some with large haematomata had some neurological deficit. He stressed that these good results had been achieved using simple and easily available methods.

BIOCHEMICAL ASPECTS OF RUPTURED ANEURYSMS

M. BUCKELL (London) outlined research in progress at Atkinson Morley's Hospital on three biochemical aspects: examination of local changes in haematoma and cerebrospinal fluid, biochemical profile at all stages of illness, and investigation of general metabolism by means of balance studies.

Reappearance of oxyhaemoglobin in cerebrospinal fluid absorption spectrum was helpful as evidence of re-bleed. Enzyme measurements were disappointing. Cerebrospinal fluid GOT exceeded plasma when there was obvious infarction. 5 HT-like activity was found in three of four haematomas from patients with spasm and not in five comparable specimens from cases without spasm; all nine contained a polypeptide active on smooth muscle and present in greater amount in spasm cases. Dr. Anne Uttley had found a prolonged thromboplastin generation time in 10 of 50 patients.

On admission cases of unexplained subarachnoid haemorrhage had little biochemical disturbance. Patients with aneurysms, angiomas, and primary intracerebral haemorrhage showed increased osmolality, urea, protein, haematocrit, haemoglobin, and whole blood specific gravity with less frequent, mild rises in transaminase and transient elevation of blood sugar. All these changes were more marked in comatose cases. Reduced bicarbonate concentration was often found in patients with demonstrable lesions, regardless of conscious level. Reduced arterial $p\text{CO}_2$ and raised $p\text{H}$ were confirmed in another group of patients. Investigation of hypothalamic damage after ruptured aneurysm, with Dr. J. S. Jenkins, revealed a reversed diurnal cortisol rhythm in 21 of 60 cases.

Results of nitrogen, sodium, potassium, and fluid balance, with calorie intake, steroid excretion, and blood chemistry were presented for four patients.

EXPERIENCE WITH TWO CASES OF MUSCLE EMBOLIZATION OF CAROTID-CAVERNOUS FISTULA

C. B. SEDZIMIR and J. OCCLESHAW (Liverpool) described two cases of carotid-cavernous fistula which had been treated with muscle embolization. The first case, a man of 19, had probably developed a carotid-cavernous fistula after an extensive gun-shot wound of the left side of the head and face two years before admission though the diagnosis had not been made at the time. At present admission he had sustained a subarachnoid haemorrhage and angiography demonstrated the fistula. A muscle strip was inserted into the internal carotid artery in the neck via the common carotid and allowed to embolize into the cavernous sinus with cessation of the intracranial bruit. A faint bruit returned 10 days later and radiographs showed that the muscle had moved on from the cavernous sinus to a cerebral vein.

The second patient, a woman of 44, was admitted with signs and symptoms of a fistula five days after a road accident. Angiography demonstrated the fistula. On this

occasion a muscle embolus was inserted in the neck after the intracranial internal carotid had been occluded with a clip above the cavernous sinus. Control of the fistula with complete regression of abnormal physical signs was achieved by this procedure.

DURAL SINUS THROMBOSIS

R. M. KALBAG (Newcastle) discussed the problem of dural sinus thrombosis. He noted that only 217 cases had been recorded in the Registrar General's returns for the period 1952-61 and he felt that many cases were probably unrecognized during life and at necropsy. Even when a clinical diagnosis had been made this was seldom confirmed by angiography. He said that the angiographic findings included extreme slowing of the cerebral circulation and deep venous filling in the arterial phase but that final diagnosis depended on the persistent failure to fill of all or part of one of the dural venous sinuses. The presence of small anastomotic venous channels, usually in the region of the superior and inferior anastomotic veins, indicated a favourable prognosis, whilst failure to fill the Galenic venous system usually implied a fatal outcome.

He noted that opinions on prognosis had varied considerably but it seemed certain that the slower the evolution the greater the chance of recovery. The use of anticoagulants to limit the area of thrombosis could be dangerous and should probably be applied before there was spread to cortical veins, if at all.

SUBTRACTION TECHNIQUE FOR CEREBRAL ANGIOGRAPHY

G. SULLIVAN (Preston) described subtraction radiography as a technique of after treatment of radiographs taken during contrast medium injection. He said that it was used to reveal the shadows of the contrast medium which were apparently invisible, being hidden by the shadows of the radiopaque parts of the patient.

The method of obtaining a subtraction radiograph was demonstrated. This was followed by an illustration of the way in which subtraction radiography helped in obtaining diagnostic information from films taken of four patients who were investigated by arteriograms of the head and neck during injection by catheter of contrast medium into the aortic arch and main arteries arising from the arch.

He concluded that subtraction radiography was not only useful in improving poor radiographs but could show structures which, due to their position, were normally hidden by radiopaque parts of the body.

VARIATIONS OF INTRACRANIAL PRESSURE RECORDED DURING EXTENDED OBSERVATIONS

J. C. M. CURRIE (London) reported a study of intracranial pressure using a radio-pressure transducer. The method was described and illustrated in clinical use. Pressures were recorded in patients over several weeks. Observed changes in pressure were then shown due to the pulse, respiration, jugular compression, and posture in patients with normal and raised intracranial pressure.

