LETTERS TO THE EDITOR

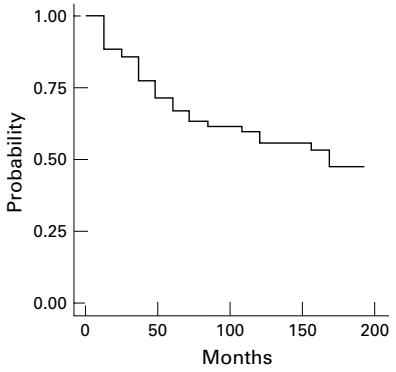
Acute Optic Neuritis in Australia: a 13 year prospective study

The frequency with which multiple sclerosis develops after an attack of acute optic neuritis varies widely in different series and has been reported to range from 11.5% to 85%.[1] The variability in the findings may relate to different methods of patient selection, diagnostic criteria, geographical factors, duration of follow up, and study design.

A cohort of 82 patients (59 females, 23 males) with uncomplicated ON aged 10 to 50 years (mean 29.2) who were examined neurologically and had visual evoked responses (VERs) performed in our department during the period 1973–83 were re-examined in 1983–85. Twenty six of the patients (32%) had progressed to probable or clinically definite multiple sclerosis during the follow up period of 7–114 (mean 57) months. Female sex, young adult age, and the presence of HLA-B7 or DR2 seemed to increase the risk of developing the disease.[2]

Seventy one of the 82 (87%) (52 females, 19 males) were reviewed in 1991–2; 11 patients could not be traced. Neurological examination was performed on 49; two patients had died with multiple sclerosis and a telephone questionnaire was completed on the remainder. Thirty three (46%, or 40% of the original 82) had developed probable or clinically definite multiple sclerosis after a mean duration of 13.25 years (range 8–29.6 years). Eight cases had developed multiple sclerosis since the previous review. Kaplan-Meier and actuarial methods of assessment,[3] predicted that 52% would develop the disease after 15 years (figure). There was a significantly greater risk of developing multiple sclerosis for patients in the 21–30 year age group than those outside this range but there was no significant difference in the rate of progression to the disease for males and females. There was no significant difference in the probability of developing multiple sclerosis in patients with single or recurrent attacks of optic neuritis or bilateral optic neuritis, nor in those who were DR-2 positive (table 1).

The finding in the Australian cohort that 52% of patients with optic neuritis were at risk of developing probable or clinically definite multiple sclerosis in 15 years is comparable with that of 57% in 11.6 years in the United Kingdom,[4] 49% in 20 years in the United States,[1] and 45% in 15 years in Sweden.[5]



Probability of patients with a first attack of optic neuritis not developing multiple sclerosis in 15 years.

Clinical features of patients with optic neuritis (ON)

	ON	*ON-multiple sclerosis*	
Age (y):			
≤20	10	4	
21–30	8	17	
31–40	11	9	
41–50	9	3	χ^2 = 8.7, 3df, p=0.07
Sex:			
Males	13	6	
Females	25	27	χ^2 = 1.57, 1df, p>0.10
ON Type:			
Single	23	17	
Recurrent	11	13	
Bilateral	4	3	χ^2 = 0.82, 2df, p>0.5
HLA Type*:			
DR2+	15	22	
DR2−	19	11	χ^2 = 2.63, 1df, p>0.1

*Four subjects not typed.

