Abstracts

AB-2537-76
Catheter Embolization of Intracranial Arteriovenous Malformations as an Aid to Surgical Excision — Wolpert SM (Section of Neuroradiology, Department of Radiology, Tufts-New England Medical Center Hospital, Boston, Massachusetts 02111), Stein BM — Neuroradiology 10: 73-85 (Nov 21) 1975*

Eleven cases of large arteriovenous malformations (AVMs) were treated from February 1974 to March 1975 by embolization via the internal carotid artery with beads, and eight of them had subsequent surgery. There was one postoperative death. A second embolization was performed in three patients with further diminution of vascularity. Embolization improved the perfusion of the adjacent normal brain and was an important preoperative procedure which facilitated the operation and made it surgically feasible to operate on some cases which might otherwise have been considered to be inoperable.

AB-2538-76
In Vivo Determination of Cerebral Blood Volume With Radioactive Oxygen-15 in the Monkey — Eichling JO (Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, Missouri 63110), Raichle ME, Grubb RL Jr, Larson KB, Ter-Pogossian MM — Circulation Research 37: 707-714 (Dec) 1975*

A method for the in vivo determination of cerebral blood volume was tested in 15 adult rhesus monkeys. The technique utilized external residue detection and required the serial measurement of two mean transit times, namely, that of an intravascular tracer, C15O-hemoglobin, and that of a diffusible tracer, H218O. In computing the mean transit time for the intravascular tracer, the conventional Hamilton extrapolation of the downslope of the recording obtained for the washout of the tracer from the brain subsequent to an intracarotid bolus injection was found to be inadequate, yielding a mean transit time that systematically underestimated that parameter. Alternatively, the use of a power law extrapolation, as proposed by Huang, allowed a more accurate prediction of the vascular mean transit time. The preliminary studies testing the method predicted that the relationship between cerebral blood volume (CBV) and cerebral blood flow (CBF) was adequately represented by the equation CBV = 0.80CBF0.90 for the cerebral blood flow range of 16 to 134 ml/100 gm min⁻¹ with a normocapnic cerebral blood volume of 3.5 ml/100 gm perfused brain tissue (arterial Pco2 = 37 torr, CBF = 50 ml/100 gm min⁻¹).

AB-2539-76
Baroreceptor Reflex Control of Arterial Hemodynamics in the Dog — Cox RH, Bagshaw RJ (Bockus Research Institute, Departments of Physiology and Anesthesiology, University of Pennsylvania, Philadelphia, Pennsylvania 19146) — Circulation Research 37: 772-786 (Dec) 1975*

The regional differentiation of carotid sinus control of arterial pressure-flow relationships was studied in chloralose-anesthetized dogs. Simultaneous pressure-flow measurements were made in the ascending aorta, the celiac artery, the cranial mesenteric artery, the renal artery, and the femoral artery. The carotid sinuses were bilaterally isolated and perfused with pulsatile pressure. The open-loop reflex gain was not symmetrical about and was maximum at pressures below the closed-loop operating point pressure. Changes in both peripheral resistance and cardiac output contributed significantly to the open-loop gain, with the former predominating. Aortic impedance for frequencies above 3 Hz was at a minimum at the closed-loop operating point and increased for both higher and lower values of carotid sinus pressure. For the frequency range from 3 to 9 Hz, regional impedance in all of the beds varied inversely with carotid sinus pressure. The sensitivity of the various beds to changes in carotid sinus pressure around the operating point increased in the order celiac < mesenteric < renal < femoral. Following vagotomy, operating point values of regional resistance and sensitivity were significantly increased. This fact suggests that the aortic arch receptors exert a significant influence on regional vascular impedances at operating point pressures. The fraction of cardiac output in the celiac, mesenteric, and renal beds was nearly independent of carotid sinus pressure before and after vagotomy, but that in the femoral bed increased with carotid sinus pressure. These results demonstrate the nonuniform nature of carotid sinus and aortic arch baroreceptor control of regional blood flow.

AB-2540-76
Hypoxic-Ischemic Leukoencephalopathy in Man — Ginsberg MD (Department of Neurology, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania 19104), Hedley-Whyte ET, Richardson EP Jr — Arch Neurol 33: 5-14 (Jan) 1976*

Three cases of hypoxic-ischemic leukoencephalopathy were studied. In two patients, the neurologic disorder followed drug overdosage; in the third, the apparent precipitating event was a postoperative myocardial infarction complicated by circulatory insufficiency. All patients were deeply unresponsive, with varying reflex patterns. In all three cases, the brain showed extensive symmetrical necrotic lesions of the central white matter, with minimal damage to gray matter structures. The lesions in case 3 showed, in addition, vascular necrosis and ring hemorrhages. Common to all cases was a prolonged period of hypoxemia, hypotension, and elevated venous pressure. Acidosis occurred in

*Authors' abstract.

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two. These observations and analysis of previous reports of similar cases suggest that leukoencephalopathy tends to occur when the hypoxemia is prolonged and is associated with periods of hypotension and metabolic imbalance.

AB-2541-76
Anatomical Features of the Straight Sinus and Its Tributaries: Clinical Correlations — Browder J (Veterans Administration Hospital, East Orange, New Jersey 07019), Kaplan HA, Krieger AJ — J Neurosurg 44: 55-61 (Jan) 1976

The authors report a variety of arrangements of the venous channels comprising the straight sinus (sinus rectus) and its connections during a continuing study of the cerebral sinuses and their tributaries. In approximately 85% of 131 specimens of dura mater with enclosed venous sinuses derived from fresh cadavers, the straight sinus was represented by a single midline tentorial channel whereas in the remaining 15%, segments of it were doubled and in a few, tripled. In addition to these aberrations in the development of the main trunk of this sinus, the venous patterns at the junctions of the inferior sagittal sinus, vein of Galen and straight sinus showed comparable developmental inconstancies. Also in no specimens were the patterns of venous channels in the leaves of the tentorium cerebelli alike. The course, size, and connections of all the tributaries of the straight sinus have been studied and consideration given to their potentials as collateral pathways in the event either the vein of Galen or the straight sinus itself were occluded.

AB-2542-76
Cerebrospinal Fluid Creatine Phosphokinase in Acute Subarachnoid Hemorrhage — Greenblatt SH (Department of Neurological Surgery, Albert Einstein College of Medicine, Bronx, New York 10461) — J Neurosurg 44: 50-54 (Jan) 1976

The authors measured the level of creatine phosphokinase (CPK) in 35 cerebrospinal fluid (CSF) specimens from 30 patients with acute subarachnoid hemorrhage, and correlations were sought with 17 other clinical and laboratory parameters. Elevations of CSF CPK have no diagnostic specificity. However, they do show a statistically significant correlation with the existence of any destructive process in cerebral tissue (hydrocephalus, infarction, intraparenchymal hemorrhage, or intraventricular clot). Yet arterial spasm without infarction does not raise the CSF CPK level. During the preoperative management of ruptured aneurysms and vascular malformations, a significant elevation of the CSF CPK level can thus provide a clue to the presence or significance of one or more of these destructive processes.

