BSCN

Founded as
the EEG Society
in 1942

PEMBROKE
COLLEGE OXFORD

11th Triennial BSCN Teaching Course

Pembroke College Oxford, UK

28th March – 1st April 2022

Welcome note by the BSCN President, Dr Jacquie Deeb

Dear Colleagues,

On behalf of the organisers, I am happy to invite you to join us at the 11th Triennial BSCN Residential Neurophysiology Teaching Course in Pembroke College, Oxford, UK from 28 March – 1 April 2022.

After the meetings held in Wadham College since 1990, the British Society for Clinical Neurophysiology is pleased to host the 11th Teaching course in Pembroke College set in the beautiful historic centre of Oxford that also benefits from integrated modern facilities.

The meeting will be held in person but due to the ongoing global pandemic restrictions a virtual registration option is now available.

The course will consist of lectures by international experts from Europe, United States and United Kingdom, practical demonstrations including EEG, ultrasound scan of neuromuscular system and NCS/ EMG techniques, case discussions and a quiz. The structure will follow themed days covering basic and advanced EEG, EMG, use of ultrasound scan in the neurophysiology clinic, intraoperative monitoring, evoked potentials and neurophysiology use in the intensive care unit.

The course is intended for clinical neurophysiologist and physiologists in training, those requiring an update in current practice, neurologists and clinical scientists.

The BSCN organising committee (Jacquie Deeb - President, Adrian Fowle - Past President, Gareth Payne - President Elect, Jeremy Bland - Webmaster, Ronit Pressler - Honorary secretary, Mark Baker - Treasurer, Nandini Mullati - Meeting secretary, Arup Malik - Past officer, Veronica Leach - Past officer, Louise Jones - Administrator) look forward to welcoming you in Oxford or on our virtual platform 28 March - 1 April!

Jacquie Deeb

President of the British Society
for Clinical Neurophysiology (BSCN)

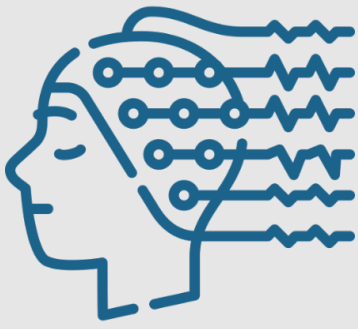
Photography and video

Please note that photography and video recording are not allowed throughout the duration of the course. This includes during all lectures and workshops and applied to all types of electronic recording devices. In addition, all patient specific content (including photos or videos of patients) from to lectures and workshops cannot be saved, copied or electronically shared. Any violation may be prosecuted.

Monday 28 March

Time	Topic	Speaker
AM	**Chair: Dr J Deeb**	
0900 - 0915	President's Welcome	Dr Jacquie Deeb
0915 - 0945	EEG in paediatric seizure syndromes	Dr Sushma Goyal
0945 - 1030	Neonatal EEG and seizure semiology	Dr Ronit Pressler
1030 - 1100	Coffee break	
1100 - 1145	Criteria for identifying interictal epileptiform discharges	Prof Sándor Beniczky
1145 - 1230	Trainee case presentation x3	
1230 - 1330	*Lunch*	
PM	**Chair: Dr R Pressler**	
1330 - 1400	Presurgical evaluation of epilepsy	Dr Nandini Mullatti
1400 - 1445	Trainee case presentation x3	
1445 - 1515	Tea	
1515 - 1715	Workshops – 3 running parallel, 1 hour each	
	° Seizure Semiology	Dr Rachel Thornton
	° Setting up and running home video telemetry*	Dr Franz Brunnhuber
	° Epilepsy Surgery: planning and SEEG*	Dr Nandini Mullatti
1745 - 1845	*Social Programme (Official Oxford Walking Tour, requires preregistration, max 20 places)*	
1930 - 2030	*Dinner*	

*Workshops for virtual attendees

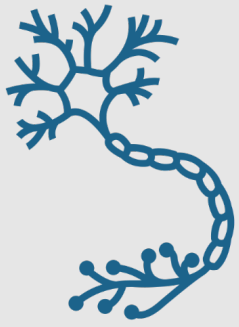


Tuesday 29 March

Time	Topic	Speaker
AM	**Chair: Dr J Bland**	
0900 - 0945	Technical aspects of EMG	Prof Sanjeev Nandedkar
0945 - 1030	Nerve conduction techniques	Dr Machiel Zwarts
1030 - 1100	*Coffee*	
1100 - 1145	Testing the neuromuscular junction	Prof Erik Stalberg
1145 - 1230	Paediatric EMG	Dr Matthew Pitt
1230 - 1330	*Lunch*	
PM	**Chair: Dr G Payne**	
1330 - 1400	Ultrasound, what is it good for?	Dr Jeremy Bland
1400 - 1430	Nerve and muscle ultrasound: a guided tour	Dr Nens van Alfen
1430 - 1515	Trainee case presentation x 3	
1515 - 1530	*Tea*	
1530 - 1730	Workshops: Ultrasound of peripheral nerves	Dr Nens van Alfen, Dr Jeremy Bland, Dr Doreen Fialho, Dr Antonin Gechev, Dr Nattanit Gregoris, Dr Sabine Klepsch,
1815 - 1915	*Dinner*	

Wednesday 30 March

Time	Topic	Speaker
AM	**Chair: Dr N Mullati**	
0900 - 0945	Status Epilepticus: overview and what is new	Dr Stephan Ruegg
0945 - 1030	Encephalopathy & Periodic Discharges on EEG	Prof Peter Kaplan
1030 - 1100	Coffee	
1100 - 1145	EMG of the Urogenital system	Prof David Vodusek
1145 - 1230	Trainee case presentation x3	
1230 - 1330	*Lunch*	
PM	**Chair: Dr A Fowle**	
1330 - 1400	Peripheral Nerve Injury	Mr Michael Fox
1400 - 1430	Trainee case presentation x 3	
1430 - 1500	*Tea*	
1500 - 1730	Workshops: NCS/ EMG techniques	
	° Single fibre EMG	Dr Matthew Pitt
	° Quantitative EMG analysis	Prof. Sanjeev Nandedkar
	° Nerve conduction study for focal neuropathies	Dr Machiel Zwarts
1745 - 1845	*Social Programme (Official Oxford Walking Tour, requires preregistration, max 20 places)*	
1745 - 1945	*Council Meeting*	*Council members only*
1900 - 2000	*Dinner*	



Thursday 31 March

Time	Topic	Speaker
AM	**Chair: Dr M Baker**	
0900 - 0945	Somatosensory and auditory Evoked Potentials	Mr Peter Walsh
0945 - 1030	Visual Electrophysiology	Dr Gareth Payne
1030 - 1100	Coffee	
1100 - 1145	Introduction to Intraoperative Monitoring	Dr David MacDonald
1145 - 1230	Trainee case presentation x3	
1230 - 1330	*Lunch*	
PM	**Chair: Dr N Kane**	
1330 - 1400	IOM for Spinal Surgery	Dr Alan Forster
1400 - 1430	IOM for Cerebral Surgery	Dr Ana Mirallave-Pescador
1430 - 1500	*Tea*	
1500 - 1530	IOM of brainstem surgery	Dr Francesco Sala
1530 -1615	Trainee case presentation x3	
1615 - 1645	Quiz	Dr Mark Baker & Dr Gareth Payne
1800	*Official photograph*	
1830	*Drinks reception*	
1930 - 2200	*Gala Dinner (Black tie, optional)*	

Friday 1 April

Time	Topic	Speaker
AM	**Chair: Dr A Fowle**	
0900 - 0945	Assessment of hypoxic brain injury	Dr Nick Kane
0945 - 1030	Continuous vs routine EEG in critical care	Prof. Peter Kaplan
1030 - 1100	*Coffee*	
1100 - 1145	Peripheral neurophysiology in critical care	Dr Andrew Michell
1145 - 1230	Critical illness neuropathy and myopathy	Dr Gerald Cooray
1230 - 1330	Presentation of prizes	
1230 - 1330	*Lunch*	
1330	*Close of meeting*	