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Post-traumatic hydrocephalus: influence of craniectomy on the CSF circulation

Post-traumatic ventricular dilatation may have a wide range of aetiological factors: starting from neuronal loss due to head trauma and possible secondary ischaemic insults, to obstruction of CSF circulation resulting in hydrocephalus. It is important to differentiate between post-traumatic hydrocephalus and brain atrophy before considering placement of a shunt. Making this decision can be facilitated by measurement of the resistance to CSF outflow.[1] However, the pattern of the CSF circulation may change dramatically after a cranioplasty resulting from a previous decompressive craniectomy for refractory intracranial hypertension after head injury. The effect of the skull and dura on CSF hydrodynamics has been explored experimentally: the resistance to CSF outflow after craniectomy decreases twofold and brain compliance (expressed using the pressure-volume index, PVI) increases.[2] This problem is important clinically as the following case illustrates:

A 44 year old man fell downstairs and was admitted with a Glasgow coma score (GCS) of 4. Brain CT disclosed an intracerebral haematoma, which required a right frontal lobectomy and decompressive craniectomy to control raised intracranial pressure. Five months later he remained severely disabled with deteriorating GCS and increasing spasticity. Brain CT showed a progressive ventricular dilatation with widening of the cortical sulci. Cranioplasty had been delayed because of persistent problems with infections.

The first lumbar computerised infusion test[3] was performed 5 months after injury to study the patient's CSF circulation. The opening pressure was low (5 mm Hg) with a very low pulse amplitude. An infusion of normal saline at a rate of 1.5 ml/min increased the intracranial pressure (ICP) to a plateau of 12.2 mm Hg within 22 minutes. The calculated resistance to CSF outflow was normal (5 mm Hg/ml/min) and the pressure-volume index was increased to 28 ml (figure).

It is important to mention here that the normal range for the pressure-volume index, calculated from the constant rate infusion (as an inverse of elastance coefficient[3]) is different from the values obtained by the bolus injection.[1] Values below 13 ml indicate a tight brain, from 13 ml to 23 ml normal compliance, and above 23 ml hypercompliant brain. A slow constant rate infusion tests global compliance of the craniospinal axis whereas a fast bolus volume load probably tests compartmental compliance of the container into which the extra volume is added.

This pattern of CSF circulation with low or normal resistance to CSF outflow, increased brain compliance, and very few vasogenic waves is characteristic of cerebral atrophy.[3]

Cranioplasty was carried out as his deterioration was attributed to the "syndrome of trephined" where the brain sinks in, particularly with erect posture and dehydration producing deterioration in conscious level and focal signs. However, 1 month later, there had been no progress in the patient's condition and repeat CT again suggested progressive ventriculomegaly. The infusion study was repeated. The opening ICP was not dramatically different (10 mm Hg) to the previous study. However, the pulse amplitude (1.5 mm Hg) was increased, and the calculated resistance to CSF outflow was greatly increased to 20 mm Hg/ml/min, with a normal pressure-volume index of 15 ml. Such a pattern is specific for hydrocephalus. After this test the patient was shunted with a Codman Medos programmable valve (setting 120 mm H_2O) ventriculoperitoneal shunt with remarkable clinical improvement, the GCS rose to 14, he began to talk and his spasticity in his arms decreased dramatically. It is obvious why the pressure-volume compensatory reserve (PVI) decreases after cranioplasty[2], but the interpretation of an increase in the resistance to CSF is not immediately apparent. Two explanations are possible:

The patient had developed an acute hydrocephalus, possibly as a result of traumatic subarachnoid haemorrhage. Craniectomy was a factor allowing compensation of CSF circulation in the early stages. It is difficult to explain what is the nature of such compensation. Shapiro *et al*[2] attempted to offer an interesting but conceptually difficult hypothesis that the time constant (resistance to CSF outflow×compliance of cerebrospinal space) of cerebrospinal system hydrodynamics has a tendency to remain constant. Therefore, a

mechanistic increase in compliance after craniectomy tends to be followed by a decrease in the resistance to CSF outflow. This process may be reversed after cranioplasty—that is, a decrease in PVI may be followed by an increase in the resistance to CSF outflow.

The second possible scenario is more important for clinical management. A large craniectomy may facilitate irreversible ventricular enlargement over weeks or months.[4] Thus, after cranioplasty, the expanded ventricles may, via the cerebral mantle, obstruct the lumen of the cortical subarachnoid space and increase the resistance to CSF outflow.

