Proceedings of the Society of British Neurological Surgeons

The 90th meeting of the Society of British Neurological Surgeons was held in Birmingham on 7 and 8 October 1976.

Anatomy and pathology of the intervertebral disc applied to treatment

J. M. SMALL (Smethwick) considered the various factors responsible for producing clinical features due to intervertebral disc protrusions and related these to treatment.

Anterior sacral meningocoele

G. K. TUTTON (Preston), J. HANKINSON (Newcastle), and R. T. JOHNSON (Manchester) described three cases of this unusual condition. Less than 100 cases had previously been reported in the world literature, the largest single series being five. In these three cases two were brother and sister. The presenting symptoms of anterior sacral meningocoele were constipation, urinary difficulties, obstruction of pregnancy, menstrual irregularity, dysmenorrhoea, occasional dyspareunia, and, infrequently, severe headache, or pain on straining or on intercourse. Constipation was the most common symptom. There were many instances in the literature of death from meningitis after aspiration or attempted abdominal removal. The diagnosis could always be confirmed by the typical radiological appearance of the scimitar sacrum. Positive contrast myelography was also helpful in diagnosis. The essential points in operative treatment, which was always advisable, were a posterior approach and removal of enough sacrum to expose the dorsally placed extradural cyst which was always present and which communicated with the false neck of the meningocoele. This cyst must be removed, after which the anteriorly placed narrow neck from the theca into the meningocoele was identified and closed. No attempt should be made to remove the pelvic meningocoele.

Tumours of the cauda equina

M. R. FEARNSIDE and C. B. T. ADAMS (Oxford) reviewed 40 consecutive patients who had been admitted over a period of 20 years with intrathecal tumours of the cauda equina. In 20 of these the tumour was a neurofibroma, in 15 an ependymoma, in four a metastasis, and in one a lipoma. The histories were usually longer than two years. Presenting symptoms fell into four groups: back pain with or without sciatica, painless weakness and wasting of the legs, sphincter disturbances, or subarachnoid haemorrhage. Thirty-two of the patients presented with back pain with or without sciatica. Night pain was a helpful diagnostic feature and characteristically many patients slept in a chair. The patients with painless weakness and wasting had lesions near the conus medullaris. Physical examination revealed no characteristic pattern of signs. Essential investigations were radiography of the lumbar spine, lumbar puncture, cerebrospinal fluid examination, and myelography. Some patients had normal or only slightly raised cerebrospinal fluid protein levels. The treatment of choice was surgery. When total removal was not possible radiotherapy was indicated. Although no patient with an ependymoma died because of the disease, morbidity was high because of sphincter disturbances and bilateral nerve root involvement. There was clinical recurrence in only one patient with an ependymoma. The prognosis for neurofibromas was good. The outlook for sphincter involvement was bad, operation rarely improving the situation.

Occult lumbar spinal stenosis

A. R. CHOUDHURY and J. C. TAYLOR (Derby) described a group of 28 patients who presented with low back pain associated with unilateral or bilateral sciatic or femoral neuropathy. Plain radiography of the lumbar spine was not helpful, and myelography was either negative or showed minimal changes because of normal ventrodorsal diameter and lack of filling of the lateral recesses. Exploration of the lumbar canal by full laminectomy was carried out on clinical indications. In all cases nerve roots were found incarcerated in the lateral recesses which were stenotic as a result of hypertrophy of the facet joints. Decompression of the nerve roots by unroofing the lateral recesses with excision of overhanging facet joints relieved the symptoms. The sagittal AP diameter was found at operation to be 18 mm or more. This condition had been named 'occult spinal stenosis'. In all cases there was a history of trauma. Adhesions were variable in size, thickness, and colour. It was
felt that such variation suggested recurrent inflammation and that the hypertrophy of the facet joints might be the result of traumatic inflammatory hyperaemia. The symptoms and signs were found in patients usually below 50 years of age. They were similar to those encountered with lumbar disc protrusions. Sciatic scoliosis was rare with occult stenosis and, when present, was associated with disc herniation. Radiological investigations were unhelpful. The place of myelography was simply to exclude other lesions. The indications for surgery were clinical. The diagnosis of occult stenosis could be made only at operation on finding altered facet joints, adhesions, fixity of nerve roots, normal sagittal AP diameter, and absence of other significant lesions. Treatment was wide laminectomy, and the results were gratifying.

