neuroscience concepts while focussing in the second part of the meeting on focussed clinical issues and of course, to participate in the discussions!

Jon Mink will address fundamental issues in the ‘motor tool box’: reflex, instinct and voluntary motor function. Mark Edwards will present evidence for altered or distorted body image representation in certain forms of dystonia. Then we will hear from Tamsin Owen and Laurence Reed about cognitive functioning and stress in a variety of dystonias before and after DBS with information from PET imaging data and implications for understanding distributed functions of the basal ganglia and cortex.

Under the careful scrutiny of John Rothwell and Marina de Köning Tijssen, we will continue to explore functional anatomy with new information on imaging models in dystonia by Daniel Lumsden and neuronal firing patterns in childhood dystonias presented by Verity McClelland. We will discuss the impact of age of onset and of dystonia duration on response to DBS. The morning will conclude with a state of the art presentation on DBS electrode location by Laura Cif from the Montpellier Functional Neurosurgery department in France.

After lunch, practical and technical issues relating to DBS in children will continue to be discussed by Margaret Kaminska and Warren Marks.

Amande Pauls will also address specifically the role of DBS in cerebral palsy as one of the dominant groups of motor disorders experiencing the difficulties of living with dystonia and choreoathetosis (dyskinesia).

In the penultimate session after tea, there will be specialized talks from allied health professionals encompassing Occupational Therapy as well as Physiotherapy and the very important issues of assessment scales, goal-setting and outcome measures. Hortensia Gimeno will present concepts and data on manual functioning, activity and participation in dystonia. Elegast Monbaliu will focus on a new scale for dyskinesias in secondary dystonias and discuss the relative merits and disadvantages of existing scales.
Markus Elz and Jane Hutton from Warwick University will present a statistical overview on modelling dystonia. Then Terence Sanger will have the difficult task of reviewing what we have learned about movement disorders in children to date, picking up on key concepts and future work. The conference proper comes to a climax with our guest speaker, Marina de Köning Tijssen from Holland who will cover ‘Jerk movements, myoclonus-tics-startle & dystonia: from behavioural phenotype to movement disorder.’

To fulfil the role of bringing so many different clinicians together we conclude the day in the Gordon Museum across the quadrangle from the lecture theatre, with a reception and a special talk on images in neuroscience by the artist Susan Aldworth, who has exhibited widely and currently has a small exhibition ‘The Portrait Anatomised’ at the National Portrait gallery in London.

I hope that together we will make this another memorable meeting on movement disorders in children and young people.

Jean-Pierre Lin
Consultant Paediatric Neurologist
Chair, BPNA MDSIG
Sensorimotor, cognitive and emotional integration in movement disorders in children and the influence of neuromodulation

**PROGRAMME**

9.00-9.30  Registration Tea & coffee

**Session 1: Overview of movement disorders**

*Chairs: Dr Jean-Pierre Lin (UK) & Dr James Blackman (USA)*

9.30-10.00  Reflexes, instinct and voluntary motor control: similarities and differences
Jon Mink (USA)

10.00-10.30  Body image, sensory processing and dystonia in young people: are we getting the right picture?
Mark Edwards (UK)

10.30-11.00  Cognitive function and stress in dystonia and the impact of neuromodulation of the basal ganglia on distributed circuits
Tamsin Owen (UK) and Laurence Reed (UK)

11.00-11.20  Tea & coffee break

**Session 2: Imaging and neurophysiology for dystonia & DBS**

*Chairs: Professor John Rothwell (UK) & Professor Marina de König-Tijssen (The Netherlands)*

11.20-11.50  Motor phenotype and connectivity: does structure follow function?
Daniel Lumsden (UK)

11.50-12.10  Intracranial recordings in children with dystonia: challenges, limitations and preliminary data
Verity McClelland (UK)

12.10-12.30  Dystonia distribution, duration and response to DBS in children and young people: is there a continuum from primary to secondary dystonia?
Jean-Pierre Lin (UK)

12.30-13.00  Deep Brain Stimulation and the rationale for multiple electrodes
Laura Cif (France)

13.00-14.00  Lunch
Session 3: DBS trouble-shooting and technical issues
Chairs: Mr Keyoumars Ashkan (UK) & Dr Martin Smith (UK)

14.00-14.30 Wires, batteries, body, brain: getting technical!
Margaret Kamińska (UK)

14.30-15.00 Deep Brain Stimulation for children: risks and challenges, Texan style
Warren Marks (USA)

15.00-15.20 The challenges of DBS in cerebral palsy: an international meta-analysis
Amande Pauls (Germany)

15.20-15.45 Coffee and Tea

Session 4: Assessing outcomes after DBS
Chairs: Professor Jane Hutton (UK), Professor Terence Sanger and Professor Richard Selway

15.45-16.15 Manual ability beyond fine motor function: lessons from the COPM and AMPS in childhood movement disorders after DBS
Hortensia Gimeno (UK)

16.15-16.45 The Dyskinesia Impairment Scale: a new scale to measure dystonia and choreoathetosis
Elegast Monbaliu (Belgium), Els Ortibus (Belgium) and Hilde Feys (Belgium)

16.45-17.15 Modelling dystonia, secondary complications and outcomes after intervention: how do we measure change and prevention?
Markus Elze (UK) and Jane Hutton (UK)

17.15-17.45 Managing dystonia and choreo-athetosis in children and young people: what have we learned?
Terence Sanger (USA)

Keynote Lecture
Chairs: Michael Samuel & Els Ortibus

17.45-18.15 Jerky movements, myoclonus-tics-startle & dystonia: from behavioural phenotype to movement disorder
Marina AJ de Koning-Tijssen (Netherlands)

18.15-19.30 Reception at Gordon Museum Guy’s Campus

18.45-19.00 Images of the Nervous System
Susan Aldworth (UK)
9.30-11.00: Overview of Movement Disorders

Chaired by Dr Jean-Pierre Lin and Dr James Backman

Dr Jean-Pierre Lin, Consultant Paediatric Neurologist, Complex Motor Disorders Service (CMDS) Evelina Children’s Hospital, Guy’s & St Thomas’ NHS Foundation Trust, London

Jean-Pierre Lin qualified in medicine in 1983 from Edinburgh University Medical School. After further training, including adult neurology and paediatrics, he obtained an Edinburgh University George Guthrie Research Fellowship from 1990-4 leading to a PhD in 1998 within the Department of Physiology at Edinburgh University studying ‘Motor Assessments in Cerebral Palsy’ supervised by E Geoffrey Walsh, motor physiologist and J Keith Brown, paediatric neurologist and received the 1994 American Academy of Cerebral Palsy and Developmental Medicine Richmond Paine Cerebral Palsy Award.

