Investigation

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SPHENOIDALELECTRODES

Dr. R. McLachlan: Dr. Sadler, your paper on sphenoidal electrodes versus various surface electrodes has demonstrated that electrodes such as the mandibular notch electrodes are equivalent to sphenoidal electrodes. If this is true, why are so many people still using sphenoidal electrodes?

Dr. R. Desbiens: Surface sphenoidals often have more artifact and false detections than sphenoidal electrodes.

Dr. F. Dubeau: Occasionally activity can be picked up by sphenoidal electrodes which is not visible with surface electrodes. The onset of a seizure may be seen up to 5 or 10 seconds earlier with sphenoidal electrodes.

Dr. W. Blume: There was a study in *Epilepsia* demonstrating that within a few days, sphenoidal electrodes migrate to the surface with chewing. Is there anything to suggest that the best data from sphenoidal electrodes occurs within the first day?

Dr. J. Girvin: AP skull x-rays should be done immediately after insertion of the sphenoidal electrodes. If, after the first couple of seizures, a clear focus of onset cannot be identified, then I would make certain (by x-rays) that the sphenoidal electrodes are where they should be.

Dr. P. Hwang: When I was in training, we had to obtain a skull x-ray immediately after insertion of sphenoidal electrodes and the electrode had to be within one centimeter of the foramen ovale. It became very evident that if the electrode was in this location, the patient could tell you, because they would complain of pain in their jaw.

Dr. F. Dubeau: With digital EEG, it would be quite easy to do a study using patients with both sphenoidal electrodes and surface sphenoidal electrodes. Two or three independent observers could then read the EEG with some looking only at surface sphenoidal electrodes and others using montages with sphenoidal electrodes.

Dr. J-M. Saint-Hilaire: At our hospital, we routinely use sphenoidal electrodes. I must admit that I don't recall any incidents where it has made a difference about localization or changed our minds in any way.

TIRDA

Dr. W.B. Woodhurst: Could we hear a group discussion on the localization of TIRDA (Temporal Intermittent Rhythmic Delta Activity)?

Dr. M. Sadler: Dr. Reiher published a paper and stated that it correlated well with temporal lobe epilepsy. I don't believe it has ever been looked at in a surgical series.

Dr. R. Desbiens: In Dr. Reiher's paper, he stated that TIRDA correlated with spikes in the deep temporal structures but did not necessarily correlate with the side.

Dr. D. MacDonald: Dr. Klass agreed with Dr. Reiher that TIRDA was highly associated with temporal lobe epilepsy. Most patients with TIRDAand temporal lobe epilepsy also have focal temporal lobe spikes. I would be nervous attributing TIRDA to temporal lobe epilepsy if there were no associated sharp waves, particularly in the elderly population.

Dr. S. Wiebe: Dr. Klass's paper indicated that TIRDA was very helpful for lateralization of seizure onset.

Dr. F. Andermann: There are studies where patients have had depth electrodes and surface electrodes and the TIRDA does not correlate with spiking in the depth.

HOW MANY SEIZURES ARE ENOUGH?

Dr. N. Pillay: How many seizures need to be recorded particularly if there are bitemporal interictal spikes and there is a normal MRI?

Dr. F. Dubeau: I don't think there is a definite number. Each case has to be decided on its own merit.

Dr. F. Andermann: I would like to suggest that there may not be a need for ictal recordings at all if there is any demonstrable lesion on MRI and a single spike focus appropriate for the lesion.

INVASIVE RECORDING

Dr. R. McLachlan: In London, we do not use depth electrodes. We use special, tubular, subdural electrodes with concentric rings and with a posterior insertion are able to record along the length of the parahippocampal gyrus. The immediate morbidity with subdural

electrodes is perhaps slightly greater than that with depth electrodes. Patients have a moderate degree of headache and there is a risk of aspectic meningitis. Subdural electrodes are very good for seizure lateralization.

Dr. A. Olivier: We have had extensive experience with depth electrodes. Our complication rate has been very small. There was a single case of a frontal subdural hematoma. We have had three brain abscesses and one case of meningitis. We have had no cases of intracerebral hemorrhage. there have been no permanent neurological deficits. It would therefore appear that both techniques have a low morbidity.

Dr. R. McLachlan: The depth electrodes are very limited in their coverage and therefore the focus of onset could be missed.

Dr. J-M. Saint-Hilaire: Perhaps there needs to be a study looking at a combination of depth and subdural electrodes. Subdural electrodes may mislateralize the side of onset.

Dr. D. MacDonald: Sperling did a study using simultaneous depth electrodes and subdural strip electrodes. The conclusions were not entirely clear.

Dr. W. Blume: In Sperling's study there were many more depth electrodes than there were subdural electrodes, so I don't think it is a fair comparison.

Dr. A. Olivier: This is an extremely important topic and I do not think we have answered the question.

MRI

Dr. M. Jones: We don't do volumetric analysis in Vancouver.