**Electromyography in the diagnosis of lumbar disc protrusions**

J. A. Martins Campos (Lisbon) studied the results of studies of electromyography in the diagnosis of protruding lumbar intervertebral disc. It was concluded that the EMG seemed to be of definite value as a screening investigation and in establishing the organic nature of low backache and sciatica. As there were no complications, it was of special use whenever a psychiatric cause or malingering was suspected. The EMG was helpful in the differential diagnosis between high and low lumbar disc protrusions. The EMG was less reliable in the differential diagnosis between lesions in two contiguous spaces.

**Problems of fibrous dysplasia of the sphenoid bone**

J. G. Hamilton (Smethwick) presented three cases. The first was a woman 27 years of age with a 10 year history of progressive visual impairment in the right eye. This had been on the whole painless, but there had been some pain in the orbit during a pregnancy. Vision was reduced to counting fingers and there was marked optic atrophy on the affected side. Skull radiography showed uniform thickening of the sphenoid bone characteristic of this condition. The right optic foramen was 2 mm in diameter, compared with 4 mm on the left. Bilateral surgical decompression of the optic nerves was carried out. On the left side the remaining vision was lost after operation, but on the right side there was no change, and it was hoped that the decompression would prevent further deterioration. The second patient was operated on by Sir Geoffrey Jefferson in 1964 for fibrous dysplasia affecting the frontal and sphenoid bones. At no stage was there any visual impairment and in 1968 he was still well apart from having had one seizure. The radiological appearances in the sphenoid were similar to those in the first case, although the bony involvement also extended on to the frontal vault. In a third case a similar radiological condition was found in a patient who was asymptomatic but who had skull radiographs taken after a minor head injury. Both optic foramina were severely constricted, although vision was normal on both sides. The problem of management in this case was discussed.

**Bacteriology of brain abscess**

J. De Louvois, Peter Gortvai, and Rosalinde Hurley (London) presented the results of a prospective study (in six centres) of 46 abscesses of the central nervous system (36 brain abscesses, seven subdural or extradural abscesses, three intraspinial abscesses). Contrary to previous reports, and irrespective of current or antecedent antibiotic therapy, no abscess was sterile. Seventy per cent yielded microbes in pure culture, and 30% in mixed culture. Streptococci (80%) occurred in abscesses of all types, and at all sites. The microbe most frequently isolated (40% of cases) was Streptococcus milleri. All strains so far tested were of Lancefield group F, Ottens and Winkler type O III. The bacteroides group (24%), staphylococci (20%), proteus species (15%), and others (4%) were also isolated. Enterobacteriaceae and the bacteroides group were found most often with abscesses of the temporal lobe after infection of the middle ear. Staphylococci were found principally in post-traumatic brain abscess and in intraspinial abscess. The sensitivity of the microbes isolated indicated that only 50% of patients would be expected to respond to penicillin in moderate dosage. The total mortality was 24%. The inclusive mortality of brain abscesses was 20%, and the mortality of treated brain abscess was 14%.

**Forty years on**

B. H. Cummins (Bristol) presented the case of a lady, aged 80 years, with historical connections with well-known figures in British neurosurgery. In 1932 a large tentorial meningioma was excised by the then Mr. Hugh Cairns. Preoperatively the patient had presented with occipital headaches, vomiting, and amblyopic attacks of some months' duration. From that operation she made a full recovery and was followed up by the late Mr. Douglas Northfield and by Mr. J. Pennybacker. In 1935 she had severe occipital headaches when
pregnant, but these improved, and she was well until 1972 when she began to have fits. In 1976 she was found to have mild dementia, dysphasia, and right hemiparesis. Skull radiography showed massive left occipital calcification, and on 4 May 1976 about 80% of a large tumour was removed. Microscopically this was seen to be a very hard, calcified, and virtually bloodless meningioma. Histologically, it consisted chiefly of degenerate psammoma bodies. She made an uneventful recovery, regained her speech and vitality, and now lives with her son.