AB-2543-76
Experimental Evaluation of the Spasmogeneity of Dopamine on the Basilar Artery — White RP (Department of Pharmacology, University of Tennessee Center for the Health Sciences, Memphis, Tennessee 38103), Hagen A, Robertson JT — J Neurosurg 44: 45-49 (Jan) 1976

Arteriograms of the basilar artery reveal that dopamine given intracisternally to dogs can generate cerebral vasospasm. This finding supports a recent hypothesis of others that dopamine may play a role in the pathogenesis of vasospasm, especially since many substances are known which fail to produce such spasm. Compared to blood or prostaglandin E1, however, the spasm induced by dopamine was delayed in onset, less in incidence, and usually less intense. Possible explanations for such experimental differences are discussed.

AB-2544-76
Role of Histamine in Posttraumatic Spinal Cord Hyperemia and the Luxury Perfusion Syndrome — Kobrine AI (Department of Neurological Surgery, George Washington University Clinic, Washington, DC 20037), Doyle TF — J Neurosurg 44: 16-20 (Jan) 1976

The authors studied the effect of pretreatment of monkeys with antihistamines on hyperemia observed in the lateral funiculus of the spinal cord after severe experimental spinal cord trauma. After administration of Chlorpheniramine and Metiamide, the spinal cords were traumatized with a 600 gm-cm injury. Blood flow in the lateral funiculus at the injury site was then determined hourly for six hours. The blood flow at this site remained in the normal range at all times in all animals. Neither a hyperemia nor an ischemia could be demonstrated. This finding reaffirms the authors' previous observation that ischemia does not exist in the lateral funiculus after severe experimental spinal cord trauma, and explains the previous observation of hyperemia as a histamine-related phenomenon, easily blocked by the administration of Chlorpheniramine and Metiamide, potent antihistamines which together block both the H1 and H2 receptor sites.

AB-2545-76

The authors used the hydrogen clearance method to measure focal spinal cord blood flow (SCBF) in the rhesus monkey over a wide range of mean arterial blood pressures (MAP) in an attempt to test the hypothesis of autoregulation. The MAP was either lowered by bleeding or raised by the intravenous infusion of norepinephrine or angiotensin. The SCBF remained constant and in the normal range with an MAP of 50 to 135 mm Hg, indicating the presence of autoregulation. Below 50 mm Hg, SCBF fell passively with further decreases in MAP. At MAP values above 135 mm Hg, vasodilatation occurred which resulted in a breakthrough of autoregulation and marked increases in SCBF with further increases in the MAP.

AB-2546-76
Klinische Bedeutung von Blutviskositätsveränderungen im Rahmen der zerebrovaskulären Insuffizienz (Clinical Significance of Changes in Blood Viscosity in Cerebrovascular Insufficiency) — Lechner H, Ott E (Psychiatrisch-Neurologische Universitätsklinik, A-8036 Graz, Auen-
transient cerebral ischemic attacks (TIA) the risk factors
experienced in our Department in the past five years, were
cranial aneurysms.

Aneurysms of the distal anterior cerebral artery are
teenth in ten patients, 6.7% of the intracranial aneurysms
are relatively uncommon and consist of about 4% of the intra-
cranial aneurysms.

In this paper 11 aneurysms of the distal anterior cerebral
arteries in ten patients, 6.7% of the intracranial aneurysms
experienced in our Department in the past five years, were
reported. Ten of them were saccular and one was fusiform.
All of them arose from the pericallosal artery at the genu of the
corpus callosum.

The patients with these aneurysms had a higher incidence of
coexisting anomalies of the anterior cerebral artery than
the ordinary statistical incidences reported from the
angiograms and autopsies.
The aygos anterior cerebral artery was seen in two cases,
the supreme anterior communicating artery (Laitinen) with
a saccular aneurysm on it in one case, the defective horizontal
portion of the anterior cerebral artery on one side in two
cases, the hypoplastic pericallosal artery on both sides in one
case, and two aneurysms of one irregular and hypoplastic
pericallosal artery in one case. Two cases had other
aneurysms in the middle cerebral artery respectively. Only
three cases showed normal features of the bilateral anterior
cerebral artery.

These anomalies with the saccular aneurysms suggested
that the developmental defect in this artery might play an
important role in the formation of this aneurysm.
In analyzing the clinical course of these patients
characteristic clinical symptoms and signs suggesting the
rupture of this aneurysm were not present.

Clipping or ligation of the aneurysm was performed in
seven cases and removal of the aneurysmal sac in one case
with the fusiform aneurysm. An aneurysm of the supreme
anterior communicating artery disappeared spontaneously.
One patient refused operation. Thus eight cases were
operated upon without operative mortality.
At operation a unilateral or bilateral frontal exposure
may be employed although a unilateral frontal flap is ade-
quate in the majority of cases and the aneurysm is easily
found when it is approached through interhemispheric
fissure.

Aneurysms of the Distal Anterior Cerebral Artery —
Kinoshita K, Matsukado Y (Department of Neurosurgery,
Kumamoto University Hospital, Kumamoto, Japan) —
Brain and Nerve 27: 1193-1202 (Nov) 1975*

Aneurysms of the distal anterior cerebral artery are
relatively uncommon and consist of about 4% of the intra-
cranial aneurysms.

In this paper 11 aneurysms of the distal anterior cerebral
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All of them arose from the pericallosal artery at the genu of the
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The patients with these aneurysms had a higher incidence of
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The aygos anterior cerebral artery was seen in two cases,
the supreme anterior communicating artery (Laitinen) with
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One patient refused operation. Thus eight cases were
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At operation a unilateral or bilateral frontal exposure
may be employed although a unilateral frontal flap is ade-
quate in the majority of cases and the aneurysm is easily
found when it is approached through interhemispheric
fissure.

Pathophysiological Aspects of Acute Stage Patients With
Ruptured Intracranial Aneurysms. Part II: Relationships
Between Neurological Prognosis and Sequential Changes of
Cerebral Blood Flow Dynamics — Sakurai Y, Ito Z,
Uemura K (Division of Surgical Neurology and Radiology,
Research Institute of Brain and Blood Vessels, Akita,
Japan) — Brain and Nerve 27: 1213-1221 (Nov) 1975*

Relationships between cerebral blood flow (CBF)
dynamics and neurological deficits were studied in 14
patients with subarachnoid hemorrhage due to ruptured in-
tracranial aneurysm.

