Letter from the Editor

In this edition of the newsletter we are trialling some new ideas, I would like to credit these to Peter Walsh whose knowledge and enthusiasm for neurological monitoring is fantastic. So, thank you to Peter for some new and interesting ideas. We have a new ‘Question Corner’ where you may pose questions regarding any aspect of Neurological monitoring on an anonymous basis to other members of NM_UK. Please send your conundrum to katyyoung_1@hotmail.com. If you can help with an answer, send it to me using the e-mail address above and I will publish it in the following edition of the newsletter. All questions will be posed anonymously but please give your name and hospital when replying with answers.

Also included in this newsletter is an ‘Article Review Section’ where readers can review the most recent articles related to Neuromonitoring and help keep us all up to date…..so get reading and I’d love to print what you find!

Hope you enjoy this issue!

Katy Young
Newsletter Editor
Letter from the Chairman

Welcome to all our subscribers who have joined us since May! And to those of you who have been with us from the beginning, thank you for your support.

Summer has passed in a flurry of organisational activity culminating in our Edinburgh 2010 meeting, 'The Theory and Practice of Neuromonitoring in Orthopaedic Spinal Surgery'. This was deemed a considerable success by the delegates, with the afternoon demonstration of spinal instrumentation on cadavers being one of several highlights. Full reports of this meeting will be in the next newsletter.

A brief business meeting was held at the dinner on the Thursday evening and the draft minutes of this will be in the next newsletter. You may recall that I sent an Email asking for nominations for the Steering Group. No new nominations were received but at the meeting, three subscribers who were delegates volunteered to sit on the Steering Group. I would like to welcome:

Emma Bowers       Newcastle
Lesley Chandra     Exeter
Ciara McAree      Edinburgh

The current members of the Steering Group were all nominated and have agreed to serve for the next year. Details of the election process will be in the minutes.

In the NHS of the 21st Century, professionals are already working far more than their contracted hours and so helping to run a group such as ours has to be done in that ever decreasing space between work and personal commitments. I am very grateful to everyone who has given their time so freely to help create Neuromonitoring UK - a professional special interest group, capable of running a meeting the size of Edinburgh 2010.

Education, training and accreditation are vital to our specialty but in the current turmoil created by MSC (Modernising Scientific Careers) it is not clear how this can best be achieved. Please work with, and remind your professional bodies that without proper training programmes, patients are potentially at risk during certain surgical procedures. It is a sobering thought that a surgeon must be deemed competent before performing spinal surgery unsupervised, and yet no similar national accreditation exists in our field. There are of course some individual departments who have, for several years, run their own local training schemes. We need to follow and develop their example.

Whilst the profession works towards a formal, long term solution for this situation, Neuromonitoring UK will continue to run educational events to support its subscribers. We need to consider carefully the format of these because, with the expected cuts in public service funding, training budgets will inevitably be limited. I am aware of several subscribers who were unable to attend Edinburgh 2010 because insufficient funds were available and many more could not come because of clinical commitments. It is important that, as far as possible, everyone who wishes to participate in our education and training events has the opportunity to do so. For this reason I am attending an exhibition and seminar on education and training at Birmingham NEC this week. I want to see how we might use new media techniques for training purposes. Registration is free and so there is no cost to NM_UK!! I will report back and by the end of the year I hope to be able to tell you of our plans for 2011.

Christine Reber
Synergy MEPs:

We have a Viasys Synergy machine that we take into theatre and are looking to shortly begin MEP monitoring but are not really sure how to connect the Digitimer headbox to our machine or how to set up the channels that we need. Can anybody help?

Thanks. Anon.

Journal Review Section

Review of: ‘Neurophysiological basis of direct cortical stimulation and applied neuroanatomy of the motor cortex: a review’

Reviewed by Katy Young

Being a complete virgin to direct cortical stimulation I was reading this paper as a blank canvas hoping fill some of the large gaps in my knowledge of this area of neurophysiological monitoring. This paper certainly did open my eyes to the two different techniques that are available for intraoperative monitoring using direct cortical stimulation, namely (and as I understand the more traditional) bipolar cortical stimulation (BCS) and monopolar cortical stimulation (MCS).

