Electronystagmography (ENG.) as an aid to Diagnosis of Intracranial Lesions

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Introduction

EMIL DUBOIS – Reymond described the corneo-retinal potential difference in 1849. In the human retina, the electrical processes that are always taking place, even in darkness, cause it to be negatively charged against the cornea. Hence, the eye may be considered as a dipole, the electrical axis of which coincides with the optical axis. ENG, which was first described by Schott in 1922, utilizes this principle to record the changes in electrical fields produced by the eye movements by means of skin electrodes placed at the outer canthi of the eyes. Although it has been used extensively as a valuable clinical tool by the neuro-otologists in Europe, USA and UK for the investigation of disorders of the vestibular system, it has only been introduced into Malaysia recently. We report two interesting ENG records of central vertigo.

Case 1

T.S.Y., 36 years old Chinese male was seen in April 1975 with six weeks history of bitemporal and occipital headaches, worst in the right temporal region. This was continuous and throbbing in nature; it was associated with bouts of giddiness, nausea and vomiting. He had no hearing loss, tinnitus or otorrhoea. There was no past history of head injuries or loss of consciousness.

Examination revealed no significant abnormalities of the ears, nose and throat. Tuning fork testing suggested essentially normal hearing in both ears; pure tone audiogram confirmed this. His blood pressure was normal. Neurological examination revealed a minimum ataxia with tendency to fall to the right. Cranial nerves functions appeared to be intact. No papilloedema was detected. There was, however, spontaneous horizontal third degree nystagmus to the right and spontaneous vertical nystagmus on looking upwards.

The spontaneous nystagmus was recorded in ENG; it disappeared in darkness and upon closing of his eyes (Fig. 1). Optokinetic stimulation did not abolished the original spontaneous nystagmus (Fig. 2). These findings indicated a central vertigo.

X-ray internal auditory meati and chest were normal.

Lumbar puncture was performed; the C.S.F. pressure was normal, protein 41 mg% and sugar 74 mg%.

EEG showed marked focal abnormalities affecting the fronto-temporal regions of the right cerebral hemisphere. The finding on this tracing was compatible with the presence of a focal destructive process such as a cerebral tumour.

Brain Scan (Fig. 3) and right carotid angiogram (Fig. 4) supported the diagnosis of space occupying lesion in the right parieto-temporal regions. On referral to Neuro Surgical Unit, a right parietal craniotomy confirmed the diagnosis and a malignant astrocytoma was removed.

Case 2

C.L.H., a 25 year old Chinese girl was first seen in March 1974. She reported that she has been having episodes of severe giddiness which

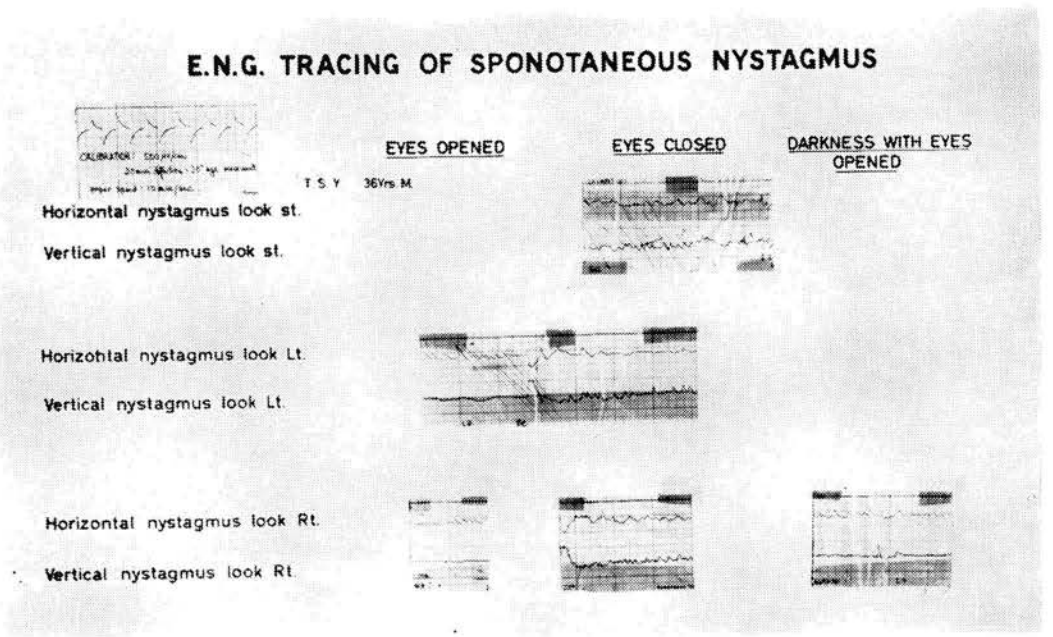

Fig. 1, Case 1

Electronystagmogram, T.S.Y.