In 1994, Jean-Pierre Lin left Scotland to become a Senior Registrar in Paediatric Neurology at Great Ormond Street Hospital for Children proceeding to his current permanent post as Consultant Paediatric Neurologist at Guy’s & St Thomas’ NHS Foundation Trust.

Specialist Services Developed 1997-2013

1. Director Clinical One Small Step Gait and Movement Laboratory 1997-99: for children with cerebral palsy undergoing complex orthopaedic procedures. 2. The Movement Therapy Clinics 1997-2008: aimed at tailoring specific motor management strategies, particularly targeted intramuscular botulinum toxin A injections for children with central motor disorders. 3. The Complex Motor Disorders Assessment and Management Service (CMDS) 2006-present was pump primed by a New Services and Innovation Grant Project Number G060708 from the Guy’s and St Thomas’ Charity from April 2007-9 to deliver Deep Brain Stimulation for children with dystonia and intrathecal baclofen pump implants for children with spasticity alone or mixed spasticity-dystonia. The CMDS received the Well Child Best Team Award August 2011 for work promoting activity and participation in children with severe dystonia:


Research Interests and Projects. Major clinical and research interests include movement disorders in the developing child and the impact of neuromodulation.

2010-12 Dystonia Society UK: ‘Neuroimaging in Children with Dystonia.’

2011-12 Dystonia Society UK: ‘The Impact of Dystonia in Children’

2013-14 Action Medical Research  ‘Improving outcome following Deep Brain Stimulation Surgery in children and young people using Connectivity mapping of the brain’*

2012-14 Wellcome Trust Social Sciences PhD Project: ‘The Use of DBS to Manage Dystonia in Children’ *: IRAS Ref: 67508. Study ID: 12372 Chief Investigator Professor Claire Williams and Principal Site Investigator for Guy’s and St Thomas’ NHS Foundation Trust: Dr Jean-Pierre Lin: *Studies included on the National Institute for Health Research Clinical Research Network (NIHR CRN) Portfolio.

National and International responsibilities: Chair of the British Paediatric Neurology Association Movement Disorders Special Interest Group (BPAMDSIG); Medical Advisor to The Dystonia Society UK; Medical Advisor to Dystonia Europe

Publications may be found on the researchgate website: https://www.researchgate.net/profile/Jean-Pierre_Lin/?ev=hdr_xprf
Dr James Blackman, Medical Director, Cerebral Palsy International Research Foundation

Dr James Blackman received his Doctor of Medicine degree from the Ohio State University, completed pediatrics residency at the University of Michigan and Fellowship in Developmental/Behavioral Pediatrics at Harvard University (Children's Hospital, Boston). He attained a Master's Degree in Public Health at San Diego State University. His research and practice have focused on causes, outcomes, and treatments of early brain injury. He is a past president of the American Academy for Cerebral Palsy and Developmental Medicine and a former Fulbright Senior Scholar at the University of Queensland (Australia) Royal Children’s Hospital.

Jonathan W Mink, Professor Neurology, Microbiology & Anatomy, Brain & Cognitive Sciences and Pediatrics; Chief, Division of Child Neurology Vice Chair, Department of Neurology, University of Rochester Medical Center, USA

Jonathan W Mink, MD PhD is Professor of Neurology, Neurobiology & Anatomy, Brain & Cognitive Sciences, and Pediatrics at the University of Rochester Medical Center in Rochester, NY, USA, where he is also Chief of Child Neurology. He received his MD and PhD in Neuroscience at Washington University in St Louis. He then trained in Pediatrics and Child Neurology at Washington University and St Louis Children’s Hospital. He was on the faculty of Neurology and Pediatrics at Washington University until moving to his present position in 2001. Dr Mink is an internationally recognized expert in basal ganglia physiology and in movement disorders of childhood. He currently has an active basic research programs in Basal Ganglia Mechanisms of Dystonia and Parkinsonism, as well as clinical research programs in Batten Disease and Tourette Syndrome. Dr Mink serves on the US National Institute of Neurologic Disorders and Stroke Board of Scientific Counselors and on the US Food and Drug Administration Pediatric Advisory Committee. In addition, he co-chairs the Scientific Advisory Committee of the US Tourette Syndrome Association.

Reflexes, instinct and voluntary motor control: similarities and differences

To be effective and efficient, the motor system must support two seemingly opposite properties: automaticity and flexibility. Complex motor patterns must be possible without the need to devote cognitive resources to each execution. However, there must be the capacity to modify motor patterns based on context and need for precision. John Hughlings Jackson theorized that there is hierarchy of organization in the CNS with higher “centres” being responsible for the “least automatic” movements and lower “centres” being responsible for reflex or “most automatic” movements. While this is true to some extent, it is also true that mechanisms involved in reflexive and instinctive movements are also employed in highly complex voluntary movements.

One of the great challenges for complex nervous systems is the competition between possible movements and between “most automatic” and “least automatic” mechanisms. The basal ganglia, acting in close collaboration with the frontal lobes of cerebral cortex, play a critical role in selectively facilitating desired movements and preventing competing movements from interfering from ones that have been selected. Accurate and efficient selection and inhibition of competing movements is possible because of the anatomic organization of basal ganglia circuits. These circuits must change during development and in response to learning new skills. Specific examples from human development and disease will be used to illustrate these changes.
Dr Mark J Edwards, Senior Lecturer and Honorary Consultant Neurologist, UCL Institute of Neurology and National Hospital for Neurology and Neurosurgery, London

Dr Edwards is a Senior Lecturer in the Sobell Department of Motor Neuroscience and Movement Disorders at the UCL Institute of Neurology and an Honorary Consultant Neurologist at the National Hospital for Neurology and Neurosurgery. He did his PhD with Professor Kailash Bhatia and Professor John Rothwell, exploring the pathophysiology of DYT1 dystonia using neurophysiological techniques. He now runs a research group that uses neurophysiological and psychophysical techniques to explore the pathophysiology and treatment of movement disorders, in particular dystonia. He also holds specialist movement disorder clinics at the National Hospital for Neurology.

Body image, sensory processing and dystonia in young people: are we getting the right picture?