Comparative merits of 1 mm autogenous arterial and venous by-pass grafts as alternatives to direct arterial anastomosis for the treatment of cerebral ischaemia

Carys M. Bannister (Manchester), L. A. Mundy, and Janice E. Mundy (Hull) noted that some patients who needed revascularisation of the ischaemic cerebral cortex had neither a superficial temporal nor an occipital artery available for anastomosis to a branch of the middle cerebral artery. Both arterial and venous by-pass grafts provided alternative means of conveying the extra supply of blood to the brain in such cases. Expendible veins, unlike arteries, were present in superabundance, and this made them the obvious vessels of choice for by-pass grafts. While experimental small diameter arterial by-pass grafts remained patent, the majority of 1 mm venous grafts thrombosed. With the scanning and transmission electron microscope it could be seen that the internal elastic lamina of arteries was a compact structure, whereas that of veins had an open weave construction which provided scanty cover for the collagen fibres lying in the subendothelial layer. Trauma to the endothelium of both arteries and veins was likely to occur during dissection and grafting, but the exposed arterial internal elastic lamina allowed only a few collagen fibres to come into contact with the platelets in the blood stream. The venous internal elastic lamina, on the other hand, allowed considerable contact between the platelets and collagen. Largely because of the configuration of the internal elastic lamina small diameter veins were unsuitable for by-pass grafts if they had diameters in the region of 1 mm. When grafts of this size were needed, the use of autogenous arterial grafts must be seriously considered.

A pathological study of syringomyelia

J. M. Rice-Edwards (London) hoped that the principle of classifying the two main types of syringomyelia into communicating and non-communicating would be adopted, although he had serious reservations about the use of the adjective ‘communicating’. Pathological study of 20 cases of syringomyelia was described. In each case there was evidence that the syrinx was primarily formed from a dilated central canal, and in nine there was a clear indication of Chiari malformation. From the 20 cases there was sufficient evidence that the syrinx was primarily due to dilatation of the central canal. Ependymal cells (or in one case subependymal glial cells) were seen lining the cavity, and in two cases enough ependyma was present to indicate that the widening of the canal was developmental. In three cases the upper end of the central canal was blocked, and in the remainder there was a very narrow communication which was inadequate to act as a conduit to fill the syrinx from the fourth ventricle. These findings are incompatible with Gardner’s theory and other modifications of the hydrodynamic theory which rely on the concept that the syrinx fills from the fourth ventricle. Pathological features described are best explained by the assumption that the condition is basically developmental, a persistence of a fetal state of hydromyelia which is frequently associated with the Chiari malformation. Progression of the condition is thought to be due either to secretion of CSF from the wall of the syrinx or as a result of forces imparted to the fluid in the enclosed cavity. Squeezing of the cord during coughing and straining may cause fluid from the syrinx to extend upwards and possibly in other directions. The benefit to patients of posterior fossa surgery is almost certainly due to decompression of the tonsils and not to plugging of the central canal.

Is difficult labour the commonest cause of communicating syringomyelia?

Bernard Williams (Smethwick) observed that patients with communicating syringomyelia frequently give histories of having been born as the result of a difficult labour, and a retrospective study had therefore been made by means of questionnaires of patients with this disease, including those with spina bifida, brain tumour, head injury, meningitis, and neurofibromatosis. The histories were checked by questioning controls.

The questionnaires were scored for such features as birth weight, duration of labour, use of forceps, and breech presentation. Of 175 controls 23% had a score, while of 90 syringomyelia patients 54% had a score. A history of severe birth difficulties with scores over three occurred in 25%
of the syringomyelia patients and in only 5% of the controls. Forty per cent of the syrinx patients were first borns, compared with 25% of first borns among the controls. It was considered that the mechanism which causes the cerebellar tonsils to engage in the foramen magnum was uncertain, and that several factors were likely to be operating in any one case. Excessive mouldings in the second stage of labour might force the occipital bone around the foramen magnum upwards to produce a basilar invagination. Any cause of brain swelling such as anoxia, haemorrhage, or hydrocephalus which might follow haemorrhage, might contribute towards engagements of the cerebellar tonsils in the foramen magnum. It was suggested that birth trauma might be the most common cause of communicating syringomyelia.