CBF in the acute stage of these subjects was measured by
the \(^{133}\) Xe clearance method using a six-channel detector unit.
Mean hemispheric CBF, regional CBF, vascular response
for hypercapnia and function of autoregulation were
evaluated in reference to neurological symptoms.
The ruptured aneurysms were located in the anterior
communicating artery in six cases, the internal carotid artery in
three cases, and the middle cerebral artery in five cases. In
13 cases, direct intracranial operations were performed.
The materials were divided into four groups with two sub-
groups by their neurological prognosis. In Group I, a severe
case, the patient died soon after bleeding. Mean CBF was
20.6 ml/100 gm per minute with diffuse ischemia.
Group 2 had cases with poor prognoses. This group was

*Authors' abstract.
divided into two subgroups (Group 2a and Group 2b). The prognosis of Group 2a was evaluated as severe neurological deficit and a vegetative state in the chronic stage; the patients in Group 2b had severe neurological deficit without a vegetative state.

In Group 2a the CBF pattern showed "global luxury perfusion" in the acute stage, followed by continuous vasomotor paralysis and diffuse ischemia in the chronic stage. In Group 2b, "global luxury perfusion" and chronic diffuse ischemia were not recognized, but vasomotor paralysis persisted for a long time.

Group 3 had patients with slight neurological deficits, and Group 4 included patients without neurological abnormalities. The values of the mean CBF of Groups 3 and 4 were almost normal. In Groups 3 and 4, vasomotor paralysis was milder than in Group 2. The differences of hemodynamics in these two groups were severity and recovery pattern of focal abnormality and vascular response.

"Global luxury perfusion," which was frequently observed in the acute stage of the Group 2a cases, was noteworthy. It was discussed in connection with severe brain damage and risk of re-rupture of the aneurysm.

From the clinical viewpoints described above, it should be apparent that the neurological prognosis was closely related to sequential changes of CBF dynamics in patients with ruptured intracranial aneurysms in the acute stage. Furthermore, sequential observations of CBF dynamics are necessary to determine the optimum timing and selection of direct operation from ruptured intracranial aneurysms in the acute stage.

**AB-2550-76**

An Extravascular Component of Contrast Enhancement in Cranial Computed Tomography. Part I: The Tissue-Blood Ratio of Contrast Enhancement — Gado MH, Phelps ME, Coleman RE (Department of Neuroradiology, Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, Missouri 63110) — Radiology 117: 589-593 (Dec) 1975*

One can calculate the tissue-blood ratio of enhancement by analyzing the quantitative aspects of the CT scans of the cranium and blood samples both before and after the injection of contrast medium. This ratio is equivalent to that between the iodine content of a given volume of tissue and an equal volume of blood. Analysis of 47 normal patients, including 27 with pathological brain lesions, indicated that there is significant extravasation of contrast medium in patients with such lesions.

**AB-2551-76**

An Extravascular Component of Contrast Enhancement in Cranial Computed Tomography. Part II: Contrast Enhancement and the Blood-Tissue Barrier — Gado MH, Phelps ME, Coleman RE (Department of Neuroradiology, Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, Missouri 63110) — Radiology 117: 595-597 (Dec) 1975*

The authors provide evidence of significant extravasation of contrast media responsible for the contrast enhancement of pathological tissue on computed tomography. The tissue-blood ratio of enhancement was calculated by the EMI scanner in two patients after injection of contrast material and prior to surgery; tumor-blood ratios for red blood cells and plasma tracers were calculated after surgery. The ratios of enhancement demonstrated the analogy between contrast enhancement and the leaking of radionuclide across the blood-brain barrier. This phenomenon may cause error if this technique is used for the measurement of cerebral blood volume. The area for complementary roles of CT and radionuclide brain imaging seems to be narrower than expected.

**AB-2552-76**

Cerebral Circulation After Cardiac Arrest — Angiographic and Carbon Black Perfusion Studies — Lin SR (Section of Neuroradiology, Department of Diagnostic Radiology, Strong Memorial Hospital of the University of Rochester, Rochester, New York 14642) — Radiology 117: 627-632 (Dec) 1975*

Cardiac arrest of 2 to 15 minutes was induced in 14 dogs. When circulatory arrest lasted longer than five minutes, abnormal cerebral angiographic findings were seen three to four hours after resuscitation, consisting of (a) marked prolongation of the arterial phase in both intracranial and extracranial arteries, and (b) faint (poor) visualization of the venous phase. No significant abnormalities were noted in dogs arrested less than five minutes, or in the control group. Carbon black perfusion studies showed multiple focal areas of small patchy and diffuse coarse reperfusion defects at the arteriolar-capillary levels in dogs arrested longer than five minutes. A combination of vascular and parenchymal changes during ischemia may be the cause for these findings.

**AB-2553-76**

Ischemia of Ciliary Arterial Circulation From Ocular Compression — Jampol LM (Illinois Eye and Ear Infirmary, Chicago, Illinois 60612), Goldbaum M, Rosenberg M, Bahr R — Arch Ophthalmo 93: 1311-1317 (Dec) 1975*

Two patients had unilateral central retinal artery and posterior ciliary artery occlusions related to oculocerebral compression during general anesthesia. One patient had evidence of extensive choroidal ischemia with diffuse hypopigmentation, pigmented mottling of the posterior pole, and disk edema. Electroretinography showed diminution of the A and B waves. The other patient showed patchy choroidal ischemia with subsequent development of wedge-shaped areas of pigmentary atrophy and mottling in the midperiphery. Iridocyclitis and prolonged hypotony were also present. Retinal and posterior ciliary artery occlusion (perhaps at the level of the ophthalmic artery) can occur as a result of ocular compression by a face mask or an improperly positioned headrest. Systemic hypotension is a factor in many cases. Proper positioning of the head on an adequate headrest and avoidance of ocular compression will prevent the occurrence of retinal and choroidal occlusion during general anesthesia.

**AB-2554-76**

Pupillary Hemiakinesia in Suprageniculate Lesions — Cibis GW (Department of Ophthalmology, University of Iowa
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Hospitals, Iowa City, Iowa 52242), Campos EC, Aulhorn E — Arch Ophthalmol 93: 1322-1327 (Dec) 1975*

An objective method of registering the pupillomotor threshold was utilized to demonstrate pupillary hemianopia (Wernicke hemianopic phenomenon) in five patients with homonymous hemianopia due to lesions above the lateral geniculate body. The results show that Wernicke hemianopic pupillary response is of no diagnostic value in differentiating between proximal lesions and those distal to the lateral geniculate body.

AB-2555-76
Surgical Removal of Arteriovenous Malformations From the Brain Stem and Cerebellopontine Angle — Drake CG (Division of Neurosurgery, Department of Clinical Neurological Sciences, Faculty of Medicine, The University of Western Ontario, London, Ontario, Canada N6G 2K3) — J Neurosurg 43: 661-670 (Dec) 1975*

The author reports his surgical experience with five cases of arteriovenous malformation of the brain stem and cerebellopontine angle causing multiple hemorrhages and severe neurological deficits. Surgical removal of the lesions had good results in four cases; there was one death.