While the dystonia is generally considered a disorder of movement, experimental studies indicate a much more widespread dysfunction within the brain. Some of this dysfunction, revealed by functional imaging for example, could be an epiphenomenon, but it is also possible that non-motor symptomatology is important in the clinical picture of dystonia and therefore in its treatment. Here I will discuss non-motor aspects of the pathophysiology of dystonia, in particular relating to the sensory system, and hope to demonstrate how dystonia is more than "just" a movement disorder.

Dr Tamsin Owen, Mile End Hospital and Complex Motor Disorders Service, Evelina Children’s Hospital, London

Tamsin Owen obtained her degree in Psychology for the University of Leeds in 1997, and her Doctorate in Clinical Psychology from Royal Holloway, University of London in 2004. Since then, she has specialised the field of Child Clinical Psychology, predominantly working within the West London Mental Health Trust, where she developed, implemented and ran a new service for Looked After Children, and undertook research looking at empathy within a population of Young Offenders. She also provided assessment and treatment for children with ADHD and autism spectrum disorders within the Neurodevelopmental team. Tamsin subsequently moved into the field of Paediatric Clinical Psychology, and began working with the Complex Motor Disorder Team (CMDT) at the Evelina Children’s Hospital. Since early 2011 she has been involved in the neuropsychological assessment of children pre- and post-DBS surgery for the CMDT. Tamsin has a special interest in anxiety-related co-morbidities and pain management within this population. Tamsin also has a lecturer post on the Doctorate in Clinical Psychology programme at Royal Holloway University of London.

Dr Laurence J Reed, Senior Clinical Lecturer in Affective Neurobiology, Imperial College London

I have been active in clinically-orientated research for over 20 years, gradually developing an approach to psychiatric and related behavioural disorders in liaison settings focusing on brain mechanisms relating to the underlying disorder. These brain mechanisms are accessible to enquiry using brain imaging techniques, and I have played an instrumental role in designing psychopharmacological imaging approaches to elucidate the particular adaptations of intrinsic brain mechanisms in: substance addiction (ICCAM Platform); dietary control and energy intake in type 2 diabetes and obesity (collaborator Professor Stephanie Amiel); and most recently in functional pain disorders and chronic fatigue syndrome (collaborator Professor Peter White).
Cognitive function and stress in dystonia and the impact of neuromodulation of the basal ganglia on distributed circuits

Tamsin Owen:
The relationship between dystonia and cognition has been the focus of much research within the adult population; however, there is a paucity of research with a child-specific focus. This presentation will explore research findings in relation to cognition and dystonia within a paediatric population. It will review the differences in cognitive function between children with primary, as compared to children with secondary dystonias, and will consider the implications of this for clinical practice. Emerging evidence in the area will be discussed, including provisional findings from work carried out within the Complex Motor Disorders Team, exploring cognitive function in children with primary dystonia pre- and post-DBS surgery. The challenges of assessing cognitive function in children with dystonia, namely variability in verbal functioning and lack of ability to manipulate test materials, will be highlighted.

Laurence Reed:
Cortico-basal ganglia are crucial brain mechanisms underpinning positive reinforcement (responses mediating approach to salient and ‘rewarding’ stimuli), negative reinforcement (responses mediating avoidance to alleviate salient ‘distressing’ stimuli) and cognitive control (evaluation and inhibition of approach/avoidance). The disruption of such circuits in dystonia thus would theoretically involve more pervasive consequences than simply movement control, including cognitive organisation, learning, memory and affective stability. We present some recent brain imaging data which implicates disruption of such circuits in dystonia and which identifies a potential method to monitor progress and the impact of interventions on dystonia. Importantly, this work focuses attention on cognitive control and pain perception in dystonia which are crucial to the experience of suffering in this disorder.

11.20-13.00 Imaging and neurophysiology for dystonia and deep brain stimulation

Chair: Professor John Rothwell and Professor Marina de Köning-Tijssen

John Rothwell, Professor of Human Neurophysiology, UCL Institute of Neurology, Queen Square, London

Professor Rothwell did his PhD with Professor David Marsden and worked in his team at both the Institute of Psychiatry and Institute of Neurology. Professor Rothwell was Head of the Sobell Department of Motor Neuroscience and Movement Disorders at UCL Institute of Neurology from 2001-2005, and elected as a Fellow of the Academy of Medical Sciences in 2004.
Marina Andrea Johanna de Koning-Tijssen

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Dr Marina AJ de Koning-Tijssen (1964) started her medical studies in 1982 and finished (cum laude) in 1990 at the Leiden University. For her doctoral thesis she worked for five months as a research fellow with Prof DS Zee, Department of Neurology, Johns Hopkins University, Baltimore, USA.

From 1991 -1998 she worked at the department of neurology, Leiden University Medical Centre (Prof Dr RAC Roos). She defended her thesis in 1997 and finished her neurology training in 1999. In 1998-1999 she worked as a clinical and research fellow at the MRC Human Movement and Balance Unit, The Institute of Neurology, Queen Square, London, England (prof P Brown). From September 1999 until January 2012 she worked as a neurologist and 2007-2012 as Principal Investigator in the department of neurology, Academic Medical Centre, Amsterdam. During this period she was co-promotor five times. In January 2012 she started as professor in Movement Disorders at the department of Neurology, University Medical Centre Groningen, and since was twice promoter. Twelve PhD projects are currently active. Over the years she supervised several medical students, research fellows, and neurologists performing a clinical fellowship. She regularly is member of PhD defending committees. She regularly gives lectures, teaching courses, is part of international movement disorder committees and organises national and international congresses.

The most prestigious prize that was awarded to her is the NWO-VIDI Laureaat (2004) for the project. “Myoclonic Dystonia: borderland between neurology and psychiatry” 

Her research line Jerky movements (Myoclonus-Tics-Startle) & Dystonia is from basic research to patient care. Basic research is focussed on genetic aspects. A large database on dystonia and myoclonus dystonia has been built and genetic studies are performed. Clinical studies are focussed on the neurological, psychiatric and cognitive aspects. Clinical medication and physiotherapy trials are currently performed for myoclonus, dystonia and psychogenic jerks.
Functional studies include neurophysiological and imaging studies (functional MRI, SPECT and PET). The aim of the functional studies is to improve diagnostic procedures and to gain insight into the pathophysiology of movement disorders.

In 2010 Dystonie Net was initiated, a national collaboration between neurologists and physical therapists on research, education and treatment of cervical dystonia.