There is third degree spontaneous horizontal nystagmus to the right and vertical nystagmus upwards. This disappears completely on eye closure. This is compatible with a central lesion.

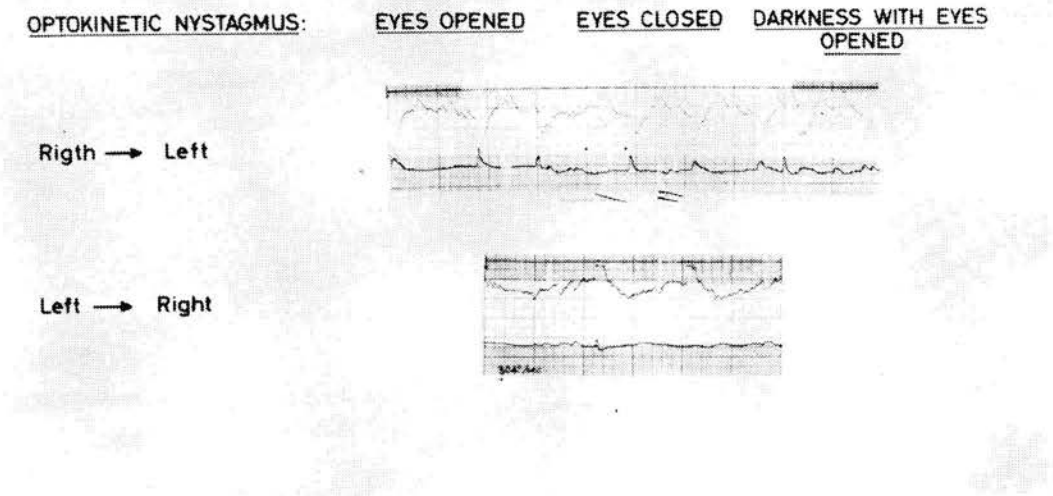

Fig. 2, Case 1

Optokinetic Nystagmus, T.S.Y.

The optokinetic nystagmus to the right is irreversible. This indicates a lesion proximal to the vestibular nucleus.

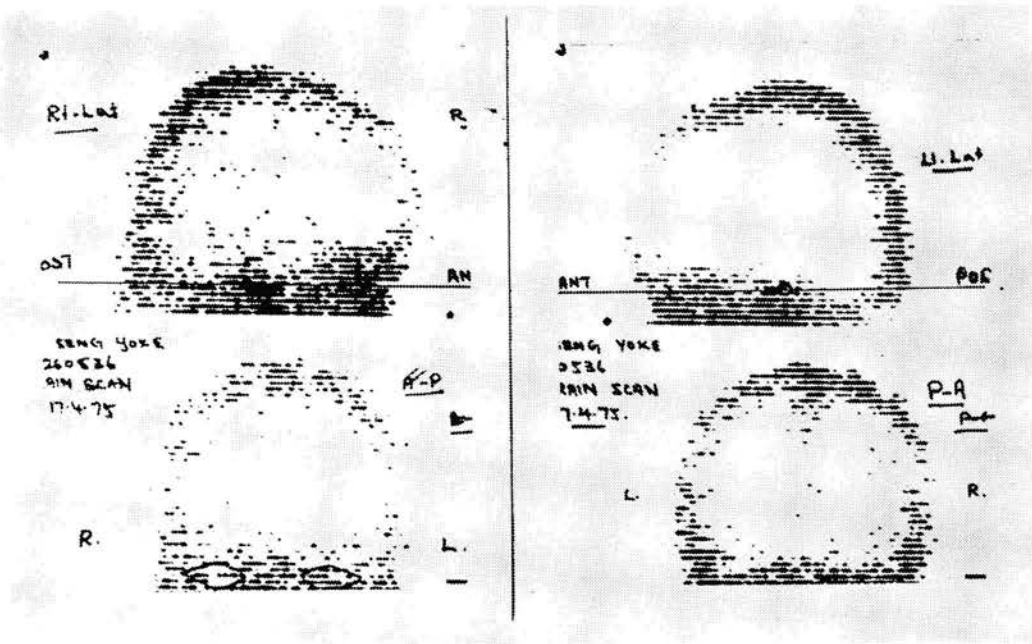

Fig. 3, Case 1
Brian Scan, T.S.Y.
There is an area of abnormal increase uptake of radiactivity in the temporo-parietal region on the right side which appears to extend to the cerebellopontine region on the same side.