This case demonstrates that when the CSF circulation is studied in patients with a large craniectomy the CSF outflow resistance cannot be taken reliably as a guide for shunting. Overnight ICP monitoring or CSF infusion study should be performed after cranioplasty, when CSF circulatory reserve decreases dramatically. Moreover, a prolonged period without a bone flap may encourage ventricular dilatation.

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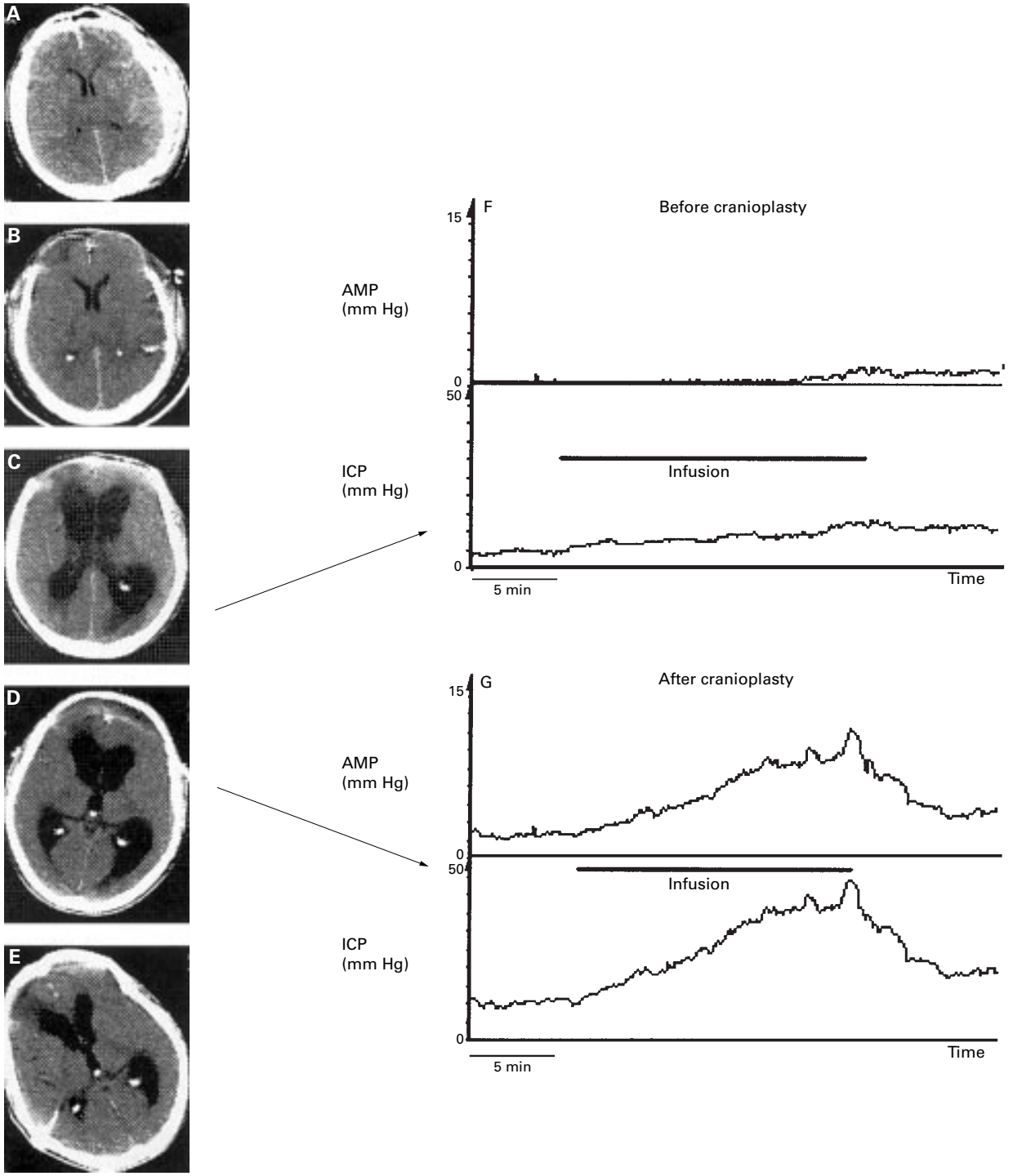