As the paper is a review it gave a good summary of the pros and cons of each technique which I have tried to summarise in the table below.
<table>
<thead>
<tr>
<th>Bipolar Cortical Stimulation</th>
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<tbody>
<tr>
<td>Extensive experience in this technique ‘its major advantage’</td>
</tr>
<tr>
<td>Movements elicited by this technique cause interference during microneurosurgery</td>
</tr>
<tr>
<td>preventing continuous monitoring of motor function during tumor resection</td>
</tr>
<tr>
<td>A frequency around 50Hz is delivered in a sequence of around 250-500 pulses necessary</td>
</tr>
<tr>
<td>to trigger an MEP. Stimulus level has to be up to 40mA</td>
</tr>
<tr>
<td>Unclear as to whether this can be performed on conscious patients</td>
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<tr>
<td>May cause seizure induction</td>
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</table>

<table>
<thead>
<tr>
<th>Monopolar Cortical Stimulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>More limited experience in this technique</td>
</tr>
<tr>
<td>Monopolar stimulation can be used continuously during microneurosurgery.</td>
</tr>
<tr>
<td>Never causes movements</td>
</tr>
<tr>
<td>Monopolar stimulation requires lower stimulation levels to evoke an MEP can be delivered</td>
</tr>
<tr>
<td>at high frequency (300-500Hz) and lower stimulus intensity when under general anaesthesia</td>
</tr>
<tr>
<td>(20mA). Only 5 pulses necessary to trigger MEP</td>
</tr>
<tr>
<td>Can be performed on conscious patients</td>
</tr>
<tr>
<td>Does not induce seizures</td>
</tr>
<tr>
<td>Directly excites axons of the pyramidal cells</td>
</tr>
</tbody>
</table>

Although very informative I did feel after reading this article that there were a number of unanswered questions and issues that I did not understand. For example, why, if both techniques trigger MEPs do you only elicit movements preventing use in microneurosurgery with BCS? I had a feeling that I did not fully understand the physics of the two procedures. As an example, anodal stimulation could perhaps have been explained a little clearer as the cathode must go somewhere but it was unclear from the paper where this would be. I do not really understand why with monopolar stimulation a lower stimulus and shorter train of stimuli can be used when both techniques are attempting to stimulate the cortex – what is it about MCS that appears to make it more selective? Certainly I felt after reading this paper that I didn’t have as much of a grasp of either of the two techniques as I had hoped. This prompted me to do some further reading and I came across the following paper.


Interestingly two of the authors of this paper are the same (at least I feel sure they are and that Olaf Suess’s surname was spelt differently in the first paper). This paper is actually a research project that:

‘analysed the data obtained from 255 cerebral interventions for lesions with direct contact to (121) or immediately adjacent to (134) Brodman area 4 in order to optimise stimulation parameters and to search for direct correlation between
intraoperative potential changes and specific surgical manoeuvres when using monopolar cortex stimulation (MCS) for electrocortical mapping and continuous intraoperative neurophysiological monitoring.’

This research paper described how monopolar stimulation is actually utilised much more clearly than in the review paper described above. Being a very traditional physiologist I would like to have an understanding of how the technique works and why it works and I feel this paper answered my questions more readily than the first. A monopolar stimulus can be applied to varying locations on the cortex using a grid or strip of electrodes and any one of these electrodes can be used individually at any time as an anode whilst the cathode (in this paper) was simply an adhesive surface electrode applied to the ipsilateral frontal region. The basic setting for MCS was a monopolar square wave pulse with a duration of 0.3 ms, a stimulation frequency of 400 Hz and a sequence (train) of 5 pulses. Stimulation intensity was increased in 1 mA steps starting from 0 until a compound muscle action potential (CMAP) was recorded or an upper limit of 25 mA was reached, if this occurred and no CMAP was elicited the stimulation frequency was increased to 500 Hz and the pulse sequence could be increased from 5 – 7 pulses.