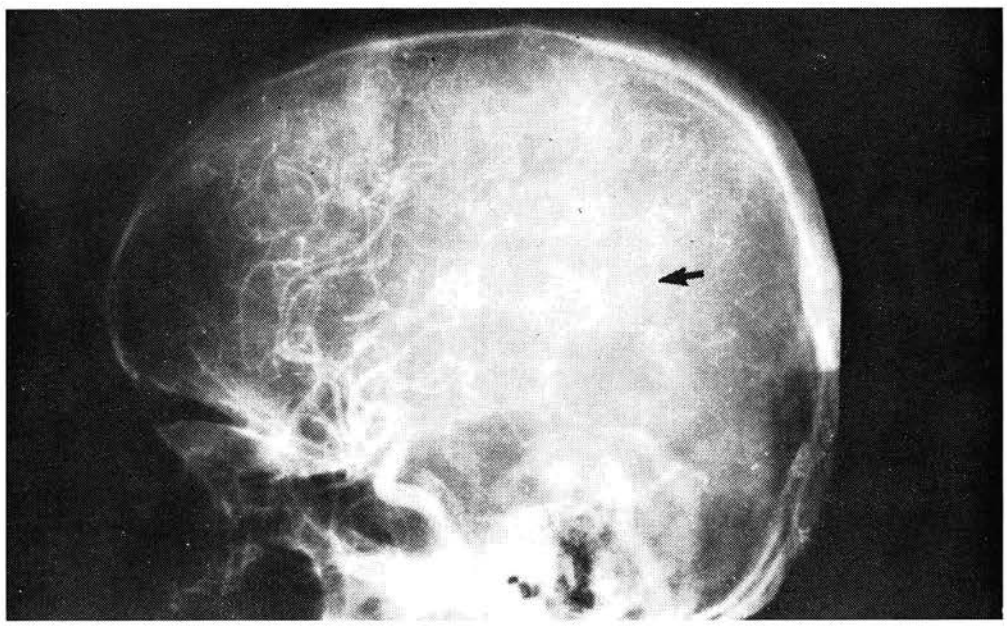

Fig. 4, Case 1
Angiogram (R), T.S.Y.
The branches of the middle cerebral artery are spread out displaced around a mass in the temporo-parietal region. The pericallosal branch of the right anterior cerebral artery is displaced upwards. A definite area of abnormal circulation in the right tempero parietal region seen.

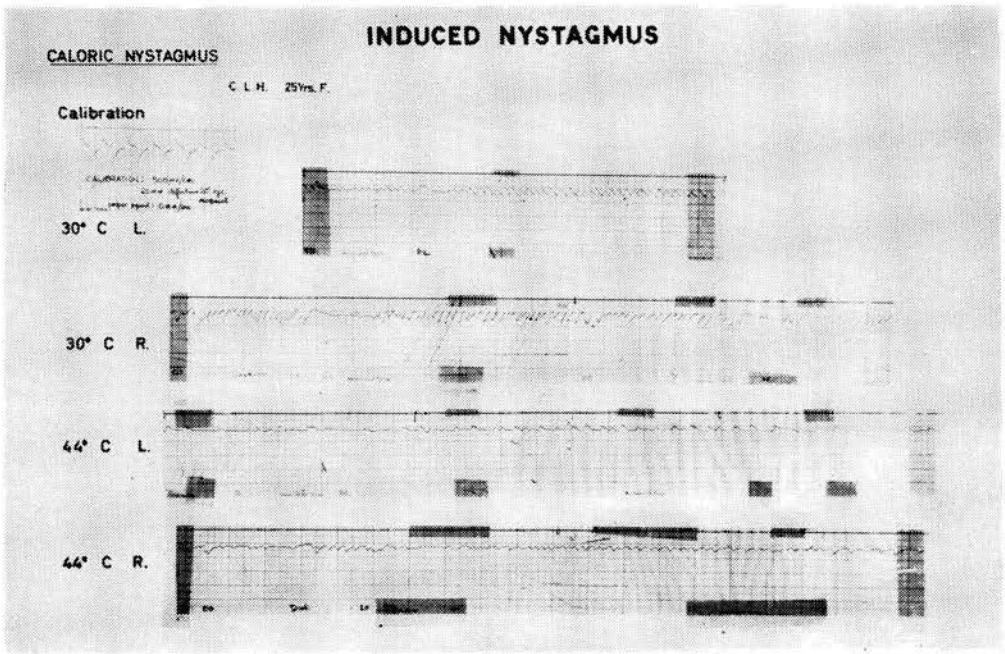

Fig. 5, Case 2
Electronystagmogram, C.L.H.

The induced nystagmus with caloric stimulation of the labrinth increases on eye closure (EC), thus indicating a peripheral lesion.
There is canal paresis on the left side, with directional preponderence to the right. This indicates a lesion probably in the cerebellum with pressure on the vestibular nucleus.