**Dr Daniel Lumsden, Paediatric Neurology Trainee, South Thames Region**

Daniel Lumsden is a trainee in paediatric neurology in the South Thames Region. Since the early stages of his clinical training he has been interested in the management of movement disorders, and in particular the emerging field of neuromodulation. Daniel is currently undertaking a period of research working towards a PhD investigating the applications of neuroimaging techniques, and in particular diffusion weighted imaging, in improving patient selection and outcome following surgery Deep Brain Stimulation surgery. The research work of the Complex Motor Disorder Service has been supported by The Dystonia Society, Action Medical Research and the Guy's and St Thomas' Charitable Trust.

**Motor phenotype and connectivity: does structure follow function?**

In recent years advances in neuroimaging techniques have improved our understanding of the mechanisms of brain injury in children with motor disorders. Diffusion weighted imaging (DWI) has provided a window into the developing brain, increasing our understanding of the mechanisms in spastic cerebral palsy (CP) and providing potential biomarkers for quantifying risk factors for the development of CP. Moving beyond simple local measures of white matter microstructural integrity, DWI has also facilitated mapping of connectivity within the developing brain, and probing of the cortico-subcortical connectome. In the context of CP, conventional structural MRI is a poor predictor of motor phenotype, with imaging found to be "normal" in a significant minority of cases.

Newer imaging techniques may provide further information, though current literature is largely limited to children with spastic CP. Provisional experience within our own group suggests that DWI may provide information about motor phenotype, with potential applications for both patient selection and prognosis for interventions such as DBS. DWI may also provide the opportunity to probe the distributed motor network, possibly guiding target selection for DBS on an individualised basis.
Verity McClelland is an Academic Clinical Lecturer in Clinical Neurophysiology at King's College Hospital, London and King's College London. She studied medicine at the University of Newcastle upon Tyne and obtained her PhD there, supervised by Professors Janet Eyre and Simon Miller. This involved investigating reflexes between muscles of the upper limb and the descending modulation of these reflex patterns by corticospinal pathways, in healthy adults, adults with stroke and children with cerebral palsy. She continued training in the clinical field of Paediatric Neurology and was awarded her current NIHR funded Academic Clinical Lectureship in Clinical Neurophysiology in 2008. In her current post she has studied central motor conduction times and somatosensory evoked potentials in children with dystonia. She has also studied cortex-muscle interactions (Corticomuscular coherence) and their modulation by afferent stimuli in healthy adults. She has recently been awarded a grant from the Academy of Medical Sciences to study Corticomuscular coherence in children with movement disorders.

In her spare time she plays violin in the Woking Symphony Orchestra and enjoys walking and sailing with husband Nick and children Alice (3) and Thomas (7 months).

**Intracranial recordings in children with dystonia: challenges, limitations and preliminary data**

In patients undergoing Deep Brain Stimulation (DBS) for movement disorders, microelectrode recordings from the basal ganglia are often performed to aid confirmation of electrode position within the Globus Pallidus interna. Such recordings in adult patients have increased our understanding of basal ganglia firing patterns and revealed how pallidal activity differs between dystonia and Parkinson's disease. Recordings in awake patients have demonstrated how these discharge patterns change during active and passive movements, providing further insights into the sensorimotor physiology of the basal ganglia. Pallidal local field potentials, which reflect the product of synchronous activity in populations of GPi neurons, have been shown to relate to dystonic muscle activity, providing further evidence for a role of abnormal pallidal discharge patterns in the pathophysiology of dystonia.

Obtaining similar data in children with dystonia is desirable since the underlying pathophysiology may differ in a developmentally immature motor system. Further, secondary dystonia represents a larger proportion of childhood dystonia and the underlying physiology in this group is less well understood. However, there are various limitations with performing this work in children. Preliminary data from microelectrode recordings in 37 children undergoing DBS at our centre will be presented, alongside a discussion of the challenges and limitations of recording and interpreting such data in the paediatric population.
Dr Jean-Pierre Lin, Consultant Paediatric Neurologist, Evelina Children’s Hospital, Guy’s & St Thomas’ NHS Foundation Trust, London

Dystonia distribution, duration and response to DBS in children and young people: is there a continuum from primary to secondary dystonia?

There are many causes of dystonia and the dystonia assumes many features. This presentation discusses the shared characteristics of the dystonias of childhood and the impact of the duration of dystonia and the proportion of life lived with dystonia on responsiveness to neuromodulation. This approach suggests a possible shared continuum between ‘primary’ and ‘secondary’ dystonias.

Dr Laura Cif, MD, PhD, Consultant in the Unit of Functional Neurosurgery, Department of Neurosurgery, University Hospital, CHRU, Montpellier, France

Deep Brain Stimulation and the rationale for multiple electrodes

Deep brain stimulation (DBS) is a challenging neurosurgical technique requiring millimetric precision. It is proposed for treating movement (Parkinson’s disease, essential tremor, dystonia, myoclonus) and psychiatric disorders (OCD, depression). DBS has been used since 1996 for treating severe dystonia and it is now widely accepted that the globus pallidus internus (GPI) is the most efficient target for lasting therapeutical benefit in dystonia. The stereotactic coordinates of the brain target is based on direct imaging and / or guided by microelectrode recording (MER). Nevertheless, the anatomical definition of the target on MRI or its specific signatures on MER does not guarantee the achievement of therapeutical effect. We will focus on the treatment of dystonia where the standard surgical protocols include bilateral implantation of a single electrode, most often within the GPI. However, dystonia can be associated with other movement disorders such as myoclonus, tremor, tics, and also with behavioural disorders such as self-injurious behaviour (SIB), which may also be susceptible to be alleviated by DBS.

The objective of this talk is to summarize and discuss the rationales for employing multiple electrode implantations for treating both the dystonia and the associated movement and behavioural disorders. There are several arguments to propose multiple electrode implantations, based on data related to anatomical issues (morphometric, somatotopy, functional), clinical issues (spread of symptoms, type of symptoms) and disease (symptoms progression or recurrence, involvement of different basal ganglia – cortical circuits).

Even in the early era of ablative surgery for treating dystonia, staged procedures were employed for gradual increase of the size of the lesion within different structures (GPI, motor thalamus). These staged procedures aimed to optimize and prolong the therapeutic effect and to limit side effects. Multiple electrode implantations could be proposed when the volume of the nucleus aimed at is important as is the case for the GPI. In this situation, several therapeutic locations could be defined for different electrodes.
The somatotopic organization of the GPi has been discussed in publications reporting the effect of DBS in dystonia. In conditions where symptoms affect different body parts, multiple electrodes could be required to modulate the volumes corresponding to the representation of these different symptomatic body parts.