**Aqueduct stenosis**

J. J. McMillan and Bernard Williams (Smethwick) reviewed 27 cases of hydrocephalus associated with aqueduct stenosis. The cases were selected on the basis that all had complete occlusion of the aqueduct at initial ventriculography and that all were free from defects of the neuraxis. Cases of spina bifida and of encephalocoele were excluded. There were no specific features enabling the condition to be diagnosed with certainty, no patterns of behaviour could be predicted, and there was no evidence of aetiology. The methods of treatment were outlined, and the main feature of note was the high failure rate of all forms of internal shunting. Evidence was presented favouring the production of aqueduct stenosis by hydrocephalus rather than the reverse, and it was suggested that pathology was due to external compression rather than to intrinsic pathology in the aqueduct. It was suggested that external compression from hydrocephalus produced a bilateral tentorial cone aggravated by diverticula which developed from the posterior end of the third ventricle. These elements competed for space at the tentorial hiatus to produce downward dislocation and distortion of the brain stem leading to aqueduct occlusion. On the basis of experimental evidence and evidence from this study it was suggested that early onset hydrocephalus accompanied by mild ventricular enlargement might initially escape attention because it was compensated. Even compensated mild hydrocephalus might lead to depression of the tentorium, and exposure of the mid-brain to compression by the lateral ventricles. The factors leading to decompensation were as yet unknown. Cure of symptoms might be brought about by by-passing the aqueduct or by decompressing it. Important conclusions from this study were that the failure rate of all forms of treatment was high and that the functional capacity of the subarachnoid space should be assessed before surgery was undertaken.

**Causes and management of failures of shunt implants for hydrocephalus**

B. H. Dawson (Salford) presented a paper on this subject.

**Electric stimulation implants for the relief of chronic pain**

John Miles and Sam Lipton (Liverpool) considered that surgical techniques for the relief of pain were justified if such pain could no longer be relieved by adequate and appropriate analgesics. When chronic pain was associated with malignancy and limited life expectancy surgical destruction of some part of the nervous system for the relief of the pain was both justifiable and effective. The authors expected success in 85% of such cases. When the pain was associated with normal life expectancy and normal or only slightly limited function, as with phantom limb pain, then destructive surgery was not appropriate. With any destructive technique relief of pain was limited in time and was associated with the risk of incapacity due to excessive destruction. Repetition of destruction was possible but usually proved increasingly less effective and was associated with increasingly greater risks of incapacity. It was for such pain that alternatives to destruction were sought, one of these being electrical stimulation. The authors had been using electrical stimulation, including implanted electrodes activated by telemetric radio-frequency induction, since 1972. It was soon found that not all pain was susceptible to this form of treatment and that selection was the main problem. A series of therapeutic and provocative tests designed to indicate the ease with which external influences, including electricity, could modify pain had been devised. The responses to stimulation of the appropriate peripheral nerve, the segment of the cord, or the posterior columns of the cord were charted and a decision was then made as to whether implantation should be carried out. The authors now felt usually capable of predicting a good response in which case implantation was recommended. They also felt reasonably sure when there was little or no prospect of success and then did not implant. They encountered many instances of partial responses to testing and in these cases other factors had influenced the decision whether or not to implant.
Bilateral spontaneous carotico-cavernous fistulae: myth—or merely mechanism