Trainee cases timetable

Time	Presenter	Title
		Mon 28 March
1145	Hnin Hay Mar	A Child with developmental regression and abnormal movements
1200	Saadia Afzal	A curious case of jerks
1215	Syed Shah	A 57-year-old male with progressive weakness and an unusual incidental finding
1400	Jiten Mistry	Jerks and Giants
1415	Wint Nandar Hein	Focal seizure or normal variant
1430	Joseph Hutchinson	A 58-year-old man referred after a seizure
		Tues 29 March
1430	Andreas Themistocleous	24-year-old lady with difficulty walking
1445	Rohan Kandasamy	A case of chronic, progressive, unexplained arm weakness
1500	Jafar Ibrahim	Stridor in an Infant
		Wed 30 March
1145	Charles Fry	Being woken up at 4am. A grave situation indeed
1200	Myat Thura	Acute onset neuropathy presenting in Sjogren Syndrome
1215	Giulia Attard Navarro	Block failure! A case of iatrogenic nerve injury
1415	Satya Duddu	A Patient's journey from ptosis to muscle cramps and jaw stiffness – a case report
1430	Khazina Waraich	Atypical origins: An uncommon cause of scapular winging - the importance of clinical examination with video and EMG findings
1445	Syed Haider	Post-partum leg weakness in a young female
		Thurs 31 March
1145	Esther Das	A case of "severe fibromyalgia"
1200	Sarah Green	A Wobbly Walker
1215	Karen Sutterlin	The Sound of Silence
1530	Eimer Maloney	Dumb-bells
1545	Nonnie McNicholas	The one root cause to all problems: A case series
1600	Rama Musa	A case of a 73-year-old lady presented with right hand weakness

Organising committee

Dr Adrian J Fowle FRCP BSc

Adrian was a keen scout and one of the first “computer kids” at school, experiences which still underpin his clinical neurophysiology. Fleshed out at St Thomas’s Hospital, London as undergraduate and rather more at Kings College Hospital as the last Senior Registrar. In between, a period of basic research in neurophysiology at the Sherrington School taught him proper lab practice and instrumentation, and that he had no taste for research politics. In contrast, he was “volunteered” into clinical politics and management as a trainee, serving on the BSCN Council almost continuously until they made him President (just before Covid!) to stop him. He has recruited more doctors into the field than most, and improved access for physiologists. He created West Surrey Clinical Neurophysiology, Chertsey and served there for many years. He is now consultant clinical neurophysiologist at The Whittington Hospital, London and Medical Director of Mediservices Healthcare Ltd.

Dr Arup Mallik

Dr Arup Mallik trained in Glasgow and has been a consultant clinical neurophysiologist at the Queen Elizabeth University, Glasgow since 2005. His day-to-day work involves most of the general areas of EEG and EMG but over the last 15 years has developed a special interest in IOM. He has been a member of the Specialty Advisory Committee in Clinical Neurophysiology at the Royal College of Physicians since 2013 and has a keen interest in training. He is a past meetings secretary for the BSCN (2017-2020).

Dr Gareth Payne MBChB, BMedSc(Hons), FRCP, FRCP Edin, PGCertMedEd, MAcadMEd

Gareth Payne is a Consultant Clinical Neurophysiologist working in Bangor, North Wales. For 13 years he worked in University Hospital Wales in Cardiff where he reported Visual Physiology for patients from all regions in Wales. Gareth is the BSCN President Elect as well as current Chair of the Education Committee and is the author of the 2021 Neurophysiology Curriculum. He is also the creator the Visual Physiology learning resource which will allow trainees to meet all reporting requirements of the Visual Physiology Curriculum. When not driving between hospitals and home, Gareth plays double bass and bass guitar in a cover band called Rock Trolley which performs in local pubs and festivals.

Dr Jacquie Deeb

Jacquie Deeb is the current President of the British Society for Clinical Neurophysiology (BSCN). She is a Consultant in Clinical Neurophysiology in Queen's hospital, Romford part of Barking, Havering & Redbridge Hospitals NHS Trust and Honorary Consultant in Great Ormond Street Hospital, London. Since her appointment in 2010, she has been running a service of full electrodiagnostic services including adult and paediatric EMG and EEG, evoked potentials, diagnostic telemetry, deep brain stimulation and botulinum toxin for movement disorders. Her special academic interests are in paediatric EMG and movement disorders.

Dr Jeremy Bland

Dr Jeremy Bland qualified from Manchester University in 1981 and trained in clinical neurophysiology in the West Midlands before taking up a post as consultant in clinical neurophysiology at the Kent and Canterbury Hospital and the Regional Neuroscience Centre in London in1989. Since 1992 he has developed an interest in all aspects of the epidemiology, aetiology, diagnosis and treatment of carpal tunnel syndrome, compiling a database of over 50,000 patients suspected to have the disorder and publishing several original papers and review articles on the topic including a Cochrane review of steroid treatment for CTS. Since 2006 he has run a clinic dedicated to treating patients with carpal tunnel syndrome as part of a cooperative, multidisciplinary care pathway spanning primary and secondary care. He has lectured extensively on these topics, most recently at meetings of the BSCN, BPNS, ISPNI and AANEM and received the AANEM 'distinguished researcher' award in 2021.

Louise Jones

Louise joined the BSCN as their Administrator in August 2020, having previously worked as PA to Professor Brian Neville, Professor Helen Cross and Dr Ronit Pressler and has over 35 years' experience as a Medical Administrator working both for the NHS and private sector. She lives in West Sussex and is married to Tristan with two grown up sons.

Dr Mark R Baker

Mark is a consultant clinical neurophysiologist and consultant neurologist at the Royal Victoria Infirmary, and honorary senior clinical lecturer at Newcastle University. In addition to his routine clinical practice (electroneurography, EMG, EEG, epilepsy surgery, SEPs, MEPs), he has special interests in the neurophysiology of movement disorders and ALS/MND. In his laboratory at Newcastle University research is focused on the physiology of movement control and pathophysiology of neurological disorders, and the development of electrodiagnostics and electroceuticals for neurological diseases, with an emphasis on neurodegenerative diseases. He currently serves as Treasurer of the BSCN.

Dr Nandini Mullatti

Nandini Mullatti is a Consultant Clinical Neurophysiologist and Epileptologist at Kings College Hospital, London. She runs the epilepsy surgery programme at King's. She has 30 years of postgraduate teaching experience, and heads the National Training Program for Clinical Neurophysiology in the United Kingdom. She has pioneered the use of stereoencephalography (SEEG) in epilepsy surgery programmes in the United Kingdom. She also runs the UK Epilepsy Surgery Network, which she founded in 2009. She did her training in Neurology from the National Institute of Mental Health and Neurosciences in Bangalore, India and Clinical Neurophysiology training in Bristol, Uk and Toronto, Canada. She is a Member of the Canadian EEG Board. She is currently the Meetings Secretary of the BSCN. Her research interests include seizure semiology, epilepsy surgery and SEEG, and she teaches and lectures extensively on these topics.

Dr Ronit M Pressler PhD MD (Hons) MRCPCH

Dr Ronit Pressler is Consultant in Clinical Neurophysiology at Great Ormond Street Hospital for Children and Associate Professor at the UCL-GOS Institute of Child Health, London. She currently serves as Honorary secretary at BSCN. She has been chairing a number of neonatal task forces and working groups including the ILAE neonatal seizure classification task force and the neonatal guidelines update task force. She is Associate Editor at Epilepsia Open. Her research interests are neonatal seizures, particularly their diagnosis and treatment, as well as the pre-surgical evaluation in children with complex epilepsy.

Dr Veronica Leach

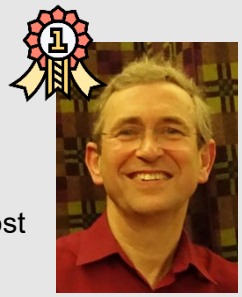
Dr Veronica Leach is a Consultant Clinical Neurophysiologist and Clinical Lead in the Queen Elizabeth University Hospital Glasgow providing a comprehensive Neurophysiology service to the West of Scotland Region. She has expertise in EEG, EMG and Stereo-EEG. She is also Consultant Clinical Neurophysiologist to the William Quarrier Scottish Epilepsy Centre and contributes to Paediatric Neurophysiology in the Royal Hospital for Children in Glasgow. She served as Honorary secretary of The BSCN from 2017 until 2021.

Faculty

Dr Ana Mirallave Pescador

I graduated in Spain where I also did my training in Clinical Neurophysiology. I did my posdoc in in vitro electrophysiology in New York (USA) at the centre for neurosciences, New York University. I currently am a consultant Clinical Neurophysiologist at King´s College Hospital NHS Foundation Trust and lead the intraoperative neuromonitoring section of the departments of Neurosurgery and Clinical Neurophysiology. I am a student of Big Data Science at Queen Mary University of London. I am a board member of the International Society of Intraoperative Neuromonitoring (ISIN) where I co-chair the Artificial Intelligence Committee.