In dystonia, symptoms can progress over time and the adjustment of the therapeutic settings of one implanted electrode will not always permit their improvement. The addition of electrodes could improve new symptoms that appear during the follow up and also improve on initially partial therapeutic outcome. In conditions like myoclonus-dystonia, several symptoms are expected to benefit from DBS. While myoclonus and dystonia can be efficiently treated by stimulating the GPi, an alternative strategy suggests a simultaneous implantation of both the ventral intermediate nucleus (Vim) of thalamus and the GPi.

There are now more and more arguments in favour of a remote effect of DBS on several structures belonging to the same network. In disorders where the target is impaired by the pathological process (metabolic disorders, tumors, infections, vascular), several anatomical structures belonging to the same network could be targeted to increase the drive of DBS therapeutic effect. Multiple electrode implantations could also be proposed to improve symptoms mediated by different circuits (ex motor and limbic circuits for treating dystonia and self-injurious behaviour in Lesch Nyhan syndrome).

We will examine and describe personal clinical cases and data from the literature where multiple electrode implantations have been performed.

The decision of implanting multiple DBS electrodes within the same or several anatomical targets is based on the anatomy of the targeted structure, and the need to reinforce effect of DBS via structurally impaired circuitry. It is also justified by the potential of disease progression during follow-up and the need to control several symptoms mediated via different motor projections, or motor and behavioural symptoms belonging to sensorimotor and limbic circuitry where there is no consensus agreement on the best therapeutic target (eg in Tourette syndrome).

In conclusion, there is a rationale for DBS through multiple electrodes implantations in selected cases.
14.00-15.45 Deep brain stimulation trouble-shooting and technical issues

Chaired by Mr Keyoumars Ashkan and Dr Martin Smith

Mr Ashkan qualified from the University of Wales College of Medicine in 1993 with commendations in medicine and surgery as well as a first class honours degree in medical biochemistry. He underwent dual postgraduate training in surgery and medicine, obtaining Membership of the Royal College of Physicians (MRCP) in 1997 and the Fellowships of the Royal College of Surgeons of England and Glasgow (FRCS) in 1998. Thereafter, he underwent higher specialist training in general neurosurgery in London being awarded the Fellowship of the Royal College of Surgeons in Neurosurgery (FRCS SN) in 2002. His subspecialist training in stereotactic and functional neurosurgery included a fellowship in France with Prof. Benabid, generally considered as the founder of the modern deep brain stimulation surgery, which led to a MD degree. He was awarded the Fellowship of the Royal College of Physicians (FRCP) in 2011. He was a senior lecturer and honorary consultant in neurosurgery at the Institute of Neurology and National Hospital for Neurology and Neurosurgery from 2004 to 2006. He was appointed as a consultant neurosurgeon and honorary senior lecturer at Kings College Hospital in January 2007. He was promoted to the position of Reader in Neurosurgery in 2011.

Mr Ashkan’s main interests are neuromodulation surgery including deep brain stimulation, spinal cord stimulation and occipital nerve stimulation for movement disorders, pain and headaches; image guided, minimally invasive and stereotactic surgery for brain tumours including awake craniotomies. He has won over 20 undergraduate and postgraduate prizes and scholarships. He has attended/presented papers in over 140 national and international meetings and has published over 220 full papers, abstracts and book chapters. He is a member of several international neurosurgical committees as well as a reviewer for a number of journals.

Dr Martin Smith is a Consultant Paediatric Neurologist based in Birmingham, UK where he runs a joint movement disorder clinic with Dr Hardev Pall that was originally instigated by the late Dr Stuart Green. Dr Smith now leads the BPNA movement disorder course working with wonderful colleagues including Dr J-P Lin, Dr Alasdair Parker, Dr Manju Kurian, Dr Lucinda Carr, Dr Arni Majumdar and Professor Mary King.

Dr Margaret Kaminska, Consultant Paediatric Neurologist, Evelina Children’s Hospital, London

Margaret Kaminska obtained her degree in medicine at the Medical University in Warsaw, Poland and completed her training in Paediatric Neurology in Poland in 2003. She moved to London to work in General Paediatric Department of Kings College Hospital and then in Paediatric Neurology in Evelina Children’s Hospital. Her main interest focuses on movement disorders and the applications of deep brain stimulation and intrathecal baclofen therapy.

Wires, batteries, body, brain: getting technical!
Dr Warren Marks, Medical Director, Rehabilitation and Movement Disorders Program, Cook Children’s Medical Center, Fort Worth, Texas USA

Positions and Employment
1988-  Physician, Cook Children’s Medical Center, Fort Worth, TX
1988-  Physician, Harris Hospital, Fort Worth, TX
1989-91 Vice Chairman, Medical Subspecialties Division, Cook Children’s Medical Center, Fort Worth
1989-  Editorial Board, Medical Staff News, Cook Children’s Medical Center, Fort Worth, TX
1989-  Co-Director, Transitional Care Unit, Cook Children’s Medical Center, Fort Worth, TX
1991-  Director, Pediatric Clinic, Muscular Dystrophy Association, Tarrant County, TX
1992-  Medical Director, Rehabilitation Services, Cook Children’s Medical Center, Fort Worth, TX
2007-  Medical Director, Movement Disorders Program, Cook Children’s Medical Center, Fort Worth
2009-  Physician, Baylor All Saints Medical Center, Fort Worth, TX
2009-  Assoc. Professor, Dept. of Pediatrics, U of North Texas Health Science Center, Fort Worth, TX
2011-  Affiliate Faculty, Dept. of Computer Engineering Hercleia Lab, U of Arlington, Arlington, TX

Selected Peer-reviewed Publications (Selected from 24 peer-reviewed publications)

Cerebral palsy is the most common etiology of movement disorders and among the most common disabling conditions in childhood. The management of abnormalities of motor tone is at the foundation of the overall strategy to improve the lives of people affected by cerebral palsy and other movement disorders. The introduction of new techniques for diagnosis and classification and the development of new strategies for intervention is exciting. We are presently at the stage of developing an understanding of the role of these new interventions, at a time when worldwide the distribution of healthcare resources is being scrutinized. It is therefore more important than ever to evaluate new technologies and strategies in a thoughtful manner.
Deep Brain Stimulation for children: risks and challenges, Texan style

While there is extensive use of deep brain stimulation, pediatric experience is much more limited. We have performed 140 DBS related surgeries on 75 patients. This includes 157 leads, including 66 primary implants. Cerebral palsy is our most common diagnosis. There are unique issues of performing these complex surgical children. Challenges include patient selection, the surgical procedure, and postoperative management. Infection and strokes have been problematic, but outcomes can be rewarding. Improvement in motor function can be seen in patients with cerebral palsy by 6 months, and sustained over time. Although the percent of motor improvement compares favorably to patients with Dyt-1 dystonia, outcome in the CP population is related to the severity of motor impairment at the time of implant.