AB-2556-76
Neurogenic Control of Cerebral Blood Flow in the Baboon. Effects of the Cholinergic Inhibitory Agent, Atropine, on Cerebral Autoregulation and Vasomotor Reactivity to Changes in PCO2 — Kawamura Y, Meyer JS (Department of Neurology, Baylor College of Medicine, Houston, Texas 77030), Hiromoto H, Aoyagi M, Tagashira Y, Ott EO — J Neurosurg 43: 676-688 (Dec) 1975*

Cerebral chemical vasomotor reactivity and autoregulation were tested in normal baboons before and after the intravenous or intravertebral infusion of atropine sulfate (0.02 mg per kilogram). Atropine did not appreciably affect autoregulatory response, but intravertebral injection suppressed the increase of cerebral blood flow (CBF) by inhalation of 5% CO2 and enhanced the decrease of CBF induced by hyperventilation. These changes produced by intravertebral injection of atropine were not observed after intravenous injection. Since the verteobasilar arterial system supplies the brain stem and diencephalon, this suggests that a central vasodilator tonus of the cerebral vessels is maintained by the innervation of the cerebral vessels by cholinergic neurons which have their central origin in the brain stem and diencephalic area.

AB-2557-76
Cerebral Hemorrhage Following Heart Surgery — Humphreys RP, Hoffman HJ, Mustard WT, Trusler GA (Divisions of Neurological and Cardiovascular Surgery, Hospital for Sick Children and University of Toronto, Toronto, Canada) — J Neurosurg 43: 671-675 (Dec) 1975*

The authors report a study of the problem of intracranial hemorrhage in 16 children following cardiac surgery, four studied clinically, and 12 by postmortem pathological review. Eleven children sustained subdural hematomas of varying sizes, one had a massive extradural clot, and four had intracerebral clots. The preoperative, intraoperative and postoperative data of these 16 patients are presented, but the specific factors causing the intracranial hemorrhage remain unexplained. The neurological course was similar to that of patients with an intracranial space-occupying lesion, and fundamental neurosurgical management principles for the treatment of this potentially reversible process should be observed.

AB-2558-76
Central Cholinergic Control of Cerebral Blood Flow in the Baboon. Effect of Cholinesterase Inhibition With Neostigmine on Autoregulation and CO2 Responsiveness — Aoyagi M, Meyer JS (Department of Neurology, Baylor College of Medicine, Houston, Texas 77030), Deshmukh VD, Ott EO, Tagashira Y, Kawamura Y, Matsuoka M, Achari AN, Chee ANC — J Neurosurg 43: 689-705 (Dec) 1975*

Cerebral autoregulation and vasomotor responsiveness to carbon dioxide (CO2) were measured quantitatively by the use of the autoregulation index and chemical index, respectively, in normal baboons before and after intravertebral and intracarotid infusion of the anticholinesterase agent, neostigmine methylsulfate (Prostigmin). Continuous measurements were made of cerebral blood flow (measured as bilateral internal jugular venous outflow), arterial and cerebral venous PO2 and PCO2, cerebral arteriovenous oxygen differences, and endotracheal CO2.

The effect of intravertebral infusion of neostigmine (12.5 µg/kg body weight) was compared to intracarotid infusion of neostigmine (25 µg/kg body weight) for assessment of any specific action of the drug on a hypothetical cholinergic vasomotor center, presumed to be located in the territory of the verteobasilar supply. No significant or persistent changes in cerebral blood flow (CBF) and cerebral metabolic rate for oxygen (CMRO2) followed either intravertebral or intracarotid infusion of neostigmine. Cerebral vascular resistance (CVR) and cerebral perfusion pressure (CPP), however, decreased significantly after intravertebral infusion. Cerebral autoregulatory vasodilation during increases of CPP was significantly reduced following both intravertebral and intracarotid infusion. Cerebral autoregulatory vasodilation was not altered as CPP was lowered. Cerebral vasodilatory reactivity to CO2 inhalation was significantly enhanced following intravertebral neostigmine but not following intracarotid neostigmine. Cerebral vasoconstrictive response to hyperventilation was not influenced by neostigmine. These results support the view that central cholinergic cerebrovascular influences exist, and are vasodilatory in nature.

AB-2559-76
Regional Cerebral Blood Flow Studies Following Superficial Temporal-Middle Cerebral Artery Anastomosis — Heilbrun MP (Division of Neurosurgery, University of Utah Medical Center, Salt Lake City, Utah 84132), Reichman OH, Anderson RE, Roberts TS — J Neurosurg 43: 706-716 (Dec) 1975*

Regional cerebral blood flow (rCBF) studies were per-
formed during the postoperative period on 16 patients with internal carotid occlusions and inaccessible stenoses, and middle cerebral artery occlusion and stenoses, who underwent superficial temporal artery-middle cerebral artery (STA-MCA) anastomoses. The intra-arterial xenon method with selective application of the xenon bolus through the internal carotid and the newly established superficial temporal channel has allowed comparison of the flow provided by the pathological input with flow through the new input. The results show that initial rCBF (rCBFt) was globally reduced in all patients to a mean of 28.4 ± 11.9 ml/100 gm/min at a mean Pco₂ of 29.6 ± 9.55 mm Hg. Patients with transient ischemic attacks (TIA) and minor strokes with minimal residua (RIND) had a mean rCBF, of 30.4 ± 11.6 ml/100 gm/min at a mean Pco₂ of 30.1 ± 12.4 mm Hg, while patients with completed strokes had a mean rCBF, of 25.0 ± 12.4 ml/100 gm/min at a mean Pco₂ of 29.1 ± 8.8 mm Hg. There was no significant difference between these two groups. This finding suggests that in this small group of patients with TIA and RINDs, the cause of the stroke is probably related more to decreased perfusion than embolus, and may explain why these patients' symptoms improve after STA-MCA anastomosis. The results of this study suggest that in addition to an inaccessible lesion, global or focal decreased rCBF is a necessary criterion in the definition of indications for intracranial revascularization procedures.

AB-2560-76
Spontaneous Cerebral Revascularization in a Patient With STA-MCA Anastomosis. Case Report — Ausman JI (Department of Neurosurgery, University of Minnesota Health Sciences Center, Minneapolis, Minnesota), Moore J, Chou SN — J Neurosurg 44: 84-87 (Jan) 091976*

The authors report a case with spontaneous revascularization of the brain after surgical anastomosis of the superficial temporal artery to the middle cerebral artery.

AB-2561-76
Ultrastructure of Aneurysms — Stehbens WE (Department of Radiology, Stanford University School of Medicine, Stanford, California 94305) — Arch Neurol 25: 1169-1171 (Dec) 1975*

The fine structure of five cerebral aneurysms, four early aneurysmal changes and three arteriovenous aneurysms (two cerebral and one spinal) was investigated from surgical and autopsy specimens. Each lesion was characterized by thickening, lamination, redundancy, and separation of basement membranes, abundant cellular debris, and a paucity or absence of elastica. In several instances, extracellular lipid and lipophages were present. These vascular lesions were remarkably similar to one another and also to the degenerative changes in experimental arteriovenous aneurysms, thus substantiating the concept that they, too, are essentially degenerative in nature.