Dr Alan Foster

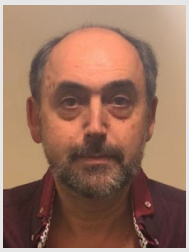


Graduating from Aberdeen in 1978: working my way via Gloucester (heard 'Dr Foster went to Gloucester' almost daily when there... comes from 13th century King Edward [Longshanks] trip there - fell from horse into puddle, humiliated - no rhymes allowed naming the king!). Then Clinical Neurophysiology – Research post Thomas' and The National, then registrar job. SR in Yorkshire; Consultant in Dundee - after corticography, carotid endarterectomies and MVDs a Friday afternoon phone call about 1993 from Mr Varma of "Alan, if I put a needle in the thalamus, can you tell me where the end is - and can you do the same in the spinal cord?" DBS followed: in 2000 I went to the Walton in Liverpool, to develop IOM, returning to Aberdeen in 2005. Routine work, and Neurosurgical IOM followed until 'retirement' in 2015 - though still do ARI EEGs, and IOM training/audit for Inomed and Bespoke.

Dr Andrew Michell MA MRCP PhD

Dr Michell is clinical lead in Addenbrooke's Hospital, Cambridge, part of Cambridge University Hospitals NHS Foundation Trust. The Clinical Neurophysiology department provides a full electrodiagnostic service, including EMG and nerve conduction, EEG, adult and paediatric video EEG telemetry and intraoperative monitoring. Services are also provided to Papworth Hospital, Cambridge. Dr Michell is East of England Training Programme Director for Clinical Neurophysiology , and also sits on the British Society for Clinical Neurophysiology (BSCN) council.

Dr. Antonin Gechev MD, PhD



Dr. Gechev's professional life was focused initially in some aspects of spinal roots dysfunction, causing intermittent paralysis. He found Clinical Neurophysiology might help to identify underlying mechanisms. That took him to a position developing comprehensive neurophysiology method to evaluate radiculopathies with colleagues from Bulgaria and the Netherlands. Later he was involved in Clinical Governance and became Medical Director of a Rehabilitation Hospital. After four consecutive terms he returned with energy to clinical practice with newly gained experience in leadership, innovation and management. His interest in Clinical Neurophysiology flourished in the last 13 years working in NHS Hospitals with passion and enthusiasm. The recent research interests are focused on Small Fibre Neuropathy assessment with ultrasound and Decomposition Electromyography application in demyelinating neuropathies.

"My medical career of 30 years is inspired by the willingness to help patients and my family, collaborating with brilliant colleagues all over the world and developing new technologies".

Dr David MacDonald

Neurophysiologist, epileptologist and neurologist with 30 years of clinical, academic and administrative experience. Areas of expertise include intraoperative neurophysiologic monitoring (IONM), electroencephalography (EEG), evoked potentials, electrocorticography, functional mapping, epilepsy monitoring and pre-surgical evaluation, neurology, teaching, research, and guideline development. Internationally recognized IONM pioneer with many publications, frequent speakerships, and invited editorships. Also founding member, past President, Scientific Committee Co-Chair and permanent advisory board member of the International Society of Intraoperative Neurophysiology (ISIN).

Prof David B Vodusek MD PhD FEAN MD, PhD, FEAN

David Vodušek is Emeritus Professor of Neurology at the University of Ljubljana, Slovenia. Born in Slovenia he received his MD and PhD from the University of Ljubljana. He spent time in the Department for Clinical Neurophysiology, Uppsalla, Sweden, Institute of Neurology, Queen Square, London, Baylor College, Houston, and at NYU, NY USA. In 1997 he was appointed full Professor of Neurology at the University of Ljubljana. He served as Head of the Institute of Clinical Neurophysiology in Ljubljana, as Chair of Neurology, Medical Faculty, University of Ljubljana and from 1996-2017 as Medical Director of the Division of Neurology, University Medical Center Ljubljana, where he continues to work as consultant. Dr. Vodušek is a member of the Slovene and German Neurological Association, BSCN, and the European Academy of Neurology (EAN-Chair of the International Liaison Group).Through EAN he is also active in the Bio Med Alliance where he chairs the CME Experts Permanent Committee. He serves on the editorial boards of Neurology and Urodynamics, Neurological Sciences and JECME. During his career, Dr. Vodušek has authored more than 100 articles in international journals and has co-edited the 130th volume of the Handbook of Clinical Neurology series (Neurology of Sexual and Bladder Disorders).

Dr Doreen Fialho FRCP, PhD

I am a Consultant Clinical Neurophysiologist at Guy's and St Thomas' and at King's College Hospital NHS Foundation Trusts. I have a specific interest in neuromuscular disorder and evoked potentials and a particular expertise in muscle channelopathies, having completed a PhD in this field and having run the neurophysiological evaluations at the national skeletal muscle channelopathy clinic at The National Hospital for Neurology, Queen Square until 2021. I have recently started to explore high resolution ultrasound as an additional modality alongside peripheral neurophysiology, which I believe is an exciting development to increase the diagnostic information obtained in patients undergoing nerve conduction studies and EMG.

Prof Erik Stålberg

Erik Stålberg, born 1936, entered Clinical Neurophysiology in 1967 after his thesis on propagation velocity in human muscle fibres. He was chairman and head of the Dept of Clin Neurophysiology, Uppsala University Hospital from 1991 and also Professor in Clinical Neurophysiology from 1993 until retirement. He has developed EMG methods such as SFEMG, Macro EMG, Scanning EMG and has developed quantitative parameters to describe human motor units in health and disease.

Prof Francesco Sala

Francesco Sala is Professor and Chair of Neurosurgery at the University of Verona, in Italy, where he graduated in 1992. His main fields of clinical and research interest are Paediatric Neurosurgery and Intraoperative Neurophysiology, particularly for brain and spinal cord tumour surgery. He established the Intraoperative Neurophysiology Unit at the Department of Neurosurgery in Verona where more than 4000 elective neurosurgical procedures have been performed under neurophysiological guidance. In 2005 Dr. Sala was one of the co-founders of the International Society for Intraoperative Neurophysiology, where he has served as Secretary (2009-2011), Chairman of the Education Committee (2011-2013), and President (2013-2015). He has served as member of the Executive Board for the International Society for Paediatric Neurosurgery, the European Society for Paediatric Neurosurgery and the European Association of Neurosurgical Societies. From 2017 to 2021 he has served as first Chair of the Neuromonitoring Committee of the World Federation of Neurosurgical Societies. His research interests in Paediatric Neurosurgery embrace functional surgery of central nervous system tumours, Chiari malformation and spinal dysraphisms. Since September 2020 he has been Vice-President of the Italian Neurosurgical Society. He has authored 113 peer-reviewed papers and 29 book chapters.

Dr Franz Brunnhuber MD

Born in Augsburg in the south of Germany, Medical school in Ulm, Board Certificate in Neurology in Munich, Doctorate (Dr med) in Neurophysiology from University of Tübingen. Specialising in Epilepsy at the Epilepsy Center in Kehl/Kork (Southwest Germany) before relocating to London following an invitation by Prof C Binnie at King's. First appointment in UK in Clinical Neurophysiology at Royal London Hospital and King's College Hospital in 2000. Then substantive appointment at King's College Hospital from 2003. Served as Clinical Lead in Neurophysiology from 2007 until 2013. His team won an NHS innovation award in 2012 with the development of HVT. Organised several masterclasses on video-telemetry and HVT in the UK and abroad; most recently in Copenhagen in October 2021. Involved in teaching and training of medical students, clinical physiologists and SpRs in Neurophysiology, Neurology and Psychiatry.

Dr Gerald Cooray PhD

I completed my medical degree at Uppsala University, Uppsala, 2006. I did a PhD in clinical neuroscience at Karolinska Institutet, Stockholm, 2010. Specialist training in Clinical Neurophysiology was done at Karolinska University Hospital, Stockholm. I worked for 2 years as a consultant at the same hospital before moving to Great Ormond Street Hospital in 2020.

Prof Machiel J Zwarts MD PhD

Machiel Zwarts received his M.D. from the Faculty of Medicine, University of Groningen in 1978 and completed his residency in Neurology and Clinical Neurophysiology in 1984 at the University Hospital, Groningen. In 1989 he received his Ph.D. degree on the thesis ''Applications of muscle fibre conduction velocity estimation'' – A surface EMG study. During his professional life he worked both in general, academic and tertiary hospitals as a neurologist and clinical neurophysiologist. He is specialised in clinical neurophysiology, neuromuscular disorders and epilepsy and published over 200 peer-reviewed articles and co-authored several books and book chapters.