CMAPs were recorded using subdermal monopolar needle electrodes positioned over representative muscle groups for the areas of cortex being stimulated, i.e. thenar muscles, forearm flexors, quadriceps and gastrocnemius muscles. Filters were set at 100 Hz – 10 kHz and sensitivity to 100 uv to 1 mV, the time base was set to 20-500 msec.

The optimum settings used which enabled mapping of Brodman area 4 in 204 of the 255 cases (79.6%) was the monopolar square wave pulse of 0.3 ms duration, 400 Hz stimulation frequency, and a train of 5 pulses. A CMAP could be triggered in another 23 cases by increasing the stimulation frequency to 500 Hz. Increasing the impulse sequence from 5 – 7 pulses proved successful in triggering CMAPs in a further 6 cases. Brodman area 4 could therefore be mapped with MCS in 232 of 255 cases (91%). The remaining 23 cases where no CMAP was triggered could be accounted for by pre-existent high-grade pareses and some technical problems. Most CMAPs (85.4%) were recorded from the thenar muscles.

This paper cites from other previous studies and it has been found that CMAP potentials can vary without any pathological background by 5% in latency, 30% in duration and 50% for the amplitude. In this study CMAPs could be recorded after high frequency anodal MCS in 91% of the 255 cases.

In summary after reading this paper I feel that I have a much clearer understanding of MCS, in terms of the quality of the paper I feel that the sample size (255 cases) is substantial enough to ensure the study has a high power. The paper is well written and subdivides the cases into three clear groups stating the reasons why CMAP changes were encountered – for this you will have to read the paper!
Meeting Review

By Brett Sanders

BSCN Meeting – Norwich, March 18th 2010

Once again a very informative BSCN meeting with a flavour and focus on Intraoperative Monitoring (IOM). The day focused on audits including the majority of centres that are involved with IOM, a surgeon’s opinion on IOM as well as advances and barriers within this field.

The key factors and concerns that were established during this meeting were: The use of multimodal IOM as the way forward for providing more accurate and precise electrophysiological opinions during surgical intervention; tailored protocols for each centre incorporated around a national gold standard of guidelines used by all IOM centres; the need for more specific and standardised training of Clinical Physiologists within this field and the development of a tightly knit team dynamic amongst surgeons, physiologists and anaesthetists.

In the end the onus is on all of us involved in the field of IOM Neurophysiology to develop and strengthen this profession and by becoming actively involved in a society such as Neuromonitoring UK, we will be able to promote the growth in this field of expertise, building on the existing foundation to create a world-class profession.

Christine Reber discussing

"Future challenges for Intraoperative Neurophysiology in Britain"

Peter Walsh taking questions after presenting a paper on:

‘Intra-Operative Neurophysiological Recordings During Micro-Vascular Decompression for Hemi-Facial Spasm’

Job Advert

NMUK are looking for regular journal reviewers to write reviews for the Neuromonitoring Newsletter. Please contact Katyyoung_1@hotmail.com if you can spare a small amount of time when you can to help us with this.
Forthcoming Meetings

1st ever Intraoperative Neurophysiologic Monitoring Joint Cross Atlantic Educational Symposium

4th – 6th November 2010
Groningen, Holland, The Netherlands

Visit http://www.neurophysiology.org/xwiki/bin/download/Content/neurophysiology_and_neuroscience_meetings/ASNM-ISINNov4-62010-k.pdf for more details including the special offer on registration for physiologists

American Society of Neurophysiological Monitoring Fall Symposium
23rd-24th October 2010 – Chicago IL

Visit www.asnm.org/Meetings.aspx for more information.

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