EDWIN BICKERSTAFF (Smethwick) commented that the term 'bilateral carotico-cavernous fistulae' was not infrequently used, but it was doubtful whether spontaneous fistulae ever occurred simultaneously on both sides, or even in sequence. It was noted that the cavernous sinuses were connected anteriorly and posteriorly by the intracavernous sinuses, and anteriorly with the superior ophthalmic vein and its tributaries. The patency of these structures might vary. The well-known clinical picture was produced by arterial blood passing through the sinus into the superior ophthalmic vein or into the orbital veins. This usually occurred on the same side as the fistula, but a case was shown illustrating how a fistula developing between a left-sided intracavernous aneurysm and the sinus did not fill the ophthalmic vein on its own side but passed through the intracavernous sinus into the opposite superior ophthalmic vein to produce contralateral pulsating exophthalmos, chemosis, ophthalmoplegia, and bruit. All these features ceased immediately after arteriography, and repetition showed the intercavernous sinus to be occluded at its mid-point. It was argued that if arterial blood escapes from the carotid artery into the sinus and passes both into its own ophthalmic vein and through a patent anterior intercavernous sinus into the opposite ophthalmic vein the clinical appearance of a 'bilateral' fistula would be seen when only one fistula in fact was present. If a unilateral syndrome developed and then the ophthalmic vein thrombosed after the impact of arterial blood, the clinical features might well disappear, but the fistula was still present and the arterial blood might force its way through the intercavernous sinus into the contralateral ophthalmic vein, making it appear as if a second fistula had developed on the opposite side. It was the direction of flow of the arterial blood and the anatomy and patency of the sinus and its connecting veins that determined the clinical presentation, all forms of which could be explained on the basis of a unilateral fistula alone. Bilateral carotid arteriography was mandatory in each case, and might sometimes be therapeutic.

Treatment of carotid-cavernous fistula by balloon-tipped intra-arterial catheter

U. M. CHOWDHARY (Dublin) reviewed 10 previously reported cases of occlusion of carotid-cavernous fistula by balloon-tipped intra-arterial catheters. Two further cases treated by the author were presented. Cure resulted in each case without the occurrence of neurological deficits. Both fistulae were traumatic in origin. Through a small arteriotomy at the carotid bifurcation a balloon-tipped (Fogarty) catheter and a drum-cartridge ('Intracath') catheter were introduced into the internal carotid artery. The balloon was placed under fluoroscopic control at the presumed site of the fistula and was then filled with radio-opaque dye. Disappearance of the bruit was taken to be evidence of occlusion of the fistula. By means of the 'Intracath' intraoperative arteriography was then performed to investigate the patency of the internal carotid artery. In both patients the artery was found to be occluded. The internal carotid artery was found to be occluded in all but one of the 10 cases previously reported, and in none of these 10 did neurological deficits occur. It was thought that occlusion of the internal carotid artery, together with occlusion of the fistula, eliminated 'steal' of blood from the controlateral internal carotid and from the vertebrobasilar system, enabling the collateral supply to maintain adequate cerebral circulation.

Surgery of aneurysms of the middle cerebral artery: a comparison of results of 'wrapping' and 'clipping' procedures

J. C. TAYLOR, A. R. CHAUDHURY, and R. H. SHEPHERD (Derby) reported that two colleagues working in the same department over a number of years had fairly consistently elected to treat aneurysms of the middle cerebral artery in different ways. One (R.H.S.) had clipped the aneurysms and the other (J.C.T.) had wrapped them. The opportunity had therefore been presented of a comparison of the efficacy of these two operative techniques. In 1972 the results of the 'clipping' series had been presented, showing a mortality figure at six months of 17% and a return to work rate by the survivors of 85%. In a series of 35 patients treated by 'wrapping' the mortality was 8.6%, and 90% of the survivors had returned to work. It was suggested that for aneurysms of the middle cerebral artery wrapping was an effective and safe technique providing results which were at least as good as those achieved with clips.