AB-2562-76
Steroid Therapy in Acute Cerebral Infarction — Norris JW (Sunnybrook Hospital, University of Toronto Clinic, Toronto, Ontario, M4N 3M5, Canada) — Arch Neurol 33: 69-71 (Jan) 1976*

Fifty-three patients with acute cerebral infarction were treated in a double-blind study with either dexamethasone or placebo within 24 hours of the onset of stroke. Forty-one of these survived for longer than 28 days, and the patients treated with the steroid fared slightly better than those treated with placebo at the end of this time. Two of the five patients who died in the placebo group died of cerebral edema, compared with three out of seven patients who died in the steroid group. Infectious complications, gastrointestinal hemorrhage, and occasional serious exacerbations of diabetes occurred more commonly in the steroid group.

AB-2563-76
Effects of Prostaglandins on Cerebral Blood Vessels: Interaction With Vasoactive Amines — Rosenblum WI (Box 17, MCV Station, Richmond, Virginia 23298) — Neurology 25: 1169-1171 (Dec) 1975*

Prostaglandins B₂ and B₃ were topicaly applied to the pial vessels of mice and arteriolar constriction was observed. This constriction could be significantly increased if serotonin was added to B₂, but not when norepinephrine was added. Response to B₃ was not enhanced by the simultaneous addition of either serotonin or norepinephrine. Earlier work with prostaglandin F₂α was replicated. F₂α constricted pial arterioles and a significantly greater constriction was produced when norepinephrine was applied simultaneously with F₂α. The data suggest that among the causes of cerebral vasospasm one should consider not only the action of single agents, but also the combined effects of several agents that might be in contact with cerebral vessels.

AB-2564-76
Recent Ischemic Brain Infarcts at Computed Tomography: Appearances Pre- and Postcontrast Infusion — Yock DH Jr, Marshall WH Jr (Division of Diagnostic Radiology, Department of Radiology, Stanford University School of Medicine, Stanford, California 94305) — Radiology 117: 599-608 (Dec) 1975*

Thirty-seven cranial computed tomography (CCT) scans of proved or highly probable recent ischemic brain infaracts were analyzed visually and numerically, with results organized by infarct age. The lesions typically appeared as homogeneous low density abnormalities, with no significant difference in scan characteristics between infarct age groups, i.e., it was not possible to determine the age of an infarct by its noninfused CCT appearance alone. Eight infarcts showed "mass effect," and four of the 20 contrast-infused cases demonstrated marked density augmentation or "blush," indicating that infaracts may resemble tumor in both of these properties.

AB-2565-76
Large Artery Involvement in Giant Cell (Temporal) Arteritis — Klein RG, Hunder GG, Stanson AW, Sheps SG (Division of Rheumatology, Department of Internal Medicine, Mayo Clinic and Mayo Foundation, Rochester, Minnesota 55901) — Ann Intern Med 83: 806-812 (Dec) 1975*

*Authors' abstract.
Of 248 patients with giant cell arteritis, 34 had evidence that the disease affected the aorta or its major branches. Symptoms suggestive of large artery involvement were intermittent claudication of an extremity, paresthesias, and Raynaud's phenomenon. Physical findings included absent or decreased large artery pulses and bruits over large arteries. Four patients presented with decreased upper extremity pulses as the initial manifestation of their arteritis. Nine other patients under treatment for temporal arteritis or polymyalgia rheumatica first had evidence of large artery involvement as corticosteroid therapy was tapered or discontinued. Angiography, performed in ten patients, was helpful in indicating arteritis rather than atherosclerosis as the cause of large artery disease. Three patients died with aortic rupture, and, at autopsy, widespread giant cell arteritis was found. However, when corticosteroids were given in adequate doses, the response was favorable in most patients; intermittent claudication decreased and the pulses improved.

AB-2566-76
Complications Neurologiques des Anticoagulants (Neurological Complications of Anticoagulants) — Petrov V, Bonnal J (Clinique Neurochirurgicale de l'Université de Liège, Belgique) — Acta Neurol Belg 75: 205–218 (Sep-Oct) 1975*

During a course of anticoagulant therapy, 16 intracranial hemorrhages and 10 cerebral infarctions were observed over a period of seven years.

The intracranial hemorrhages included 11 subdural hematomas (four acute, seven chronic) and five intra- cerebral hemorrhages, one of which resulted from the rupture of an arterial aneurysm.

The anticoagulant therapy lasted in 12 cases for more than two years, and in four cases between 24 hours and two months. Monocoumarinsics are most often the cause of the hemorrhages. The subdural hematomas are unpredictable and traumatism was observed in only four cases. Three out of four patients with acute hematomas died, as well as two out of seven patients with chronic hematomas. Three out of four intracerebral hemorrhages occurred after ischemic cerebral accidents. The existence of a cerebral infarction counter-indicates the use of anticoagulants.

The cerebral infarctions occurred five times during the anticoagulation therapy, and five times after stopping the treatment (from within a few days to a few weeks).

Anticoagulation therapy, apart from infarction, is in general well supported and well supervised during the first weeks. Used for a long time, it may lead to very serious and often fatal complication, and therefore must be weighed against the advantages of the treatment.

AB-2557-76
Intracerebral Haemorrhage: Accuracy of Computerised Transverse Axial Scanning in Predicting the Underlying Aetiology — Hayward RD, O'Reilly GVA (Departments of Neurosurgery and Neuroradiology, Atkinson Morleys Hospital, London SW20, England) — Lancet 1: 1–4 (Jan 3) 1976*

*Authors' abstract.

The diagnostic accuracy of computerized transverse axial tomography in predicting the pathology underlying cases of nontraumatic intracerebral hematoma has been reviewed. A 160 × 160 matrix was used and the scans of 100 patients whose diagnoses had been confirmed by either angiographic or postmortem examination were studied. In the absence of any clinical information a diagnosis of either cerebral aneurysm or primary intracerebral hemorrhage could be made with an accuracy of 90%. The hematomas most likely to be misinterpreted are those associated with angiomas and tumors, and these two lesions were responsible for six out of the ten incorrect diagnoses. In predicting the site of a ruptured aneurysm accuracy ranged from 100% for those involving the anterior cerebral artery complex to 66% for those few hematomas associated with aneurysms of the internal carotid/proximal middle cerebral artery aneurysm complex.