Dr Matthew Pitt

Retired from Great Ormond Street Hospital in December 2019. Spent 30 years working in all aspects of clinical neurophysiology but specialising in paediatric EMG. Numbers of patients seen increased from around 30 a month to approximately 70. Particular interests were the diagnosis of myasthenia using a variation of stimulated single fibre EMG as well as interest in obstetric brachial plexus palsy and bulbar palsy. Author of Paediatric EMG published by Oxford University Press.

Mr Michael Fox

Mr Michael Fox was appointed as a Consultant in the Peripheral Nerve Injury (PNI) Unit at the Royal National Orthopaedic Hospital Trust, Stanmore in 2008 a tertiary referral centre, treating complex cases of nerve injury that are referred from hospitals throughout the United Kingdom. Mr Fox graduated from University College London Medical School in 1996 and completed his senior orthopaedic training on the prestigious Royal National Orthopaedic Hospital rotation in London specialising in Peripheral Nerve Injury. He has also undertaken fellowships in Paris, Los Angeles, Boston and Houston for nerve injuries and Salzburg (AO Fellowship) for trauma and shoulder surgery. Currently Clinical Lead of the department, Mr Fox has also held positions as Director of Medical Education and College Tutor and set up the Simulation Centre at the RNOH. Mr Fox is proud to have trained many of the next generation of orthopaedic surgeons and is also proud of his work at Headley Court, treating injured servicemen. He also enjoys working with professional sports clubs treating patients with nerve injury.

Dr Nattanit Gregoris

Nattanit Gregoris graduated from a medical school in Thailand in 2004 and then qualified as a neurologist in 2010. After relocating to the UK, she then attended her specialist registrar training in Clinical Neurophysiology at the National Hospital for Neurology and Neurosurgery and Great Ormond Street Hospital. She developed interests in neuromuscular ultrasound during her time in clinical neurophysiology training. She obtained hands-on experience by attending Dr Jeremy Bland's clinic at East Kent and Canterbury Hospital. Currently, she is working as a Clinical Neurophysiologist at Central Middlesex hospital and Charing Cross hospital.

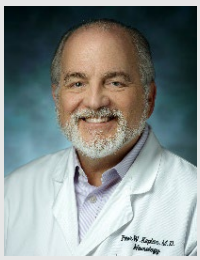
Dr Nens van Alfen MD PhD

Nens van Alfen is an associate professor of Neurology and Clinical Neurophysiologist from the Radboud university medical center (RUMC) in Nijmegen, The Netherlands. In 1997 she finished her medical training and she has been a board certified neurologist since 2004. Dr. van Alfen is the medical director of the Clinical Neurophysiology laboratory and coordinator of the clinical neurophysiology residency training program. Her areas of expertise are neuromuscular ultrasound, peripheral nerve pathology and brachial plexus neuropathies, and electrodiagnosis of neuromuscular disorders. The RUMC clinical neurophysiology laboratory performs 1200+ nerve and muscle ultrasound studies yearly, and receives visiting clinicians from all over the world for short training programs in neuromuscular ultrasonography. Dr. van Alfen’s current focus is on advancing muscle ultrasound and developing an international teaching and quality program for neuromuscular ultrasound.

Dr Nick Kane MBChB, MSc, MD (Hons), FRCS, FRCP (by election)

Dr Nick Kane trained in Clinical Neurophysiology at the Burden Neurological Institute, the National Hospital for Neurology and Neurosurgery at Queen Square, and Great Ormond Street Hospital for Children in London. He is a full time NHS Consultant Clinical Neurophysiologist at North Bristol NHS Trust, Honorary Senior Clinical Lecturer at Bristol University and current President of the Joint Neurosciences Council. Dr Kane is a former winner of the ILAE's Jubilee Gower Epilepsy prize, and has clinical neurophysiology research interests in epilepsy, coma and neuroprognostication.

Prof Peter W. Kaplan BSc MB BS FRCP



Peter Kaplan is Professor of Neurology and serves as the Director of Epilepsy and EEG at Johns Hopkins Bayview Medical Center. Peter Kaplan received his medical training from St. Bartholomew's Medical School, University of London. He then obtained membership to the Royal College of Physicians in England. He completed his residency in neurology at Duke University Medical Center. He completed fellowships in epilepsy and clinical neurophysiology at the same institution. He focuses on epilepsy, clinical neurophysiology and nonconvulsive status epilepticus. He has written extensively about these subjects as well as about eclampsia and neurologic disease in women.

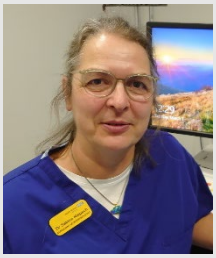
Peter Walsh

I started my career at St Thomas' Hospital London, where I gained knowledge and experience of routine EEGs as well as an appreciation of evoked potentials and nerve conduction studies. Moving to Bristol and working at the Burden Centre enabled me to consolidate and further my experience and exposure in all neurophysiology testing, being guided and mentored by Dr Nick Kane. Education of physiologists has played a large part of my career and I have enjoyed seeing staff develop and further their careers, and I was Chair of the Association of Neurophysiological Scientists education committee for many years before becoming Chair of this professional body in 2018. Currently I am service manager and clinical lead of the Grey Walter Department of Clinical Neurophysiology at Southmead Hospital, Bristol. But I still manage to make time for clinical work, and I have a keen interest in intraoperative monitoring and now tend to spend the majority of my time involved in neurosurgical monitoring, and this was my thesis for the Higher Specialist Scientific Training doctorate degree. Outside of work I enjoy running, and particularly getting off road for some cross-country runs at the weekends, but I have no intention of running a marathon.

Dr Rachel Thornton PhD

Dr Rachel Thornton is Consultant Clinical Neurophysiologist at Cambridge University Hospitals NHS Trust. Her main clinical interests are pre-surgical evaluation in children with Complex Epilepsy and EEG monitoring in paediatric and neonatal intensive care settings. Research interests include evaluation of brain networks using EEG in focal epilepsy in collaboration with groups at UCL and Kings College London. She sits on the Council of the British Society for Clinical Neurophysiology and serves as meeting secretary. She has a keen interest in education and training, having co-founded an annual paediatric sEEG workshop and as well as developing the UK ILAE EEG and semiology course.

Dr Sabine Klepsch



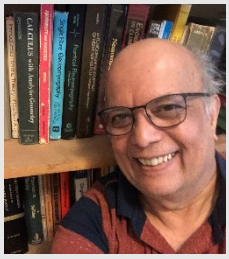
Dr Sabine Klepsch is working as a Consultant Clinical Neurophysiologist and Neurologist at Southmead Hospital for North Bristol NHS Trust. She is running a large botulinum toxin service and is using and teaching ultrasound guidance for intramuscular injections into cervical and limb muscles. She is also using diagnostic nerve sonography in her EMG clinics and has a special interest in nerve sonography findings in inflammatory neuropathies.

Prof Sándor Beniczky PhD

Sándor Beniczky is board-certified neurologist, clinical neurophysiologist and epileptologist. He is professor at Aarhus University Hospital, and he is the head of the Clinical Neurophysiology Department at the Danish Epilepsy Centre.

He is editor-in-chief of Epileptic Disorders, member of the Education Council, Congress Council and Publication Council of the ILAE, and past-chair of the joint EEG taskforce of the IFCN and ILAE. The main research interest of Dr. Beniczky is EEG and epilepsy, focusing on electromagnetic source imaging, seizure detection, standardisation and quality-assurance in clinical neurophysiology. He has supervised 11 Ph.D. students. He is author of 181 peer-reviewed papers and 22 book chapters.

Sanjeev D Nandedkar, PhD



Sanjeev is a biomedical engineer with interest in instrumentation, signal analysis, computer simulations, reference values and quantitative analysis. He has developed techniques such as Motor Unit Number Index (MUNIX), Extrapolated Reference values (E-Ref), and Multi-variable E-Ref, etc. He works for Natus Medical Inc where he helps design, development, testing and training for the electromyography systems. He has published 100+ articles in peer reviewed medical and engineering journals and also in textbooks. He also edits the 'EMG on DVD' series (now in streaming format). He received the "Distinguished Service" award from the American Association of Neuromuscular and Electrodiagnostic Medicine (AANEM), and "Excellence in Research Writing Award" from the Association of Academic Physiatrists. He enjoys teaching and travel, which has led him to many countries for conducting seminars and workshops.