Amande Pauls, Koeln, Germany

The challenges of DBS in cerebral palsy: an international meta-analysis

15.45-16.15 Assessing outcomes after deep brain stimulation

Chaired by Professor Jane Hutton, Professor Terence Sanger and Richard Selway

Jane Hutton is Professor of Statistics at the University of Warwick, and graduated from the University of Edinburgh, the University of Cambridge and Imperial College, University of London (PhD).

Professor Hutton works in medical statistics, with special interests in survival analysis, meta-analysis and non-random data. Her methodological research largely focuses on developing models to answer questions raised by health care colleagues, and patients. For example, collaborations with epilepsy specialists in meta-analyses lead to papers on biases due to within study selection of outcomes and sub-groups, and to joint models for pre-randomisation seizure counts and post-randomised trials. Collaboration on a trial of ankle sprains has lead to models for recovery rates with skew, bounded scores, with missing data. She has extensive interdisciplinary research networks, both nationally and internationally, and acts as an expert witness in several countries. She has published more than 100 refereed papers, and has been awarded more than a million pounds in peer-reviewed research grants.
Professor Terence Sanger
Viterbi School of Engineering – Biomedical Engineering
Keck School of Medicine – Neurology
Director, USC Pediatric Movement Disorders Center
Academic Director, HTE@USC

As the academic director of USC’s HTE@USC, an interdisciplinary educational program for medical and engineering students, Dr. Terry Sanger brings his background in engineering and medicine to the challenge of fostering effective collaborations between the two fields. Dr. Sanger holds appointments in Biomedical Engineering, Neurology, and Biokinesiology, and he is also the director of the Pediatric Movement Disorders Clinic at Childrens Hospital of Los Angeles. His laboratory research focuses on understanding the origins of pediatric movement disorders from both a biological and a computational perspective. Dr. Sanger coordinates the Childhood Motor Study Group (CMSG) and the NIH Taskforce on Childhood Motor Disorders, and he is principal investigator on several research studies at USC. At CHLA, Dr. Sanger works with specialists from Rehabilitation, Surgery, Neurosurgery and other specialty areas. His training includes background in Child Neurology, Electrical Engineering, Signal Processing, Control Theory, Machine Learning, and Computational Neuroscience.
Ms Hortensia Gimeno, Clinical Specialist Occupational Therapist, Evelina Children’s Hospital, London

Hortensia is a Clinical Specialist Occupational Therapist working with the “Complex Movement Disorders Service” at Evelina Children’s Hospital in London. As part of the multidisciplinary team, Hortensia works with children and young people with complex and severe movement disorders and contributes to patient selection for and evaluation of outcome following neurosurgical interventions including Deep Brain Stimulation, Intrathecal Baclofen and other therapeutic strategies. Hortensia has been working as an occupational therapist for 14 years both in the community and hospital settings. She completed her graduate training in Spain and gained an MSc in paediatric occupational therapy in 2007 at the University of East London in the UK. Active research interests include outcome measures for movement disorders following neurosurgical, pharmacological or therapy interventions, occupational therapy interventions including cognitive approaches to maximise children’s function and participation, and the impact of motor and process skills impairments in daily life activities of children and young people with neurological and developmental disorders.

Manual ability beyond fine motor function: lessons from the COPM and AMPS in childhood movement disorders after DBS

Dystonia is characterized by sustained and involuntary movements present at rest and triggered by volition and emotion. It can be aetio logically classified into primary or secondary with such differentiation important given the phenotypic characteristics and response to medical and surgical interventions may differ according to aetiology.

The importance of identifying the needs and priorities of children and young people with dystonic movement disorders, in line with a family-centred approach, is paramount. Multi-dimensional measurement across the International Classification of Function (ICF), particularly beyond impairment, is necessary in this group to fully understand the impact of dystonia at the levels of activity and participation.

In our cohort, a significant number of young people identified ability to use tools as one of their top concerns. The term “use of tools” is used in preference to “fine-motor skills” described by other authors, as the skills required to hold and utilise utensils functionally extend beyond the component of fine-motor skills.

Knowledge regarding functional improvement, including manual ability, following DBS in paediatric dystonic movement disorders remains limited. Although small, one study has recently reported upper limb function outcomes in this group.

Skilled hand use is influenced by both motor and non-motor components including perceptual, cognitive, contextual or environmental factors. As such, the use of impairment-based measures, which solely focus on the motor components of upper limb function, will offer a limited understanding of real life problems in this population.
More comprehensive assessment of functional ability in daily-life tasks is required given improvements in manual function may be more evident when assessed in the context of functional tasks. Given that childhood dystonia is a condition that affects the developing brain, deterioration in performance lasting months or years could have a detrimental effect on the child’s ability to learn new tasks.

Dr Elegast Monbaliu, Department of Rehabilitation Sciences, Faculty of Kinesiology and Rehabilitation Sciences, Katholieke Universiteit, Leuven, Belgium

Elegast Monbaliu has recently submitted his PhD manuscript entitled “Secondary dystonia and choreoathetosis in dyskinetic CP: evaluation and insights”. Under supervision of Prof Dr Hilde Feys and Prof Dr Paul De Cock, this PhD project has made a contribution to the evaluation of secondary dystonia and choreoathetosis and characterization and functional impact of these movement disorders. This research is done in close collaboration with the CP Reference centre of the University Hospital Pellenberg (Prof Kaat Desloover, Prof Guy Molenaers), the pediatric department of the University Hospital Leuven (Prof Els Ortibus) and the Committee of Flemish Motor Disability Institutes (KOMPAS).