The effect of intravenous urea was discussed and the fall in pressure after the administration of the conventional dosage compared with that following 5 g. A similar reduction in pressure occurred with the smaller dose but was of shorter duration.

Reductions in intracranial pressure following the use of Mannitol and Frusemide were also compared with the results seen with urea. Difficulties arose in comparing pressure changes due to those drugs in different patients under varying conditions. However, the opportunity to show the response of 40 g. urea, 250 ml. 20% Mannitol, and 30 mg. Frusemide each given intravenously to the same patient, under similar conditions, was taken. Reduction in pressure followed with each drug, the largest and most rapid fall followed the administration of urea. Duration of the response was most prolonged with Frusemide.

OBSERVATIONS ON C.S.F. FLOW USING ISOTOPE VENTRICULOGRAPHY

GORDON BROCKLEHURST (Cambridge) described the use of radioactive isotopes in the diagnosis of hydrocephalus and in investigating the behaviour of cerebrospinal fluid in various pathological states. Observations on cerebrospinal fluid flow were made in 27 patients after the injection of 50 microcuries of radioactive iodinated serum albumin (R.I.S.A.) into the lateral ventricle. He used a combination of serial scanning with a Magna scanner and profile scanning and body counting in a whole body counting chamber at intervals of one, six, and 24 hours. The majority of patients were children with meningo-myeloceles requiring assessment of hydrocephalus within the first few days of closure of the spinal lesion or older children requiring assessment of suspected recurrent hydrocephalus. A few other types of obstructive hydrocephalus were included.

He had found that in the normal, R.I.S.A. was found in the lateral ventricles and fourth at one hour, in the basal cisterns at six hours, and none remained after 24 hours. Body scan showed all the activity in the head at one hour and present elsewhere in the body at significantly high levels at six and 24 hours. In the obstructed case R.I.S.A. remained in the lateral ventricle and none appeared elsewhere in the body at 24 hours.

In three patients with normal flow and 18 patients with evidence of total obstruction these findings correlated excellently with the clinical findings and subsequent progress. In the remaining six patients evidence of partial block also correlated well with the clinical features.

He concluded that failure of R.I.S.A. to reach the surface of the hemispheres in 24 hours was a reliable indication of hydrocephalus and that this abnormality could precede overt clinical signs. He noted that the appearance of R.I.S.A. in the body without evidence of normal flow through the conventional cerebrospinal fluid pathways and some variations in flow patterns within the ventricles suggested that there were other factors influencing the behaviour of cerebrospinal fluid in such patients and that this might complicate the picture of simple obstruction.

MENTAL SYMPTOMS IN PATIENTS WITH ACOUSTIC NEUROMAS

Miss S. M. WOODCOCK (Preston) described the mental symptoms in a series of 31 patients with acoustic neuromas. In this series she had found at least seven patients with mental symptoms and the case histories of these patients were presented. She said that five of these had left-sided tumours and it might be that lesions on the side of the dominant hemisphere were more likely to cause memory disturbance. When E.E.G.s had been done there was a tendency to show temporal lobe abnormalities and this too might be associated with memory disturbance. The ages ranged from 37 to 68 with an average of 55.9 years.

The mental symptoms encountered included personality deterioration, memory disturbance, intellectual deterioration, confusion, depression, euphoria, and psychoneurotic traits. She concluded that these symptoms might be caused by cerebral arteriosclerosis but were most probably due to vascular disturbance from distortion of the brainstem.

MICROGLIOMATOSIS

A. A. MILLER (Preston) said that the classical microglioma arising from cells which represented reticular tissue in the nervous system was a rare tumour and the atypical variety was even rarer and presented a formidable diagnostic problem. The common site was around the fourth ventricle involving the brainstem and cerebellum but they could occur in the cerebral hemispheres or infiltrate the leptomeninges diffusely. He reviewed the literature on this subject and stressed that a diagnostic feature was the impregnation of the more mature cells by silver carbonate stains. He felt that there was a range of tumours in this group from the very anaplastic reticulum cell sarcoma, through the microglioma, to tumours in which the inflammatory elements predominated. He gave case histories of three patients illustrating these three types of tumour. He concluded that the term microglioma was now used in a wider context than formerly and also with a different meaning. It was no longer a distinct entity but one of a number of types within the primary reticuloses of the brain.

THE EARLY MANAGEMENT OF THE SEVERELY INJURED

R. S. GARDEN (Preston) discussed the organization necessary to deal with severely injured patients in the early stages. He noted that his hospital served a population of 350,000 and received an average of 2,000 road accident cases per year. He stressed that the treatment of the gravely injured patient depended largely on the organization of an accident service. In his department they had moved away from the traditional method of staffing by junior resident doctors and the department was now staffed by full-time medical officers, two of whom were on duty at any time of the day or night. This had made it possible to provide consultant cover, to train the younger men in emergency work, and to undertake research.