Prof Stephan Rüegg MD FAES FEAN

Stephan Rüegg studied medicine at the Universities of Fribourg and Berne (Switzerland). He trained at the University Hospital of Basel (Internal Medicine, Oncology, and Neurology) with approval of the specialty board neurology by the Swiss Medical Board (FMH) in 2000. 2001-2003 he spent 18 months at the University of Pennsylvania in Philadelphia as a postdoctoral fellow in the lab of Prof. Marc Dichter and clinically with Prof. Jackie French and Brain Litt. On return to Basel, he was appointed head of the EEG lab and epileptology as well as of the neurointensive care consult service in 2004. He became assistant professor in 2009 and associate professor in 2015. He was the President of the Swiss League Against Epilepsy 2016-2020. He is a Fellow of the European Academy of Neurology (EAN) and the American Epilepsy Society. Since 2022 he is co-chair of the management group of the Scientific Panel Epilepsy of the EAN. His research interests include the optimization of diagnosis and treatment of status epilepticus and its co-morbidities, the neurological prognostication of critically ill patients, like those with postanoxic encephalopathy. He focuses also on the improvement of care of autoimmune encephalitis and explores pharmaco-epidemiological aspects of epilepsy.

Dr Sushma Goyal MBBS, MD, DNB India, MRCPCH

Sushma is the Lead Consultant Paediatric Clinical Neurophysiologist at Evelina London Children's Hospital and an Honorary Consultant at King's College Hospital, London. Her specialist interests include diagnosis of seizures and epilepsy in neonates and children and evaluation of children for epilepsy surgery. She was a part of the King's team that won the NHS Innovation Challenge Prize for developing Home video EEG telemetry in the UK. She teaches on the British Neurophysiology and Paediatric Neurology training programmes and is also a faculty on neonatal and paediatric EEG courses conducted by the ILAE. She is the International Secretary of the British Society of Clinical Neurophysiology and was a member of ILAE Neurophysiology taskforce set up for the role of EEG in the diagnosis and classification of epilepsy syndromes.

Abstracts

Sushma Goyal: EEG in paediatric epilepsy syndromes

The ILAE classification of epilepsy was updated in 2017 to consider an etiologic diagnosis and associated comorbidity right from when the child first presents, and at each step along the diagnostic pathway. Epilepsy Syndrome diagnosis is the third tier of classification and refers to a cluster of features incorporating seizure types, EEG, and imaging features that tend to occur together. It often has age-dependent features such as age at onset and remission, seizure triggers, diurnal variation. This may have associated prognostic and treatment implications. These may also have distinctive comorbidities such as intellectual and psychiatric dysfunction, together with specific findings on EEG and imaging studies. The aim of this talk is to describe the common epilepsy syndromes in children according to the age of presentation with a focus on the emerging concepts of defining associated electro-clinical video EEG features.

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Ronit Pressler: Neonatal EEG and seizure semiology

Neonatal EEG is one of the few objective methods measuring the functional integrity of the immature cortex and its connections. It can assist in determining brain maturation, evaluate acute neonatal brain injury and diagnosing seizures. While the principles of electroencephalography are the same in neonates as in older children and adults, successfully recording and interpreting neonatal EEGs requires specialized skills. In particular, good knowledge of the normal EEG maturation is essential as well as understanding clinical details, such as the corrected gestational age and the clinical state of the newborn.

Abnormalities of the background may indicate diagnosis, grading and prognosis in brain injury of preterm infants (such as intraventricular haemorrhage and PVL) and term infants (such as hypoxic ischemic encephalopathy, meningoencephalitis and stroke).

Seizures are the most common neurological emergency in the neonataL period but are most often acute provoked due to hypoxic ischemic encephalopathy or stroke. The clinical diagnosis of seizures is challenging because most have no or only discreet clinical manifestation thus EEG is essential for diagnosis. Depending on the aetiology, up to 60% of seizures are electrographic-only, mostly in critically ill infants, and after treatment with some anti-seizure medication (uncoupling).

Electrographic seizures are defined as a paroxysmal abnormal, sustained change in the EEG with a repetitive and evolving pattern with a minimum 2 μV voltage (peak to peak) and duration of at least 10 seconds (ACNS, 2013). Seizure onset in neonates is focal or multifocal and involved smaller regions of onset and remained localised in preterm infants. The new ILAE classification for seizures in the neonate uses the same framework and terminology as the 2017 ILAE seizure classification (Fisher et al 2017, Scheffer et al 2017), but is tailored towards neonates. Seizures types include motor events (automatisms, clonic, epileptic spasms, myoclonic, sequential, tonic) or non-motor events (autonomic, behavior arrest) or be electro-graphic only.

Sandor Beniczky: Criteria for identifying Interictal Epileptiform Discharges

Interictal epileptiform EEG discharges (IEDs) are the most commonly used biomarker for epilepsy. In skilled hands, identifying IEDs helps in diagnosing and classifying patients with epilepsy. However, over-reading EEG, i.e. misinterpreting normal phenomena as IEDs is the most frequent cause of misdiagnosing epilepsy. The International Federation of Clinical Neurophysiology (IFCN) proposed an operational definition of IEDs, consisting of six morphological criteria. The learning objective of this lecture is that the audience becomes familiar with the IFCN criteria and be able to apply them in clinical practice. We will review the evidence supporting the accuracy of the IFCN criteria, with emphasis on the number and types of criteria necessary for identifying the IEDs, and on the influence of repetition rate within the recordings. We will present a novel way of identifying IEDs in source space, as opposed to the conventional review of EEG in sensor space. Learning the operational criteria of IEDs has proved to improve the inter-rater agreement and the diagnostic accuracy of trainees in EEG reading. Learning these criteria and applying them in clinical practice will decrease misdiagnosis of epilepsy.

Sanjeev D. Nandedkar: Technical Aspects of EMG

In electrodiagnostic studies one records very low voltage signals in presence of high ambient noise and interference. Proper settings and knowledge of instrumentation can greatly assist in making recordings with high signal to noise ratio. We will review the components of the diagnostic systems, and how they affect the signal as well as noise. We will also discuss techniques to reduce noise and artifacts, especially in sensory nerve conduction.

We record potentials in the extracellular space. The waveforms of these signals are much different from the intracellular potential of nerve/muscle fibers. The relationship between the intracellular and extracellular waveforms will be discussed using the volume conductor theory. Understanding this relationship is useful to interpret the clinical recordings and also to recognize artifacts.

Machiel J. Zwarts Nerve conduction techniques

Nerve conduction studies (NCS) provide several parameters that inform the investigator about the number of axons and the conductive properties of a nerve. Distal stimulation of motor nerves with responses recorded from muscles give information on the maximum compound motor action potential amplitudes, reflecting the number of motor axons and in pathological states the extent of reinnervation, and distal motor latencies, that reflect the integrity of the most distal part of the myelin sheath. In demyelinating neuropathies, conduction velocities often fall dramatically, as the loss of myelin sheaths between the nodes of Ranvier prevents adequate saltatory impulse conduction. In axonal neuropathies, the loss of the largest and fastest-conducting axons will eventually also lead to a decrease in NCV, but to a much lesser extent as in demyelinating disorders, and not reaching the demyelinating range of < 70% of the lower limit of normal until the CMAP becomes less than 1 mV.

In a similar fashion, responses can be recorded from sensory nerves. In a clinical setting, SNAP amplitudes reflect the number of axons in a particular nerve in a more reliable way than the CMAP amplitude does. This is because the CMAP amplitude can be maintained even when axonal degeneration occurs by regional sprouting and reinnervation of motor units. SNAP NCVs also provide an indication of the integrity and quality of the myelin sheath. Nowadays, nerve conduction

studies are often combined with ultrasound information regarding the imaging aspect of the nerves studied.

Proximal conduction studies include recording of F-responses and H-reflexes. F-responses are elicited by the antidromic conduction of a supramaximal electrical stimulus in a motor nerve, that causes depolarization and backfiring of a few anterior horn cells. Another proximal conduction technique is the so-called H-reflex. H-reflexes are CMAPs elicited by afferent activation of a monosynaptic reflex arc in the spinal cord, and as such they are the electrical equivalent of tendon reflexes. H-reflexes are used routinely for assessment of the proximal segments of these nerves.

In polyneuropathies needle EMG supplements the NCS findings. It can help demonstrate a distal to proximal gradient in the extent of axonal damage, and the amount of spontaneous activity gives an impression of the speed with which the disorder progresses (i.e. if there has been time for reinnervation to occur or not). In cases were demyelination is predominant it can show a reduced recruitment pattern signifying conduction block, and also the extent of concomitant axonal damage as described above.

Further reading:

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Erik Stålberg: Testing the Neuromuscular Junction

In this lecture I will present two out of many methods to test the neuromuscular function, Repetitive Nerve Stimulation (RNS) and Single fiber EMG (SFEMG).