AB-2568-76
How Does Blood-Pressure Cause Stroke? — Russell RWR (S.B.R., Pathology Department, Royal Hospital for Sick Children, Sciennes Road, Edinburgh EH9 1LF, Scotland) — Lancet 2: 1283–1285 (Dec 27) 1975*

In chronic hypertension the specific arterial lesions responsible for brain damage affect the small resistance arteries. The pathological characteristics of these lesions (notably the presence of microaneurysms, intramural fibrin, and lipid) and the location of lesions within the brain all suggest that they arise from mechanical distention, which destroys the integrity of the vessel and allows plasma insudation into the wall (lipohyalinosis), finally leading to occlusion or rupture. The process is analogous to the breakdown in vascular resistance and permeability which occurs in acute hypertension.

AB-2569-76
In Vivo Toxic Effects of Halothane on Canine Cerebral Metabolic Pathways — Michenfelder JD, Theye RA (Department of Anesthesiology, Mayo Clinic and Mayo Foundation, Rochester, Minnesota 55901) — Am J Physiol 229: 1050–1055 (Oct) 1975*

The effects of high concentrations of halothane on cerebral metabolism were examined in dogs with the aid of an extracorporeal circuit to support the systemic circulation. At blood levels exceeding those representing equilibration with 2.3% halothane, a dose-related decrease in cerebral oxygen consumption (CMRO2) occurred that was unrelated to the presence or absence of an active electroencephalogram. In this circumstance, despite adequate oxygen delivery, a dose-related alteration in oxidative phosphorylation also occurred as evidenced by progressive decreases in cerebral concentrations of ATP and phosphocreatine and concomitant increases in cerebral lactate and lactate/pyruvate ratio. These effects were totally reversible, except for persistence of increased CMRO2, after return to low halothane concentrations. It is concluded that the mechanisms of the cerebral metabolic effects of halothane differ from those of thiopental and, at high concentrations, are at least in part related to interference with oxidative phosphorylation. These in vivo studies confirm the potentially detrimental
The effects of high halothane concentrations on cerebral metabolic pathways as demonstrated by others in vitro.

**AB-2570-76**

**Analysis of Brain Uptake and Loss of Radiotracers After Intracarotid Injection** — Bradbury MWB, Patlak CS, Oldendorf WH (Brentwood Hospital, Veterans Administration, Los Angeles, California 90024) — *Am J Physiol* 229: 1110–1115 (Oct) 1975*

The amount of radioactivity in brain was estimated at different times after intracarotid injection in the pentobarbital-anesthetized rat. Fifteen seconds after injection, six radiolabeled solutes minimally metabolized by brain, $^3$H$_2$O, isopropanol, nicotine, antipyrine, 3-O-methylglucose, and codeine, left the brain according to first-order kinetics. Two solutes metabolized by brain, lactic acid and heroin, behaved in a more complex fashion. The behavior of the six nonmetabolized solutes was interpreted satisfactorily by a simple model in which the brain is treated as a single compartment. From the model, uptake at 15 seconds as a percentage of the dose is linearly related to the permeability when the uptake is low, i.e., 30% or less. In higher uptakes blood flow becomes increasingly important. The efflux rate is similarly related to permeability and blood flow, but additionally it depends inversely on brain space. The exchanges of $^3$H$_2$O, isopropanol, and nicotine were determined almost continuously from onset through acute and chronic phases of intracarotid injection of a silicone polymer molded into an elastic cylinder regularly caused segmental occlusion of the middle cerebral artery in sedated but conscious rhesus monkeys. Clinical changes were quantitatively monitored continuously from onset through acute and chronic phases and precise correlations made with postmortem vascular and parenchymal pathology. Minor anatomical variations in the size and branching patterns of the middle cerebral artery in this primate species paralleled those in man. Uniformity in patterns of the acute natural history and specificity in clinical pathological correlations substantiate the utility of this stroke model for tests of therapeutic efficacy.

**AB-2571-76**

**Effects of Carotid Hypotension on Aortic Hemodynamics in the Unanesthetized Dog** — Cox RH, Fronek A, Peterson LH (The Rockefeller University, New York, New York 10021) — *Am J Physiol* 229: 1376–1380 (Nov) 1975*

The effects of occlusion of the brachiocephalic artery on aortic hemodynamics were assessed in 12 chronically instrumented dogs in the unanesthetized state. Continuous measurements of ascending aortic pressure and flow were made. In the steady state following occlusion, heart rate increased by 36% and mean arterial pressure by 45%, while cardiac output was unchanged from preocclusion levels. Values of peripheral resistance and ascending aorta input impedance were both increased during occlusion. Graded occlusions of the brachiocephalic artery produced graded, monotonic increases in the entire aortic impedance spectrum between 2 and 20 Hz with more sensitive responses occurring with the smaller, submaximal responses. Considered with results of previous studies, these results suggest that activation of smooth muscle in large conduit arteries is also associated with the pressor response which accompanies carotid hypotension and that such activation has a hemodynamically significant effect.

**AB-2572-76**


The treatment of arteriovenous malformations has been one of the most difficult of neurosurgical problems. A high percentage of these cases can be satisfactorily treated by embolization. A series of such cases is reported here. In many instances this is more satisfactory than direct surgical intervention.

**AB-2573-76**

**Clinicopathological Validation of a Primate Stroke Model** — Laurent JP, Molinari GF (NIH, Building 36, Room 4A03, Bethesda, Maryland 20014), Moseley JI — *Surg Neurol* 4: 449–454 (Nov) 1975*

A method recently developed in our laboratory has been evaluated for clinical and pathological reliability and validity. Intracarotid injection of a silicone polymer molded into an elastic cylinder regularly caused segmental occlusion of the middle cerebral artery in sedated but conscious rhesus monkeys. Clinical changes were quantitatively monitored continuously from onset through acute and chronic phases and precise correlations made with postmortem vascular and parenchymal pathology. Minor anatomical variations in the size and branching patterns of the middle cerebral artery in this primate species paralleled those in man. Uniformity in patterns of the acute natural history and specificity in clinical pathological correlations substantiate the utility of this stroke model for tests of therapeutic efficacy.

**AB-2574-76**

**Hypothalamic Dysfunction and Intracranial Arterial Spasms** — Wilkins RH (Department of Neurosurgery, University of Pittsburgh, Pittsburgh, Pennsylvania 15213) — *Surg Neurol* 4: 472–480 (Nov) 1975*

Evidence is presented that suggests that dysfunction of the hypothalamus is an important step in the development of intracranial arterial spasm which accompanies subarachnoid hemorrhage and craniocerebral trauma. Speculation is offered as to the possible pathogenetic mechanisms involved.

**AB-2575-76**

**Cyclic Adenosine Monophosphate Antagonism of Prostaglandin Induced Vasospasm** — Peterson EW (Neurological Surgery, University of Ottawa Medical School, Ottawa, Ontario, K1Y 4G2, Canada), Leblanc R, Lebel F — *Surg Neurol* 4: 490–496 (Dec) 1975*

Prostaglandin F$_{2\alpha}$ was applied topically to the transclavicularly exposed basilar artery of the cat. The resultant vasoconstriction and its reversal by dibutylryl cyclic adenosine monophosphate were recorded photographically and measured, and the results analyzed statistically. Arterial BP, $\mathrm{Paco}_2$, $\mathrm{Po}_2$ and pH were determined to insure that the vascular responses were not due to any general physiological disturbance. The results indicated that prostaglandin F$_{2\alpha}$ is a powerful vasoconstrictive substance and that its effects are readily reversible by dibutylryl cyclic adenosine monophosphate.