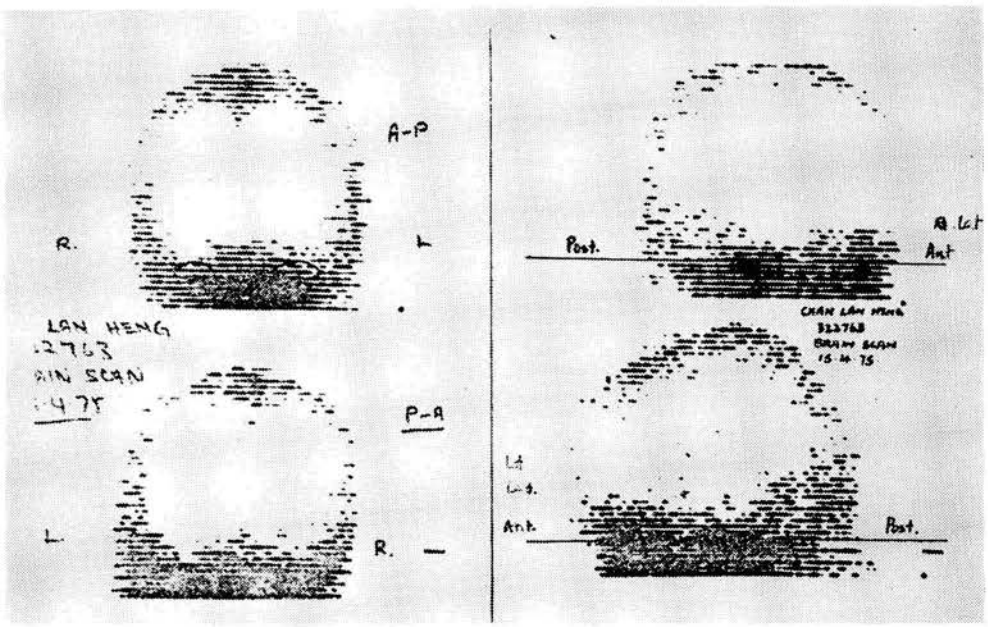

Fig. 6, Case 2
Brain Scan, C.L.H.

The Brian Scan shows a hot posterior fossa in the lateral view, more on the right than left. However, the P.A. taken earlier shows a relatively clear posterior fossa. There is obviously some delay in the uptake of radiactivity in the lesion. These findings suggest presence of extensive tumour in the posterior fossa which partially extends across the nidline from right to left.

was aggravated by lying on her left side. This was associated with vomiting and unsteadiness of gait. Some one month prior to being seen, she developed a severe occipital headache on and off; this was worst in the morning and upon bending forwards.

Examination revealed no significant abnormalities in the ears, nose and throat. Hearing was essentially normal bilaterally on tuning fork testings and pure tone audiogram. Cranial nerves functions were intact and there was no other neurological deficit except some truncal ataxia, more evident on the right side. She had no papilloedema. Her blood pressure was normal.

X-ray skull, cervical spine and internal auditory meati were normal. VDRL was non-reactive.

There was no spontaneous or positional nystagmus recorded on ENG. Caloric induced nystagmus was recorded on ENG: it showed bilateral peripheral lesions (Fig. 5). Because she had bilateral normal hearing, this suggested a lesion involving both the vestibular nuclei at the brain stem. Brian Scan (Fig. 6) supported the diagnosis of posterior fossa lesion.

Posterior craniotomy was performed by a neuro-surgical team and a large cystic astrocytoma was removed from the posterior cranial fossa, situated on the right cerebellum.

Discussion

Vertigo, the symptom of hallucination of movements, is often a difficult one to evaluate. It is, of course, necessary to differentiate a peripheral vertigo from a central one. This problem has been confronting the otolaryngologists and other clinicians for years. The importance of correlating the otological, neurological, vascular and anatomical findings in each case to reach a reasonable conclusion must be emphasised. ENG has a definite role in the evaluation of patient presenting with vertigo.

One of the great advantages of ENG is its ability to record the nystagmus, spontaneous or induced, in darkness and upon closing of the eyes. This eliminates optic fixation. In central vertigo, the nystagmus characteristically disappeared under these conditions as shown in case one; the reverse is true in peripheral vertigo (Hood 1968). Central nystagmus has been known to suppress the optokinetic nystagmus to one side (Ballantyne 1971). These ENG findings, together with the long duration of vertigo and its associated headache supported the diagnosis of central vertigo in case one.

The second case illustrates the importance of correlating the ENG findings with the clinical features and the anatomical knowledge of the vestibular system. Although it showed a bilateral peripheral lesions, her hearing was normal. This would mean that there is a lesion involving the vestibular nuclei at the main stem, e.g., posterior cranial fossa lesion. Again the associated headache and long duration of vertigo supported the diagnosis.

Summary

ENG is a relatively new investigation in Malaysia. Its value in aiding the diagnosis of central vertigo is briefly discussed in reference to the two proven cases of intracranial lesions.

Acknowledgement

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