The Dyskinesia Impairment Scale: a new scale to measure dystonia and choreoathetosis

Dystonia and choreoathetosis usually coexist in dyskinetic CP. To evaluate dystonia and choreoathetosis in dyskinetic CP, reliable, valid and sensitive measurement scales are indispensable. To date there are three commonly used scales to measure dystonia: the Burke-Fahn-Marsden Dystonia Rating Scale,1 the Unified Dystonia Rating Scale2 and the Barry-Albright Dystonia Scale.3 In contrast, no measurement scale is available to evaluate choreoathetosis in dyskinetic CP. In a first study,4 the reliability and validity of the existing dystonia scales in children with dyskinetic CP were investigated. The results showed a moderate to good reliability for the three scales. However, measurement errors of the three scales were considered too high for clinical use. Also content analysis revealed that the three dystonia scales had limitations to capture the hallmarks of dystonia.

To respond to the sensitivity limitations of the dystonia scales and the coexistence of dystonia and choreoathetosis, we developed the Dyskinesia Impairment Scale (DIS). The DIS is subdivided in two subscales, one for dystonia and one for choreoathetosis. Both subscales evaluate duration and amplitude in 12 body regions including the eyes, mouth, neck, trunk, and limbs. For the limbs, a distinction is made between the proximal and distal region and between the right and left side. In hands of experienced raters in discriminating between dystonia and choreoathetosis, the results showed good to excellent reliability for both subscales and good concurrent validity for the dystonia subscale. This makes the scale promising for measuring dystonia and choreoathetosis in long-term follow up and evaluating the efficacy of continuing developing medical interventions such as oral medications, intrathecal baclofen, deep brain stimulation and botulinum toxin and in rehabilitation applications.

Dystonia and choreoathetosis in dyskinetic CP are known as complex movement disorders. The discrimination between dystonia and choreoathetosis may be difficult because key elements like duration, speed and stereotypies of hyperkinetic movements are challenging to discriminate. Therefore, experience in discriminating between dystonia and choreoathetosis based on the operational definitions of these movement disorders, but also clinical expertise with the CP population may influence the reliability of scoring the DIS. In a third study, two groups of inexperienced raters were included; one group with clinical expertise in CP (senior physiotherapists) and another group without CP expertise (junior physiotherapists). The results of this study generally showed good reliability for the DIS in the inexperienced raters. There was no effect of clinical expertise for inexperienced raters. However, compared with the raters, experienced in discriminating between dystonia and choreoathetosis, reliability was lower with higher measurement errors. Therefore, a more comprehensive training for recognizing dyskinetic CP, based on the operational definitions is recommended.

Markus Elze, Department of Statistics, Warwick University

Markus Elze (http://go.warwick.ac.uk/melze) is pursuing PhD research in Medical Statistics under the supervision of Professor Jane Hutton joint with Professor Ulrike Köhl (Hannover Medical School). Markus has a background in Mathematics and Systems Biology; his recent work focuses on modelling survival and adverse events together with longitudinal data in medical applications. He provides time-to-event models and additional statistical assistance for a collaboration on dystonia presented in this talk.

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Modelling dystonia, secondary complications and outcomes after intervention: how do we measure change and prevention?

Modelling dystonia presents several statistical challenges. Clinical outcomes and secondary complications are often measured on scales and may shift gradually over time. The choice of rating scales and outcome measures are crucial and can change how we perceive the outcomes. The time at which the patient experiences certain events often cannot be measured exactly, but is affected by the so-called informative censoring. The results of statistical modelling have to be interpreted carefully to take potential confounders and causality into effect.

To address these challenges, appropriate statistical methods need to be used. Survival analysis can address the informative censoring.

Comparisons of several rating scales can inform on the similarities and differences between them. Models that take time and other covariates into account can show gradual changes and differences between certain patient groups and treatment strategies. This talk will present some practical examples based on recent work in collaboration with Jean-Pierre Lin’s group at the Evelina Children’s Hospital.

Terence D Sanger, MD PhD, Associate Professor, University of Southern California

Managing dystonia and choreo-athetosis in children and young people: what have we learned?

I will discuss treatment options for dystonia, chorea, and athetosis in children. The discussion will include medical, surgical, and therapy interventions, guided by our emerging understanding of the etiology of these impairments in children with primary and secondary movement disorders.

17.45-18.15  Keynote lecture: Jerky movements, myoclonus-tics-startle & dystonia: from behavioural phenotype to movement disorders

Marina Andrea Johanna de Koning-Tijssen , Department of Neurology, University Medical Centre Groningen, The Netherlands

Chaired by Michael Samuel and Els Ortibus

Michael Samuel, MA MD, FRCP, Consultant Neurologist with specialist interest in Movement Disorders / Deep Brain Stimulation at East Kent Hospitals University Foundation NHS Trust, Ashford, UK & King’s College Hospital, King’s Health partners, London, UK
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King’s College Hospital, London + 44 (0)203 299 8358 Fax
m.samuel@nhs.net

I am a consultant neurologist with a specialist interest in movement disorders and deep brain stimulation (DBS). I trained in movement disorders at Imperial College London, the National Hospital for Neurology and Neurosurgery London, and the University of Toronto, Canada. The research for my Doctorate degree involved studying the effects of stereotaxic neurosurgery and functional imaging (PET and fMRI) in Parkinson’s disease. Currently, I provide specialist clinical management of patients with all movement disorders and Parkinson’s disease at East Kent Hospitals University Foundation NHS Trust, Kent, UK, where I am Lead Clinician for Movement Disorders. At King’s College Hospital, London, I have been 1 of the 4 neurologists in the Movement Disorders Group since 2002, and additionally I work with DBS patients, as one of the clinicians providing and developing the DBS Service for Movement Disorders.

Els Ortibus, Faculty of Biomedical Sciences, Department of Development and Regeneration, Catholic University of Leuven

Els Ortibus’ research focuses on Cerebral Visual Impairment (CVI), more specifically neuroimaging biomarkers and the development of assessment tools for the diagnosis of CVI. She finished her PhD in 2011 on this topic. She co-authored several publications on the influence of visual impairment on gait. In addition, she has been and is strongly involved in research concerning the correlation between gait patterns and brain lesions (using Bayesian networks) in children with Cerebral Palsy (CP) and in assessment and treatment of dyskinesia (which is a type of CP).