CT and infusion studies. (A) Scan performed on admission. (B) After right frontal lobectomy and bone flap removal. (C) Four months after injury, before cranioplasty. (F) Infusion test demonstrated low resistance to CSF outflow and increased brain compliance. ICP=mean intracranial pressure; AMP= pulse amplitude of ICP waveform. Constant infusion rate of 1.5 ml/min is indicated by a thick horizontal line. X axis=time. (D) Five months after injury, after cranioplasty. (G) Infusion test demonstrated grossly increased resistance to CSF outflow and normal brain compliance. (E) One month after shunting: normalisation of ventricles. Bicauduate index decreased from 33% to 21% with a decrease in the 3rd ventricle diameter (from 13 mm to 8 mm).

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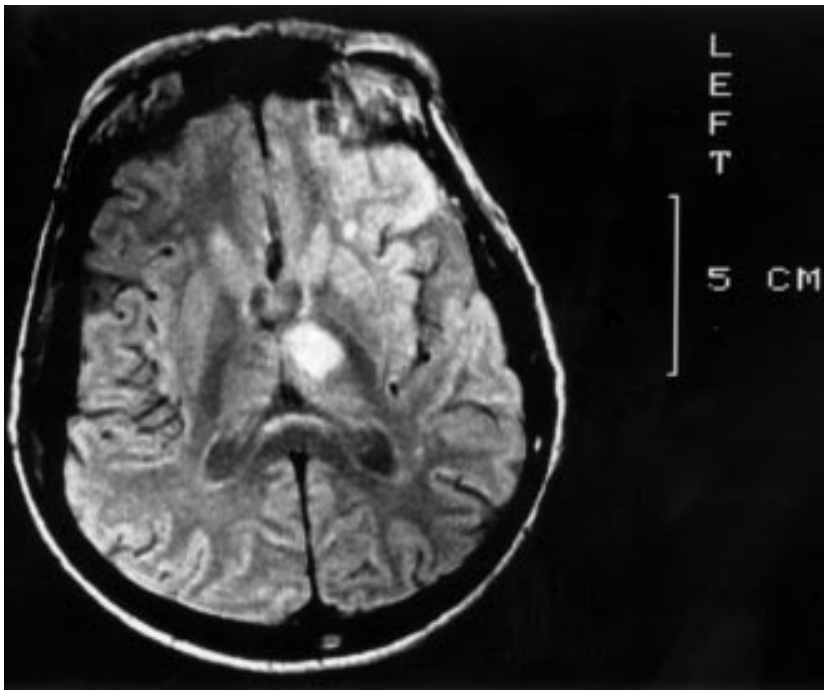
Diencephalic amnesia and apraxia after left thalamic infarction

Amnesia and apraxia are unusual manifestations of unilateral thalamic lesions. A patient in whom severe amnesia and apraxia were the presenting features of a left thalamic infarct is presented. The findings support the concept that memory and praxis both utilise circuits which include the dominant thalamus.

A 78 year old right handed Hungarian woman presented with memory loss and disorientation. She had been well and conversed normally with her daughter on the evening before presentation. The next morning, her daughter was alarmed to find her mother's house in a state of disarray. Dishes were unwashed, lights left on, and doors open. The patient seemed baffled by eating utensils, attempting to scoop food with her knife. Later that morning, she failed to recognise longstanding Hungarian friends. She was unable to recall her address, the name of the city in which she lived, or the names of her grandchildren. She subsequently failed to recognise her family doctor of 7 years. History included non-insulin dependent diabetes, hypertension, hyperlipidaemia, and atrial fibrillation. Medications were digoxin, glibenclamide, and metoprolol. Captopril had been prescribed 4 weeks previously but was ceased 2 days before presentation due to presyncopal symptoms. The patient consumed no alcohol. There was no history of cerebrovascular events.