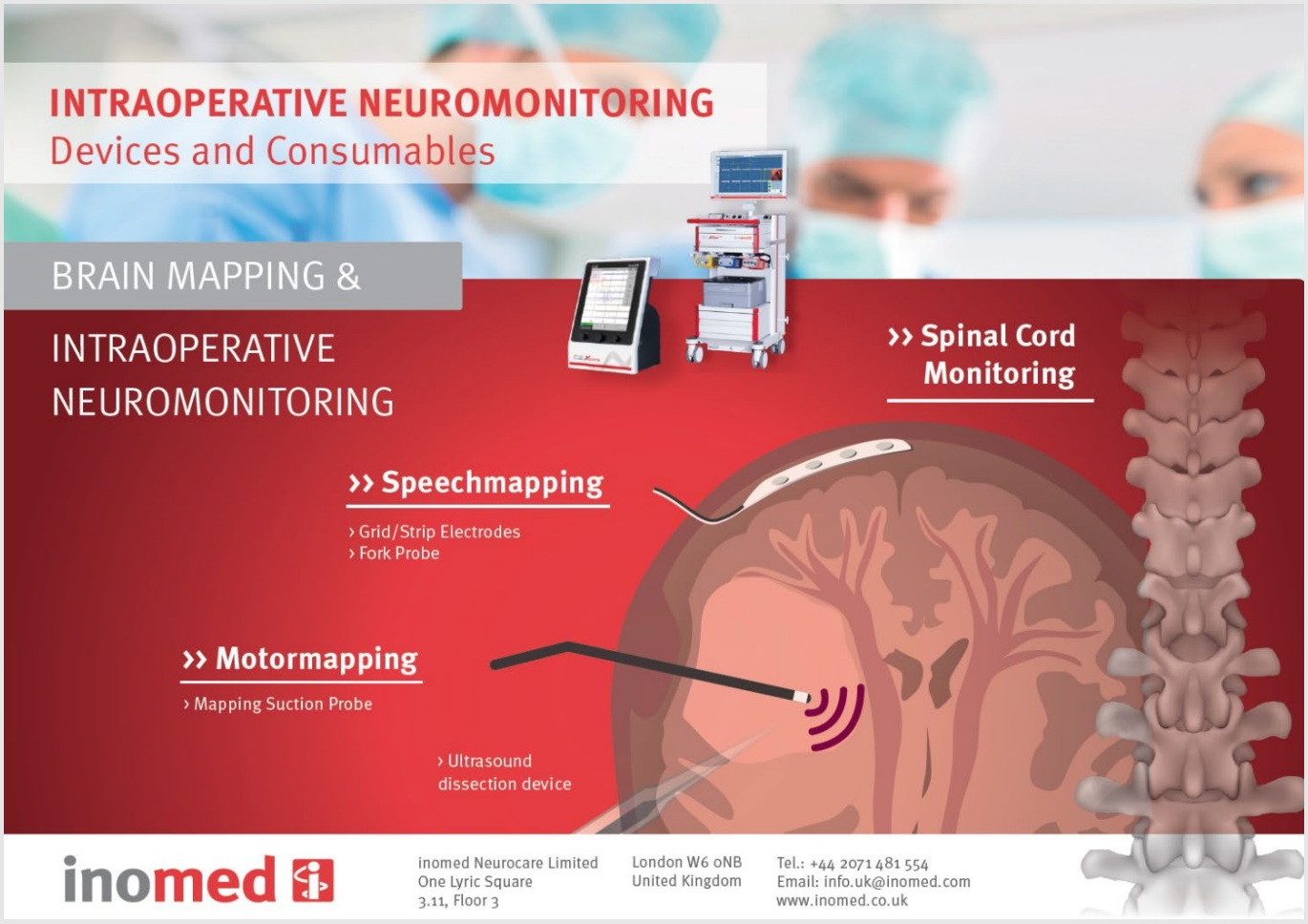
The physiological background to RNS will be discussed as well as and methodological principles, stimulation protocol and pitfalls. When performed in proximal temperature-controlled muscles, the sensitivity is up to 80% in generalized myasthenia and about 50% in ocular myasthenia.

Jitter analysis is nowadays usually performed with small concentric needle electrodes. It is quite possible to obtain acceptable signals. Special criteria to accepted signals are not further discussed, but references are given.

The method is applied both for volitional activation and for electrical stimulation. Recordings from normal muscle and from myasthenia are shown. New reference values compared to those previous used for SFEMG are given. The sensitivity in detecting neuromuscular dysfunction is same for concentric recording as for proper SFEMG recordings. Overall the sensitivity is higher than 95%.

Matthew Pitt: Paediatric Electromyography

This is an important sub speciality of Electro myography. It has many similarities to the tests performed in adults but important and at times most significant differences. Most tests can be done on standard commercial EMG machines. The consumables particularly stimulating electrodes have to be tailored to the smaller size of the patients. It is important to have programmes for motor unit analysis as well as stimulated single fibre EMG. The patients themselves demand a different approach. Reduced tolerance of the technique determines that it must be done quickly and with a very focused strategy. These strategies are dependent also on the varying pathologies seen in children. Obtaining normative data was a problem but with the recent discovery of the E-norm methodology much more feasible, and data is available for all the tests done. Special techniques that will be discussed are the modification of stimulated single fibre EMG which is particularly useful in children. Also demonstrated will be investigation of obstetric brachial plexus palsy and the bulbar palsy. The lecture will conclude with an analysis of how the test may evolve in the future.



Jeremy Bland & Nens van Alfen: Nerve and muscle ultrasound

Ultrasound scanners were first used to capture images of peripheral nerve in the early 1990s, but since 2000 there has been an exponentially increasing interest in the use of this imaging modality in disease of peripheral nerve and muscle. Although the earlier observations began with obvious applications in nerve trauma, tumours and local entrapment neuropathies, it has since become apparent that wide variety of inflammatory and inherited polyneuropathies also produce imaging changes in nerve. The field continues to develop apace with ever improving scanners and transducers providing more and more detailed images of peripheral nerve, while ongoing scientific studies around the world are elucidating the characteristic imaging changes in various nerve and muscle pathologies. Ultrasound imaging can be easily combined with nerve conduction and EMG examinations in a single patient visit, providing an integrated anatomical and physiological assessment of a nerve problem.

The single commonest observation is of nerve swelling, which may be focal at an injury or entrapment site, multifocal, usually in inflammatory neuropathies or diffuse in some inherited neuropathies. Other observations may include changes in nerve vascularity seen with doppler imaging, and changes in the mobility of nerves as well as alterations in surrounding tissues which may help to explain localized nerve pathology. There is research interest in the measurement of tissue stiffness (elastography) and contrast enhanced ultrasonography.

The two talks this afternoon will provide a brief guide to how to ‘drive’ an ultrasound scanner, and the basic techniques involved in capturing short and long axis views of peripheral nerves and making measurements. We will illustrate a variety of focal and generalized nerve and muscle imaging abnormalities. In the practical sessions we then aim to give all of the audience who have never used a scanner a chance to experience for themselves, and see how easy this technique is to pick up for those who already have a reasonable grasp of nerve and muscle anatomy.

Stephan Rüegg: Status Epilepticus: overview and what is new.

Status epilepticus (SE) is the most frequent neurological emergency requiring intensive care treatment. While diagnosis of motor forms is evident, the non-motor forms of SE (non-convulsive SE (NCSE)) pose much more diagnostic challenges given their protean symptoms. Regarding diagnosis of NCSE, the (continuous) EEG monitoring plays the major role. Following, an international team of experts revised the American Clinical Neurophysiology Society (ACNS) classification of EEG patterns in the intensive care unit (ICU), and fostered, among a multitude of adaptations, the concept of electroclinical SE. The ACNS classification, together with the so-called “Salzburg criteria” may help to better discriminate between SE and encephalopathy which represents still the most difficult task for even experienced ICU EEG readers.