Some observations on the role of blood viscosity and anti-thrombotic preparations in the study of cerebrovascular disease

R. MYLES GIBSON (Leeds) reviewed the role of lipids in atherosclerosis and blood coagulation. It was noted that considerable attention has recently
been paid to the role of unsaturated dietary lipids, initially proposed as useful substitutes for the saturated 'thrombogenic fats' of the modern diet. For 12 years stabilised seed oil (Naudicelle) had been used as routine long-term treatment supplement in cases of cerebrovascular disease where the patients had experienced transient ischaemic attacks. The preparation had also been used for preoperative and postoperative treatment of patients undergoing carotid endarterectomy. The active constituents of Naudicelle are gamma-linolenic acid 8.7% and linoleic acid 73.5%, substances which appear to be precursors of prostaglandins. The preparation has been used in 50 cases, and in patients undergoing endarterectomy there had been no side-effects. It was not possible to give statistically valid results for patients on maintenance treatment, but it appeared that the preparation has a therapeutic contribution to make in the management of patients with transient ischaemic attacks and in patients undergoing carotid endarterectomy. It was considered that further studies into the role of viscosity of blood and the anti-thrombotic properties of prostaglandins in cerebrovascular disease should continue.

Cell-mediated immunity in patients with glioma of the brain (Sir Hugh Cairns Memorial Fund Prize Essay)

D. G. T. Thomas (Glasgow) noted that there was increasing evidence that patients with glioma of the brain developed cell-mediated immunity against their tumour. Despite this natural immunity, and the benefits of modern neurosurgical management, the prognosis remained poor even for relatively well-differentiated glial tumours. The author discussed experimental findings which clarified the nature of the cell-mediated immune response in patients with glioma of the brain. In vitro response of patients' lymphocytes to stimulation by a non-specific mitogen, phytohaemagglutinin, was measured using a protein synthesis in short-term whole blood culture technique. The response of patients with glioma was depressed compared with that found in those with benign intracranial tumour or with controls with other neurological diseases. Skin tests of delayed type hypersensitivity to 'recall' antigens indicated impaired cell-mediated cutaneous reactivity in the patients with glioma. A direct leucocyte migration inhibition test in vitro was applied, using buffy coat cells and tumour homogenates in patients with glioma and other intracranial tumours. Patients with glioma appeared sensitised to tumour as did those with cerebral metastases. It was concluded that these methods could play a part in the diagnosis and prognosis of malignant intracranial tumours and suggested a basis for future developments in therapy by immunopotentiation.

Comparison of serum-mediated immunological response in two populations of brain tumour patients

J. P. Phillips, D. Finn, T. F. Buckley, M. P. Brady, R. L. Martuza, C. D. Dohan, Jr., and P. L. Kornblith (Cork) had noted that a serum-mediated immunological response was detectable in patients with glioma and the identification of cytotoxic antibodies had been developed as a diagnostic assay in patients with preoperative brain tumour. These in vitro studies were performed on a population of patients with preoperative glioma in the neurosurgical service of the Massachusetts General Hospital (MGH). Using an identical in vitro microcytotoxicity assay, involving the same target cells, two populations of patients were compared. In the first group a large number of patients with brain tumour and 67 normal blood donors were studied at the MGH. In the second group patients presenting with intracranial pathology at the neurosurgical unit of St. Finbarr's Hospital, Cork, were studied. Seventy per cent of 46 patients with confirmed astrocytoma presenting at the MGH were positive on assay when compared with 10% of 67 normal blood donor controls. Four patients with medulloblastoma were studied, and two were positive. Of 16 patients with acoustic schwannoma 37% were positive, while 31% of 16 patients with cerebral metastases demonstrated significant cytotoxicity. Only 15% of 20 patients with meningioma and 16% of 12 patients with pituitary tumours had demonstrable cytotoxic antibodies.

Sera from 10 patients with confirmed astrocytoma were studied in the St. Finbarr’s Hospital series, and six were found to be positive. None of 10 medical student controls was positive. Other control patients, five with epidual haemorrhage and four with aneurysms, were negative. In contrast, two further groups of controls without tumours, 10 laminectomy patients and six patients with traumatic subarachnoid haemorrhage, showed one positive response in each group. Of three patients with pituitary tumour who were studied one was positive. Six patients with cerebral metastases were similarly assayed for antibodies, and two were found to be positive. These results suggested that a common antigen
was being detected in the two unrelated populations of glioma patients. If further studies confirmed that a tumour associated antigen was involved then common aetiology must be considered for some gliomas.