Dr.D. Lee: Volumetric analysis is extremely labor intensive. We don't routinely do these studies except when it is not clear as to which temporal lobe the seizures are coming from. If we see abnormal signals in what visually appears to be a small hippocampus, then I don't think formal volumetric analysis is needed. Probably within the next 1-3 years there will be automated techniques for doing volumetric analysis and then it will become more widely used.

Dr. D. MacDonald: I feel very uncomfortable operating on patients who have normal MRIs. Are these patients being operated on and if so, what is the pathology?

Dr. F. Andermann: Patients who have normal hippocampal volumes are different from those with atrophy. They usually have had their seizures begin at a later age and the surgical results are not as good as in patients with proven hippocampal sclerosis.

Dr. P. Hwang: Should children who have had prolonged febrile convulsions be followed over time to see if medial temporal sclerosis develops?

Dr. F. Andermann: Such a study is being done by the group in Melbourne.

NEUROPSYCHOLOGY

Dr. R. McLachlan: I believe there is a report from the Georgia group stating that they had operated on five cases that had failed the Wada test on the resected side but they did not have any postoperative memory deficits. There then was a sixth case which ended up with a global memory deficit. Why did the first five cases not develop memory problems?

Dr. A. Lozano: Was there imaging data for these patients?

Dr. J. Girvin: Three patients who had failed their Wada test bilaterally were operated on in the 1970s before MRI. At that time, we would stimulate the hippocampus intraoperatively and do memory testing. If they passed their memory test, then we would remove piecemeal 3-4 centimetres of the hippocampus. Unfortunately, pathology was not available on these hippocampi. Now we just go ahead and take out the hippocampus without intraoperative memory testing in the case of bilateral failure.

Dr. C. Kubu: Perhaps an active epileptogenic focus can suppress normal memory functioning within the same temporal lobe and that may explain some of the memory dysfunction on the neuropsychological testing. Once the epileptogenic region is removed, perhaps memory function may improve.

Dr. M. Harnadek: At our centre we use the Wada test for assessing memory very sparingly. The patients who go on to have an amytal test are only those who show significant bilateral memory impairment. We would also do amytal testing on a patient whose memory is worse on the side that is not going to be operated on.

Dr. A. Olivier: To what extent do you do your studies blindfolded?

Dr. M. Jones-Gottman: I think neuropsychological testing should always be performed blind to avoid bias.

Dr. P. Hwang: We had six adolescents who failed the standard intracarotid amytal test, but then we went ahead to selective posterior cerebral artery amytal injection. They all passed when we selectively injected the posterior cerebral artery. They went ahead and had surgery and did well without significant global amnesia. We have subsequently stopped doing that procedure because of reports of complications including hemorrhage and stroke.

Dr. M. Jones-Gottman: Depth electrode studies and SPECT studies have shown that internal carotid artery amytal is sufficient to affect the entire hippocampus.

Dr. W. Blume: What happens when neuropsychological testing is normal in patients with temporal lobe epilepsy? In our experience, these people do not have mesial

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temporal pathology or they have mixed language representation.

Dr. M. Harnadek: We have just looked at approximately 15 cases with MRI defined mesial temporal sclerosis and no verbal memory deficit. In all of these cases, the lesion has turned out to be in the non-dominant hemisphere even in those cases where it is in the left temporal lobe in a right handed individual.

PSYCHIATRY

Dr. S. Wiebe: Is there any brief instrument that can be used for screening for warning signs?

Dr. R. Manchanda: I don't think that there is a brief rating scale that covers the total spectrum of psychopathology.

Dr. G. Savard: I think that one way you can raise your index of suspicion is by having a psychologist or psychiatrist working closely with the epilepsy surgery team.

Dr. N. Pillay: I have a two-part question with respect to *de novo* psychosis developing postoperatively. How frequent is it and does it ever relate to medication reduction? Are there any clues as to how we can predict who is going to develop this?

Dr. R. Manchanda: We had two patients with postoperative psychosis and both of them showed some traits pre-operatively such as not trusting people or being somewhat suspicious, but they were not delusional. Their psychosis, when it developed, was very gradual in progression.

Dr. G. Savard: I think that *de novo* psychosis in the postoperative period is a rare event. We had one patient with a ganglioglioma who became completely seizure-free. Is there any relationship between this particular pathology and the development of psychosis?

Dr. F. Andermann: We have had two patients with gangliogliomas who have developed psychosis *de novo* and there are a handful in the literature. There is a significant association and a study by Lisa Andermann et al has recently been published in Epilepsia.

Dr. W.B. Woodhurst: The definition of ganglioglioma is not entirely clear among pathologists and it is possible that the patients with gangliogliomas may have an associated developmental abnormality in the brain. In our experience, with approximately 20 gangliogliomas we have had no problems with postoperative psychoses.

Dr. A. Olivier: I would agree with Dr. Woodhurst. We have had 28 patients with gangliogliomas and only one developed a psychosis. In retrospect, he did have a suggestion of pre-existing psychopathology.

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