Treatment of SE is divided into four stages depending on the respective response of the patient to specific treatment steps. Stage one is imminent SE and includes the pre-hospital and emergency room phase where benzodiazepines (BZD) are administered. The safety and efficacy of early and even pre-hospital treatment of SE with benzodiazepines have been corroborated in several trials. Stage two, established SE, is the phase where an intravenously antiseizure medication (ASM) is given after the BZD. The Established Status Epilepticus Treatment Trial (ESETT) showed equipoise with level I evidence of the three intravenously (i/v) administered antiseizure medications (ASMs) phenytoin, valproate, and levetiracetam regarding safety and efficacy. Lacosamide was non-inferior to fosphenytoin in non-motor SE in another prospective trial. In children, levetiracetam and fosphenytoin were equivalent regarding safety and efficacy in two large prospective

randomized controlled trials. If the SE does not respond to a BZD and an i/v ASM, the patient has refractory SE (stage three; RSE) which is treated with i/v anaesthetics, mainly midazolam or propofol or a combination of both of them. There is no new data about these or any other new compounds for RSE. When RSE persists despite adequate treatment, the patient enters stage four, super-refractory SE (SRSE). Here, too, all therapeutic approaches lack any evidence, and most data are derived from retrospective case series. Beyond the drugs already discussed earlier, the anaesthetic ketamine is often used, together with other non-phamaceutical treatments, like the ketogenic diet, stimulation devices like the vagus nerve stimulator and deep brain stimulation. A large trial evaluating hypothermia in convulsive SE/RSE/SRSE did not show efficacy in terms of a better outcome after 90 days. Rather worrying, several large retrospective studies pointed to worse outcomes in patients undergoing coma induction with anaesthetics and called for some more cautious and individualized therapy of SE in patients with RSE/SRSE. The discussion whether anaesthetics are friend or foe is not closed.

A recent study showed that applying machine learning methods to continuous EEG data can accurately predict the optimal time window to wean patients from anesthetics in almost real-time. This is an important step to improve patient safety, the more as an another study showed that patients with RSE/SRSE were extubated with marked delay despite successful weaning. Such analysis of big EEG data sets is currently under intense evaluation for predicting outcomes and for verifying appropriateness and futility of therapeutic measures administered to patients with SE.

Future treatment approaches of SE include the clinical testing of new compounds like the mid-chain fatty acids, anti-galanins, TRAP-gamma- and KEAP-1-inhibitors, mGLuR2-PAMs, anatgomirs usf., as well as the repurposing of medications already in use for other indications, like pentoxyfillin, verapamil, SSRI’s, amantadine, dexmedetomidine, usf.

Nevertheless: the best way to treat SE, and especially RSE/SRSE, is to prevent SE by optimizing therapy of epilepsy, reducing the incidence of severe brain injuries and illness, and the early diagnosis and resolute treatment of the early stages of SE.

David B. Vodušek: Clinical neurophysiological testing of lower sacral segments

The bladder, bowel and sexual functions are neurally controlled and have striated and smooth muscles involved in their complex functioning. They are not readily amenable to clinical "observation" but functional tests for their objective assessment have been developed. The neural elements controlling these functions comprise (somatic) motor control of pelvic floor muscles, sensory input from the anogenital region, and autonomic nerve fibres. Clinical examination provides some data on motor function (the presence of voluntary and reflex contraction), and data on sensation. Morphological data obtained by imaging can provide only indirect data of potential dysfunction of neuromuscular structures. To test the integrity of the sacral segmental reflexes, the individual components of the reflex arcs and their suprasegmental connections, several neurophysiological methods have been introduced. Of the many published methods, EMG, sacral reflex studies, sensory and motor evoked potentials (SEP, MEP) have been most often studied (cf. 1, 2). All these methods have conveniently been called "uroneurophysiological". The International Continence Society has suggested standards regarding the general and technical information that needs to be stated when performing and reporting uroneurophysiological tests, to assure transparency and reproducibility of published reports (3). In the context of urodynamics, electromyography (EMG) describes the pattern of muscle activity (i.e. the timing and quantity of motor unit activity). This kind of EMG has also been called "kinesiological" and is used to demonstrate detrusor-sphincter dyssynergia. Most often, however, EMG is used for its ability to

distinguish normal from neuropathic striated sphincter / pelvic floor muscles. Wider experience is only available for the concentric needle electrode (CNEMG). CNEMG demonstrates both pathological spontaneous activity and changes in motor unit potentials (MUAPs). MUAP changes are specific and sensitive to diagnose reinnervation in sphincter muscles in individual patients. CNEMG has been found helpful in diagnosing involvement of lower sacral segments in different traumatic and compressive lesions, and malformations involving the thoraco-lumbo-sacral spine or the pelvis, because it provides data not obtainable by other methods (4).

Sacral reflex, SEP and MEP testing have, on the other hand, shown poor ability to distinguish accurately between neurogenic and non-neurogenic bladder, bowel, and/or sexual dysfunction (in other words their lack of sensitivity and specificity for this purpose in individual patients). These functions depend more on autonomic than on somatic nerve fibres, and then on several other non-neurogenic factors. Therefore, the sensitivity and specificity of neurophysiological tests should only be considered with reference to the particular underlying neurological lesion, not in direct reference to the bladder, bowel, and/or sexual dysfunction. Bulbocavernosus reflex, SEP and MEP recording has, however, been introduced to intraoperative monitoring in selected patient groups.

In routine diagnostics CNEMG and bulbocavernosus reflex testing are suggested as useful in selected individual patients with suspected lesions in the peripheral lower sacral reflex arc. CNEMG reveals muscle denervation and reinnervation, and bulbocavernosus reflex recording by EMG is more sensitive to demonstrate the preservation of the reflex arc than clinical testing. Demyelination lesions (such as in inflammatory polyradiculoneuropathy and multiple sclerosis), will show abnormalities in latencies of responses obtained in the uro-ano-genital region (sacral reflex, SEP, MEP), but the necessity to investigate such patients only rarely arises as data obtained by other means are considered sufficient. In axonal type lesions sensory involvement will be more readily demonstrated by clinical exam than by electrophysiological testing.

It should be borne in mind that the assessment of patients' uro-ano-genital functions necessarily relies more heavily on history than for instance limb functions. The clinical examination of the lower sacral neuromuscular system tends to provide less information on motor and reflex function than is typically the case of other body areas. Because of these facts neurophysiological tests may be relatively more important to assess lower sacral than other neurogenic lesions.

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Peter Walsh: Somatosensory and brainstem auditory evoked potentials

The fundamental function of the nervous system lies in the transmission of impulses, and these can be assessed by time locked averaging of evoked potentials following stimulation of the peripheral nervous system.

Somatosensory evoked potentials (SEPs) following electrical stimulation of the mixed nerve of the median and posterior tibial nerves can assess the conduction through the peripheral nerves, brachial and lumbo-sacral plexus, posterior spinal cord and medial lemniscal pathways of the brainstem, up to the cortex. Brainstem auditory evoked potentials (BAEPs) are far-field potentials which reflect highly synchronous activation of the major ascending auditory centres from the cochlea to the inferior colliculus in the mid-brain. BAEPs can be used to assess the peripheral hearing apparatus in conductive and sensorineural hearing disorders and can assess the brainstem auditory tracts in central nervous system disorders.

SEPs and BAEPs are reliable and objective measures of nervous system function that are sensitive enough to detect abnormalities even when the physical examination is normal. These evoked potential modalities can meet a variety of specific objectives that can be useful to the referring clinician. These include

1) Objective evidence of abnormality when signs or symptoms are equivocal
2) Detection of clinically silent lesions
3) Localisation of the anatomical level of impairment along a pathway
4) Providing evidence about the general category of the pathology
5) Monitoring of objective changes in the patient's status over time.

Although widely used in the past, the subsequent development of sophisticated imaging techniques has led to the recent decline in the role of SEP and BAEP recordings in the clinical diagnosis of neurological disease. However, the latencies of evoked potentials are quantifiable to 2-3 significant figures and most of the major SEP and BAEP peaks are stable over time (often of identical latencies, wave shape and amplitude in individual patients when re-tested). Also, as they are not overly influenced by the patient's level of cooperation, they are amenable to parametric statistical analysis as biomarkers for certain disease development, i.e. multiple sclerosis.

The resistance of the somatosensory cortical evoked potential (N20) and BAEPs to sedative drugs enable them to be used for the confirmation of brain death in the ITU setting; and the bilateral absence of the N20 potential following hypoxic brain injury has a high association with an unfavourable prognosis.

The standardisation of the recording techniques used, and the appropriate use of normative data, is important as the role of evoked potentials changes from a primarily diagnostic utilisation to ones that involve longitudinal and cross-sectional monitoring of progressive disease and prognostication of patient outcome.

Francesco Sala: Mapping and Monitoring in Brainstem Surgery: An Update

In spite of the advances in functional neuro-imaging (fMRI, tractography), neuro-navigation and neuro-intensive care, brainstem surgery remains challenging due to the high concentration of critical neural structures within a small volume. Accordingly, even minor injury could result in severe and sometime life-threatening complications for the patient.