Cognitive functions were examined at the bedside with the assistance of an interpreter, as the patient spoke no English, although she conversed freely in her native Hungarian. She had no recollection of events since emigrating to Australia 50 years previously, gave her correct maiden name, and could not recognise or name her grandchildren, although she recognised her daughter. She acknowledged she was in a hospital, but maintained it was in Budapest and the year was 1947. Although her recollections regarding her early life and wartime Hungary seemed accurate, she confabulated when asked for details of recent events. Short term recall of verbal material and people was poor. The patient was able to name objects such as a pencil and a watch, and obey two and three stage commands. She wrote her name and copied simple designs correctly, and could imitate gestures such as waving goodbye or blowing a kiss. However, she was unable to use eating utensils or a toothbrush, either in pantomime or when provided with the object itself. Movements of the face and limbs were normal, and there were no sensory abnormalities. Knee and ankle jerks were absent bilaterally and both plantar responses were extensor. General examination revealed atrial fibrillation and mild cardiomegaly.

The patient continued to display severe impairment of anterograde memory. She was reluctant to leave her bed, and quickly became lost unless supervised. She did not recognise familiar staff members and was unable to use ward landmarks to reorientate herself. She required assistance to feed herself, brush her teeth, and shower. When reviewed 3 months later, her memory disturbance and apraxia for simple activities of daily life (such as brushing her teeth) persisted, necessitating care in a supervised environment.



T2 weighted axial MRI brain slice showing ischaemic infarction of the left anterior thalamus and periventricular white matter ischaemic changes.

Brain MRI (figure) showed a left anterior thalamic lesion consistent with lacunar infarction and periventricular white matter disease.

Deficits of anterograde and retrograde memory after thalamic lesions are well recognised.[1] The syndrome of diencephalic amnesia after bilateral medial thalamic lesions typically involves striking disorientation for time, loss of autobiographical information (often extending back for many years), confabulation, and severe anterograde amnesia for verbal and visual material, including recognition of familiar faces.[1] These features were well illustrated by our patient, who became "marooned" in an earlier place and time. Amnesia after unilateral thalamic lesions is rare.[2] There is increasing evidence that thalamic lesions interrupt the multiple brain networks which form the anatomical substrate of memory,[1–4] encompassing the hippocampus, medial thalamus, frontal and cingulate cortices, and overlapping with the language areas of the left hemisphere.[3] The thalamus is activated in retrieval of episodic (autobiographical) and semantic (encyclopaedic) information from long term storage[4] and execution of learned motor tasks,[5] which may reflect its widespread connections with other subcortical and cortical structures.

The patient's ability to name or identify objects was not tested systematically. However, on the evidence available, it seems likely that her difficulty in utilising common objects was a manifestation of apraxia for daily tasks rather than, for example, agnosia for the objects involved. Apraxia is a rare manifestation of isolated thalamic lesions.[5] The ability to access stored motor representations is thought to be crucial for normal execution of learned actions.[5] These motor representations or "engrams" are analogous to motor memories. Although praxis is generally regarded as a function of distributed cortical regions in the left hemisphere, apraxia in association with thalamic amnesia has not been emphasised in previous reviews of this syndrome.[1–2] Involvement of deep hemispheric white matter in association with basal ganglia pathology is thought to be critical for the development of apraxia after lesions of subcortical structures.[5] The conjunction of diencephalic amnesia and apraxia after thalamic infarction in the present case may be interpreted as further evidence that retrievial of episodic, semantic, and motor memories is mediated by overlapping functional networks in the dominant hemisphere.[1 3 4]

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