She has clinical expertise in the domain of neurological rehabilitation with special focus on cerebral palsy. She runs the follow up clinic for preterm born children, the clinic for Cerebral Visual Impairment and is a member of the clinical CP reference team in the University Hospitals Leuven. She has recently become head of the Centre for Developmental Disabilities in Leuven.
SUSAN ALDWORTH

Susan Aldworth is an artist who works across disciplines. She studied Philosophy at Nottingham University and Fine Art at Sir John Cass. Her current practice exploring human identity uses both neuroscience and philosophy. Working on location in medical or scientific settings as an artist-in-residence is central to her practice – she has held residences at the Royal London Hospital, Gordon Museum of Pathology at KCL, and St Thomas’ Hospital Department of Neuropathology and is currently artist in Residence at the Institute of Neuroscience at Newcastle University. She holds research fellowships at both London Metropolitan University and Swansea Metropolitan University and lectures part time at Norwich University of the Arts. She is represented in London by GV Art.

Aldworth has exhibited widely both nationally and internationally and her work is held in many public and permanent collections including the Victoria & Albert Museum, The British Museum and The Wellcome Collection, and has been featured on Radio 3 and 4, BBC and ITV News. Her critically acclaimed solo exhibitions Matter into Imagination (2006), Scribing the Soul (2008) and Reassembling the Self (2012) all explore the relationship of the physical brain to the Self. Her radical portraits of three individuals with epilepsy are currently on display at the National Portrait Gallery, as Susan Aldworth: The Portrait Anatomised until September 2013. Her exhibition TRANSIENCE where she explores the brain as object – an historic first - etching from human brain tissue, opens at GV Art, London on 6 June 2013.

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SUSAN ALDWORTH: THE PORTRAIT ANATOMISED
National Portrait Gallery, London
Room 38a
7 March - 1 September 2013
http://www.npg.org.uk/susanaldworth

Documentary of The Portrait Anatomised:
http://vimeo.com/58779608
Listen:
The Print Master (2012)
http://www.bbc.co.uk/programmes/b019fwvx

The Portrait Anatomised (2011)
http://www.artandscience.org.uk/artists/
Complex Motor Disorders Service Workshop on
Children’s Deep Brain Stimulation

Children’s Neurosciences Centre
Evelina Children’s Hospital, London

on
Tuesday 21 May 2013
at
9.00-18.00

Closed meeting by invitation only
Complex Motor Disorders Service Workshop on Children’s Deep Brain Stimulation
Tuesday 21 May 2013
9.00-18.00
Children’s Neurosciences Centre, Evelina Children’s Hospital (by invitation)

Organiser: Jean-Pierre Lin
Minutes of discussions: Martine Barrons & Daniel Lumsden

09.00-09.30 Welcome: Evelina Children’s Hospital foyer, brief visit of the hospital
Jean-Pierre Lin

09.30-10.30 Who are We and Why are We Here?
An opportunity to describe current practice and experience of managing movement disorders in children, including DBS

The Belgian Group: Dr Els Ortibus, Paediatric Neurologist
Dr Hilde Feys, Physiotherapist
Dr Elegast, Monbaliu, Physiotherapist

The Brazilian Group: Prof Laura Silveira-Moryama Movement Disorders Specialist

The Canadian Group: Prof Gabriella Horvath, Clinical Geneticist-Neurologist

The Danish Group: Dr Peter Born, Paediatric Neurologist
Dr Annemette Løkkegaard Movement Disorder Specialist
Susanne Jensen, Clinical Nurse Specialist/Care Coordinator

The Dutch Group: Prof Marina de Köning Tijssen
Dr Deborah Sival Paediatric Neurologist
Dr Tom de Koning Pediatrician
Dr Agnes Elema pediatric rehabilitation
Ronald de Jong Pediatric physiotherapist
Melanie Eissens Occupational Therapist
Wieke Eggink PhD student
perhaps the Neuropsychologist

The Warwick Group: Prof Jane Hutton, Statistician and Epidemiologist
Dr Martine Barons, Mathematical Scientist Complex and Emergent Systems
Markus Elze, PhD Student
Dr Felicity Boardman (TBC)

The CMDS Group: Lesley Baker: Highly Specialised Speech and Language Therapist
Hortensia Gimeno: Clinical Specialist Occupational Therapist
Dr Margaret Kaminska, Consultant Paediatric Neurologist
Erin Morton: Highly Specialised Physiotherapist
Dr Tamsin Owen: Clinical Psychologist
Sarah Perides: Clinical Nurse Specialist
Dr Daniel Lumsden, Clinical Research Fellow
10.30-11.00 International Networks: Clinical and Research Opportunities  
Discussion led by Warwick Group:  
Jane Hutton and Martine Barons

11.00-11.30 Cognitive and Emotional Assessments of Children and Young People with Movement Disorders  
Tamsin Owen

11.30-13.00 Clinical Case in the Children’s Neurosciences Centre  
- MDT review: Dr Margaret Kaminska and Erin Morton  
- BFMDRS: Erin Morton  
- SALT assessment : Lesley Baker

13.00-14.00 Working lunch with sandwiches and carry on the seminars

Lesley Baker

13.20-13.40 Pain in dystonia before and after DBS: background and case examples  
Sarah Perides

13.40-14.00 A Multidisciplinary Model of patient selection for children’s DBS  
Hortensia Gimeno

14.00-14.30 Some examples of assessing baseline Gross Motor Function: case discussion example(s)  
Erin Morton

14.30-15.00 Assessing Manual Function: which scales for whom?  
Floor and ceiling effects: case examples  
Hortensia Gimeno

15.00-15.30 How to discriminate and evaluate secondary dystonia and choreoathetosis in cerebral palsy  
Elegast Monbaliu

15.30-16.00 Difficult dystonia problems and fine-tuning DBS  
Jean-Pierre Lin

i. Neck extension dystonia  
ii. Tongue thrusting dystonia  
iii. Jaw opening dystonia  
iv. Fine-tuning the hand  
iii. Parkinsonian gait after DBS  
iv. Abulia after DBS

16.00-16.30 Dystonia Severity Assessment Plan (DSAP)  
Grading cases and communicating important information  
Workshop activity for participants: bring some case histories for us to grade!  
Daniel Lumsden & Jean-Pierre Lin
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<tr>
<th>Time</th>
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<tr>
<td>16.30-17.30</td>
<td><strong>Status Dystonicus: Case Histories from the CMDS archives</strong>&lt;br&gt;Jean-Pierre Lin &amp; Daniel Lumsden</td>
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<td>17.30-18.00</td>
<td><strong>Concluding remarks further work and projects</strong></td>
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<td>18.00-</td>
<td><strong>Sampling British Beer and European Wine in Local Hostelry!</strong></td>
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