Plasma renin in subarachnoid haemorrhage

G. NEIL-DWYER and P. H. WALTER (Woolwich) noted that previous investigations had shown persistently high catecholamine levels in patients with subarachnoid haemorrhage. Others had shown that in experimental animals sympathetic stimulation influenced plasma renin levels. Studies on renin activity were made in 13 patients in the two weeks after subarachnoid haemorrhage. These patients were all managed in the usual way, but were placed on a 120 mmol sodium diet.

Four patients had persistently low renin levels. Three of these had aneurysms and all died, two from recurrent haemorrhage. Four patients showed a sudden rise in renin activity at some point, and in two of these patients at craniotomy the brain was found to be red, friable, and unsuitable for further surgery. In two patients there were transient ECG changes coinciding with a peak of renin activity and these caused abandonment of operation. Four patients with high or normal levels developed transient ECG changes. One patient who had a posterior fossa haemorrhage had renin levels that were persistently very high and these were associated with markedly raised blood pressure and persistent ECG changes. It seemed likely that this patient's haemorrhage might have caused widespread vasomotor responses due to medullary irritation. The results were felt possibly to indicate that the renin/angiotensin system might, with an overactive sympathetic system, be responsible for certain aspects of the morbidity of subarachnoid haemorrhage.

A neurological surgeon's interest in the orbit

OMAR V. JOOMA (Karachi) noted in a series of 55 cases of unilateral proptosis that cysts were present in 12.8%, chronic inflammatory conditions in 25.6%, and primary neoplasms in 61.6%. The three main features of intraorbital space lesions were proptosis, diplopia, and impaired vision. Proptosis being the most important. The direction of the proptosis was of diagnostic and surgical significance. The more anterior the tumour the greater the eyeball displacement, the more posterior the tumour the greater the proptosis. Diplopia might be present for mechanical reasons or it might be the result of direct invasion of the external ocular muscles or their nerves. The frequency of diplopia was least with cysts and benign neoplasms but was more common with pseudotumours, metastases, and some inflammatory conditions. Visual impairment was uncommon in association with benign neoplasms or cysts, even though the eyeball might be markedly displaced. Papilloedema, which was not common, was most often observed with malignant tumours, pseudotumours, and intrinsic neoplasms of the optic nerve. Optic disc pallor in adults was common in association with meningiomas and in children with optic nerve gliomas. Some anteriorly placed tumours could be palpated. Radiological examination of the orbit, carotid angiography, orbital venography, and the EMI scanner were all useful in the diagnosis of these lesions.

Most intraorbital neoplasms required surgery—an anterior approach for masses situated laterally or dorsolaterally, and a transcranial approach for cysts and tumours behind the globe, for lesions placed medially, for tumours within the muscle cone, and for most cases of pseudotumour. The results of surgery for cysts and benign tumours were excellent, but were not so satisfactory for some meningiomas, for optic nerve gliomas, or for pseudotumours.

Alcohol injection of the trigeminal ganglion for trigeminal neuralgia

J. GARFIELD (Southampton) had seen 157 patients with idiopathic trigeminal neuralgia between 1968 and 1975. Eighty-one of these were selected for injection on the basis of severity of symptoms despite adequate medical treatment. In the early years the teaching that total sensory loss in all three divisions was necessary for complete and lasting relief of pain was the starting point. The anterior approach to the foramen ovale was used, the position of the needle point being checked radiographically, but without screening or image intensification. Follow-up had been maintained in 71 patients, the average time being 3.3 years. With 23 patients follow-up had continued for four or more years. Second injections were performed in four cases. In divisions affected by pain, total loss (49 patients) produced satisfactory relief in 47 and partial loss (22) relief in 21. Additional loss in the other divisions had not affected later results either adversely or favourably.