*Authors' abstract.*
AB-2576-76

Twenty-one patients had their cerebral function measured preoperatively and three months after carotid endarterectomy using the Halstead-Reitan neuropsychological test battery. Thirteen patients were cerebrally impaired preoperatively, but 12 of them improved appreciably after surgery. Changes in internal carotid arterial blood flow measured preoperatively showed no significant correlation with the improvement in neuropsychological status. We think that carotid endarterectomy carries an even better prophylaxis for the brain as a whole than had been thought.

AB-2577-76
Spontanverlauf und Prognose einseitiger Carotisverschlüsse (Course and Prognosis of Unilateral Carotid Artery Occlusion) — Haferkamp G (Psychiatrische und Nervenklinik der Städtischen Krankenanstalten Nürnberg, Nürnberg, Germany) — Arch Psychiat Nervenkr 220: 171-186, 1975 (Springer-Verlag, publisher)*

In 80 patients with unilateral carotid artery occlusions who had neurological symptoms, course and prognosis without anticoagulant or surgical therapy were analyzed. Of these patients, 17.5% died within four weeks, 43% of this group from extracerebral complications. The survival time of those patients surviving the acute stage was also shortened: one year later only 67% of the patients were still alive, five years later 58% and after ten years only 42%. Many cases died from further cerebrovascular strokes. In most of the patients carotid artery occlusion was only one of the symptoms of a generalized arterial disease, i.e., arteriosclerosis. Resulting poor collateral circulation may be the crucial factor leading to the poor prognosis as to survival and rehabilitation: only 3.8% of the patients returned to work, 19% were able to walk, and 55% needed nursing.

These facts demand prophylactic measures: first, a decisive therapy with respect to the risk factors of stroke, and second, an alertness to transitory ischemic attacks or small strokes. The latter were found in 56% of our patients. The literature and value of different therapeutic measures will be discussed.

AB-2578-76
Sequence of Electromyographic Abnormalities in Stroke Syndrome — Johnson EW, Denny ST, Kelley JP (Department of Physical Medicine, Ohio State University, Columbus, Ohio 43210) — Arch Phys Med Rehab 56: 468-473 (Nov) 1975*

In 20 stroke patients who were examined by repeated electromyography, fibrillation potentials and positive waves were noted as early as seven to ten days after the stroke and gradually disappeared as volitional potentials and spasticity appeared. This sequence of events occurred first in the anti-gravity muscles, then in their antagonists and finally in the most distal muscles. We hypothesize that the abnormal irritability is a consequence of the loss of the neurotrophic influence on the muscle fiber after the stroke.

AB-2579-76

The influence of the sympathetic nervous system on the cerebral circulatory response to graded reductions in mean arterial blood pressure was studied in anesthetized baboons. Cerebral blood flow was measured by the 133Xe clearance method, and arterial blood pressure was decreased by controlled hemorrhage. In normal baboons, the constancy of cerebral blood flow was maintained until mean arterial blood pressure was approximately 65% of the baseline value; thereafter, cerebral blood flow decreased when arterial blood pressure was reduced. Superior cervical sympathectomy of two to three weeks' duration did not affect the normal response. In contrast, both acute surgical sympathectomy (cervical trunk division) and a-receptor blockade (1.5 mg/kg of phenoxybenzamine) enhanced the maintenance of cerebral blood flow in the face of hemorrhagic hypotension that cerebral blood flow did not decrease until mean arterial blood pressure was approximately 35% of the baseline value. The results indicate that the sympathetic nervous system is not involved in the maintenance of cerebral blood flow in the face of a fall in arterial blood pressure. Indeed, the implication is that the sympathicoadrenal discharge accompanying hemorrhagic hypotension is detrimental to, rather than responsible for, cerebral autoregulation.

AB-2580-76
Elective Carotid Artery Resection — Martinez SA, Oller DW, Gee W (Department of Otolaryngology, National Naval Medical Center, Bethesda, Maryland 20014), deFries HO — Arch Otolaryngol 101: 744-747 (Dec) 1975*

A retrospective study of carotid artery resection disclosed a 64% mortality when resection was performed on an emergency basis, as compared with 14% when the surgery was undertaken electively. This concurs with other studies that have demonstrated increased survival rates when elective carotid artery resection has superseded carotid artery rupture, and emphasizes the need for a more accurate means of predicting individual tolerance for loss of the carotid artery.

Use of the ocular plethysmograph (OPG) is proposed as a simple and accurate means of evaluating the adequacy of collateral hemispheric blood flow to compensate for a potentially resectable carotid artery.

Eleven patients have been evaluated using this technique. Nine were predicted to successfully tolerate carotid artery resection, while intolerance was predicted for the remaining two. Four of the nine patients have undergone resection of the artery with no neurologic sequelae to date.
Brain Circulation in Cerebral Transient Ischemic Attacks — Fujishima M, Tanaka K, Fukiyama K, Omae T (Second Department of Internal Medicine, Faculty of Medicine, Kyushu University, Fukuoka City 812, Japan) — Jap Heart J 16: 654–663 (Nov) 1975*

Cranial blood flow, mean cranial transit time and cranial blood volume were measured by the intravenous RISA technique in ten patients with cerebral transient ischemic attacks (TIA) at various time intervals from the onset of the last attack. Cranial blood flow was subnormal in 5 out of 11 determinations and mean transit time tended to be prolonged in the diseased hemisphere in cases suggestive of the unilateral hemispheric lesion.

A decrease in cranial blood flow was observed in TIA with lowering of heart rate below 60 beats per minute, or with atrial fibrillation, whereas no obvious correlation was present between heart rate and cranial blood flow in either 94 patients with or 62 patients without cerebrovascular diseases.

Cardiac dysrhythmias including bradycardia, leading to reduced perfusion to the brain, were discussed as a possible factor for producing TIA.

Effect of Thiouracil Upon Canine Arterial Elastic Tissue — Trillo A (Department of Pathology, Bowman Gray School of Medicine of Wake Forest University, Winston-Salem, North Carolina 27103) — Atherosclerosis 22: 369–377 (Nov–Dec) 1975*

Unlike some other mammalian species, the dog is relatively resistant to the development of elevated levels of serum cholesterol after prolonged cholesterol feeding. This may be overcome by suppressing thyroid activity with thiouracil. Information regarding possible activity of thiouracil itself upon the arterial tissues is almost nonexistent. The present investigation was undertaken to test whether this drug has any such action, especially upon the arterial elastic tissues.