Over the past two decades, intraoperative Neurophysiology (ION) has progressively emerged as an extremely valuable discipline to warrant the functional information that anatomy itself fails to provide. Neurophysiological mapping techniques are used for both intraoperative identification of key structures, such as the motor nuclei of the cranial nerves (particularly the VII, IX, X, XI and XII) on the floor of the fourth ventricle and the corticospinal bundle in the cerebral peduncle. Therefore, these techniques help to determine safe entry corridors for intrinsic brainstem tumors or to decide when to stop resection during the removal of dorsally exophytic tumors or fourth-ventricle tumors invading the floor of the ventricle itself.

Monitoring techniques, vice versa, are not aimed to identify ambiguous neural structures but rather to assess sub-continuously the functional integrity of neural pathways. It should be considered that traditional ION techniques such as SSEPs and BAEPs together could assess no more than 20% of the brainstem area, suggesting that significant brainstem injury could occur in the absence of SSEP and BAEP changes. With the advent of muscle motor evoked potential (mMEPs), ION became way more reliable thanks to the possibility to specifically monitor both corticospinal and corticobulbar motor pathways, these latter being of paramount importance during brainstem surgery. While in supratentorial surgery and spinal cord surgery, warning criteria for mMEP changes have been quite well established these are less defined during brainstem surgery.

The so-called corticobulbar MEPs have been introduced in the mid 2000s as a new technique which essentially allowed to extend to motor cranial nerves the principle of MEP monitoring, as a valid alternative to the recording of spontaneous electromyographic (EMG) activity.

Corticobulbar MEPs are elicited through transcranial electrical stimulation with recording electrodes inserted in the muscles innervated by motor cranial nerves, typically orbicularis oris and oculi (VII), posterior wall of the pharynx or vocal cords (IX/X), trapezius (XI) and tongue muscles (XII).

There are no standard warning criteria for corticobulbar MEP interpretation, but there is general consensus that irreversible MEP loss is a poor prognostic sign, correlating with severe and long-lasting cranial nerve palsy, while the preservation of MEPs usually predicts no deficits or only minor and transient deficits. Significant (50%-80%) amplitude drops are indicative of at least transient deficits.

Not all functional pathways are monitorable. Monitoring of oculomotion is still limited by the lack of techniques to monitor the fasciculus longitudinalis medialis. Techniques to monitor the afferent (sensory) pathways for the lower cranial nerve-mediated reflexes such as swallowing and coughing are still lacking. In the past few years, yet, monitoring of reflex circuits within the brainstem, such as the laryngeal abductor reflex, has emerged as a new strategy to indirectly assess the functional integrity of pathways for which there were no ION techniques in the past.

Nick Kane: Assessment of hypoxic brain injury

The potential role for EEG in the multimodal neuroprognostication of comatose cardiac arrest patients, after resuscitation and therapeutic hypothermia, will include recent findings along with our personal experience from a large single centre cohort of consecutive patients investigated with electrophysiological tests (EEG and SSEP). Although EEG has its limitations, along with all modalities in the multimodal prognostic framework, when timed appropriately and interpreted in a standardized fashion it can be probabilistic but not deterministic of an individual patient's neurological prognosis. The EEG phenotype can indicate both good and poor prognoses for a comatose patient on the Intensive Care Unit, which is a distinct advantage of this widely available modality, whilst an SSEP can predict a poor outcome.

Core tip: Appropriately timed and reported electroencephalography (EEG) recordings can assist in the multimodal neuroprognostication after out of hospital cardiac arrest, predicting both good and poor outcomes.

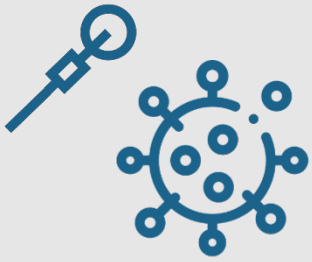
Andrew Michell: The use of nerve conduction and EMG on intensive care.

This presentation will include discussion of how to spot unusual neuropathies, pressure-related neuropathies, and those recently identified in association with COVID-19. Discussion will include pathophysiology and prognosis.

Gerald Cooray: Critical illness neuropathy and myopathy

This is a study investigating acquired muscle paralysis in patients treated in intensive care with invasive ventilation[1]. We describe the results of electrophysiological and biochemical investigations in an attempt to further characterize the cause of the muscle paralysis into either myopathic or neuropathic origin. 142 patients from (Akademiska Universitetssjukhuset, Uppsala and Karolinska Universitetssjukhuset, Stockholm) were included in the study and investigated using nerve conduction and needle electromyography studies together with biochemical analyses of myosin-actin ratios. The correlation between the diagnostic tests are described and discussed. We will present suggestions on which diagnostic tests are useful in investigating patients with acquired weakness. Furthermore, we will give a short survey on our experience at Great Ormond Street Hospital, London, with the electrophysiological presentation of acquired weakness in the intensive care setting for paediatric patients with either COVID-19 or Paediatric Inflammatory Multisystem Syndrome.

[1] Gonzalez Marrero et al Diagnostics (Basel) 2020 Nov 18;10(11):966.



HOPIN Attendee Guide

General Information

We have created this guide to help you navigate the Hopin online platform for an enjoyable event experience.

- We suggest using Google Chrome as your browser for the best performance.
- Hopin works best on a desktop rather than a mobile phone. If you wish to access the event on a mobile, we suggest downloading the Hopin event app.
- When a talk has started, the red "*LIVE*" tag will be shown on the stage button.
- The *Stage, Sessions* and *Expo* booths all have a chat option on the right side of the screen where you can join the discussion and ask questions.

Helpdesk

If you need help, visit the Helpdesk by clicking on the '*Sessions' button* to the left of your screen.

Joining Instructions

- Create a free account for yourself at https:/hopin.com
- Joining instructions will have been emailed to you before the event
- Once you have registered for the event on the Hopin platform you will have a shortcut to the event under '*My Events'* in your Hopin account
- You will see a schedule of talks as you scroll down the '*Reception landing' page*
- Navigate to the '*Stage'* using the '*Stage' button* on the left of the screen.
- You can chat to the other attendees and ask questions using the chat box on the right side of your screen.
- If you want to make a webcam or presentation larger on your screen, click on the expand screen button in the bottom right corner of the presentation screen.

Sessions

All lectures will take place in the '*Main stage'*. You can use '*sessions'* tab on the left side of the screen to access the help desk.

Networking

Hopin allows you to meet other attendees through their 1-2-1 video networking. When you select another participant in the attendee list at the right side of the reception screen you will find options to message them and schedule a meeting

FAQs / Troubleshooting:

Q: How do I know who is at the event?

A: To the right of your screen you will see the People tab, click there to see who else is attending. You can message them directly using the box below their name, or invite them to a 1-2-1 video call or group meeting.

Q: Will there be 'matchmaker' networking?

A: No! Hopin provides a 'chat with another random attendee' feature but we have disabled it for this event.

Q: What happens when I send an attendee a direct message?

A: Attendees can message each other through direct messages. To send a message, find the person you wish to chat with in the People tab, click their profile photo and send the message. A red dot in the envelope icon (top right) will let them know they have a new message.

Q: What happens when I invite another attendee to a video call?

A: The attendee will receive a direct message letting them know that you have invited them to a video call. You will both receive a link to a private session room within Hopin.
Remember to click the link yourself to join the call!

Q: Do I have to download something to run Hopin?

A: No. Hopin runs in your browser. We strongly suggest using Google Chrome for the best virtual event experience.

Q: I'm getting a 500 error or a 404 error

A: Try working through the following steps.

- Check your browser & make sure it is on the latest version (Google Chrome / Mozilla Firefox work best)
- Refresh your web browser
- Restart your web browser
- Clear your browser cache
- Sign out of your Hopin account and sign back in
- Restart your computer

Q: Will recordings of the keynote talks be available afterwards?

A: Yes. Recordings of the talks will be saved and available on the BSCN website after the event.

Q: I don't understand any of this. Help me!

A: If you are experiencing technical issues with Hopin or any other aspect of the conference, please get in touch with us at the Helpdesk (via the '*Sessions' button* on left side of screen).

Q: I've been disconnected from Hopin and can't get back into the event – help!

A: Please talk to us within Hopin if you can but if you can't get Hopin to work at all you can email or phone instead. Hopin contact details will be emailed before the event and can also be found at the back of the brochure.

Contact details

British Society for Clinical Neurophysiology (BSCN)

- Contact: Louise Jones
- Email: louiseannjones@btinternet.com
- Website: https://www.bscn.org.uk/

Pembroke College

- Contact: Alex Cox, Acting Head of Events
- Telephone: 01865 610939
- Email: alex.cox@pmb.ox.ac.uk
- Email: eventsoffice@pmb.ox.ac.uk

Hopin

- Contact: Michelle Miles
- Mobile: 07870 563966
- Email: michelle.miles@fusionliveevents.com