Dysaesthesiae occurred in 11 patients, of whom five doubted the wisdom of the therapeutic
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decision and were, therefore, classified as indicating poor results. Results showed that total sensory loss in the divisions affected by pain (49 patients) produced symptomatic success in 42 (86%) and partial loss (22 patients) success in 21 (95%). In all, 62 of the 71 patients followed up had benefited. Alcohol injection of the trigeminal ganglion remained a valuable method of treatment for the majority of patients in whom medication had failed. It was without mortality, and had a complication rate no higher than that of open operative management.

Differential thermocoagulation of Gasserian ganglion and its posterior rootlets for trigeminal neuralgia

R. P. Sengupta (Newcastle) noted that the technique of controlled thermocoagulation of the Gasserian ganglion and its posterior rootlets by a radio frequency lesion had replaced other surgical procedures in many clinics in North America and in some parts of Europe. The technique had not, however, been widely adopted in this country. Thirty-nine patients have been treated by the Sweet and Weps method from January 1975 to August 1976. Patients who received benefits from carbamazepine were excluded from the procedure. The essential technical aids were an operating table with an adjustable head-rest incorporating a cassette holder, portable x-ray apparatus, a 4 in. 20 gauge hollow needle with insulated shaft, a nerve stimulator, a thermister, a radio frequency source, and intermittent intravenous anaesthesia. The anaesthesia regime was preoperative atropine, intravenous basal sedation with Droperidol and Fentanyl, and methohexital administered just before penetration of the foramen ovale and during each episode of thermocoagulation. Under radiological control the electrode was inserted through the foramen ovale using the anterior approach. An indifferent electrode was placed on the scalp, and a low voltage current was passed through the exploring electrode to determine the exact location of its tip. After the tip had been finally positioned a thermister was inserted and the radio frequency source was attached. With the patient under the influence of methohexital the electrode tip was heated to 60°C for two minutes, after which the patient was allowed to wake up, and pin-prick sensation was then tested. Further lesions were made at higher temperatures until the desired effect had been obtained. After this procedure 36 patients had remained free from pain, although not all of these have had persistent sensory loss. First division analgesia was obtained in nine out of 12 patients treated for first division pain, and of these three developed loss of the corneal reflex after thermocoagulation, and one had keratitis. Eight out of 27 patients treated for pain in other divisions developed analgesia in the first division area and of these three lost the corneal reflex and one developed keratitis. Eight patients admitted to unpleasant sensations, but most of these were grateful for the relief of pain.

Although the period of follow-up was relatively short it could be said that the preliminary results of this technique were encouraging. This form of treatment was based on the principle that small nerve fibres were more readily inactivated by heat than large ones. It followed that A-delta and C fibres carrying pain sensation were destroyed before the larger fibres which carried light touch.

The human optic radiation: its architecture according to neurological experience

J. C. Christensen (Buenos Aires) described the anatomy of the optic radiation, and presented a review of correlation between pathology and clinical findings.

Cranial isotope section scanning

J. L. Woolley and B. Williams (Smethwick) noted that the technique of transverse axial tomography using radioisotopes was pioneered by Khul and Edwards in 1963. Others had described their own methods but had used prototype equipment. The authors described the development of radioisotope computed tomography using commercially available equipment. The scanner had dual detectors mounted on a yoke which could be rotated round the patient. Section scans were carried out through any abnormal uptake, special views taking about seven minutes. Reconstructions were carried out using a small computer operated on line to the scanner. The reconstruction method was non-iterative, and used a convolution logarithm described by Keyes. The results might be viewed immediately using photo scans or colour printout. About 50 cases had been scanned, all of which were positive on the conventional isotope scan. A diagnosis might often be quite strongly suggested by the shape of the lesion on the transverse section. Where EMI scans had been available, correlation of results had been good. These results had suggested that the method might be useful in the confirmation of areas of increased uptake of isotope, as better contrast was often obtained on the section scans than on the conventional...
scans. The method was useful in finding recurrent tumours in situations where conventional isotope scanning techniques were difficult because of increased uptake after craniotomy. Section scanning also helped to pick out abnormal areas of uptake close to the base of the skull. The technique had also been used, with promising results, in the imaging of CSF pathways.