Destructive changes were observed in arterial elastic tissues in dogs given thiouracil for three and six months. The changes consisted of accentuation of the elastic fibrillar components, formation and subsequent coalescence of clefs, and fragmentation and ultimate "dissolution" of the elastic elements. The results suggest that thiouracil may exert a damaging effect upon the arterial elastic fibers; thus, it is possible that one of the mechanisms by which thiouracil and cholesterol administration induces experimental atherosclerosis in the dog is by elastic tissue destruction, possibly promoting the subsequent lipid accumulation in the arterial wall.

Aneurysm of the Posterior Inferior Cerebellar Artery of a 5-Year-Old Girl — Kamm RC (Department of Pathology, Louisiana State University Medical Center, Shreveport, Louisiana 71130) — Am J Dis Child 129: 1437–1439 (Dec) 1975*

A case of a congenital aneurysm located on the left posterior inferior cerebellar artery, which ruptured producing subarachnoid hemorrhage and death in a five-year-old girl, is presented. The very low incidence of congenital aneurysms in young children and the relatively rare occurrence of aneurysms of the verteobasilar system are two additional unusual features of this case.

Congophilic Angiopathy Complicated by Surgery and Massive Hemorrhage: A Light and Electron Microscopic Study — Torack RM (Department of Pathology, Washington University School of Medicine, St. Louis, Missouri 63110) — Am J Pathol 81: 349–366, 1975*

Three autopsied cases of congophilic angiopathy have been studied by means of polarized light microscopy and in two of these, biopsy material was available for electron microscopic study. All three patients had a surgical procedure and a subsequent massive hemorrhagic episode. Two of these patients had clinical evidence of dementia syndrome, for which shunts were performed. Ultrastructural studies have confirmed the amyloid nature of the congophilic material in the two biopsied cases. The deposition of amyloid in these cases was believed to be a primary event and was related to a generalized body disorder. The distinction of congophilic angiopathy from Alzheimer's disease is discussed.

An Evaluation of Electroencephalographic Monitoring for Carotid Study — Baker JD, Guecklich B, Watson CW, Marcus E, Kumat V, Callow AD (171 Harrison Avenue, Boston, Massachusetts 02111) — Surgery 78: 787–794 (Dec) 1975*

Continuous electroencephalogram (EEG) monitoring was used during 213 carotid endarterectomies in 157 patients to identify cerebral ischemia. General anesthesia was used for all patients. An intraluminal shunt was not used routinely, but was inserted in 23 operations when EEG abnormalities associated with ischemia appeared. EEG changes occurred in 31 operations (14.5%). Four patterns of abnormal recordings were identified and are discussed. Six patients had ischemic EEG changes in association with hypotension during endarterectomy. In two of these patients changes appeared with a blood pressure drop of only 20 mm Hg below preoperative levels. Four patients with internal carotid artery back pressures of 75 to 100 mm Hg had EEG abnormalities which disappeared after shunt insertion. Our experience emphasizes the value of continuous EEG monitoring in detecting inadequate cerebral perfusion.

Characteristics and Limits of Tolerance in Repeated Subarachnoid Hemorrhage in Dogs — Steiner L (Department of Neurosurgery, Karolinska Hospital, 104 01 Stockholm 60, Sweden), Löfgren J, Zwentnow NN — Acta Neurol Scand 52: 241–267 (Oct) 1975*

The effects of repeated subarachnoid hemorrhage have been investigated experimentally in dogs. The main objectives were to determine the tolerance to repeated hemor-
rhage and to study the changes occurring during the repeated bleeds in intracranial pressure, EEG, ECG, systemic arterial pressure and respiration. The natural course of an intracranial hemorrhage was simulated by shunting blood from a femoral artery through a drop recorder into five different sites in the craniospinal system: the chiasmatic cistern, a lateral ventricle, the cisterna magna, the lumbar subarachnoid space, and the cerebral tissue of the left frontal lobe. The hemorrhage was allowed to continue until it stopped spontaneously. Each bleed resulted in a transient rise in intracranial pressure to the level of the arterial pressure, followed by a return to a steady state value. The time taken for the attainment of the steady state was increasingly prolonged. The final steady state pressure increased with each bleed. Ultimately, a stage was reached where the hemorrhage resulted in a sustained high pressure at the level of the arterial blood pressure, producing failure of vital functions and an irreversibly isoelectric electroencephalogram. The average number of bleeds necessary to produce this state in the case of hemorrhage into brain parenchyma was three (range two to four), into the lateral ventricle, four (range three to five), and into the cisterna chiasmatica, five (range two to seven). After five hemorrhages into the cisterna magna and the spinal subarachnoid space, a local resistance at the bleeding site was built up which prevented further bleeding.

**AB-2587-76**

**Lethal Mechanism in Repeated Subarachnoid Hemorrhage in Dogs** — Steiner L (Department of Neurosurgery, Karolinska Hospital, 104 01 Stockholm 60, Sweden), Löfgren J, Zwentnow NN — *Acta Neurol Scand* 52: 268–293 (Oct) 1975*

The mechanism limiting the tolerance to repeated subarachnoid hemorrhage was analyzed experimentally. Blood introduced by an extracorporeal femorointrathecal shunt or by injection into five different sites of the craniospinal system in living and dead dogs produced a progressive increase in the steady state CSF pressure after each subsequent bleed. The pressure increase was quantitatively related to the amount of blood entering the system. A comparison of the respective effects of injections of whole blood and of erythrocytes indicated that the red blood cells were the component which induced an increase in the outflow resistance by clogging the pathways of the cerebrospinal fluid. The increase in outflow resistance with each bleed resulted in a stepwise rise in pressure to a level incompatible with survival. The lethal volume of blood was specific for each site of hemorrhage, namely, for brain parenchyma 8.1 ml, lateral ventricle 16.2 ml, cisterna chiasmatica 17.7 ml, cisterna magna 30 ml, and spinal subarachnoid space 55 ml. The assumption that death might be a random event was discarded, the failure of vital functions being considered to be the result of the high intracranial pressure. Mock bleeds using intrathecal infusions of saline suggested that spatial decapsulation rather than cumulative ischemic effects caused death.

**AB-2588-76**

**Die Ophthalmoplegische Migräne (Ophthalmoplegic Migraine)** — Carroll JD (Regional Neurological Unit, Guildford, Surrey, England) — *Münch Med Wschr* 49: 1941–1942 (Dec 5) 1975*

This is a report of 20 patients with ophthalmoplegic migraine, whose examination failed to reveal symptomatic causes, and vascular deformities in particular (table 1). The course, symptomatology and findings are discussed.

<table>
<thead>
<tr>
<th>Table 1 Ophthalmoplegic Migraine</th>
<th>Cases</th>
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<tr>
<td>Oculomotor nerve (III)</td>
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<tr>
<td>Oculomotor nerve (III), trochlear (IV), abducens nerves (VI)</td>
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<td>Oculomotor nerve (III), abducens nerves (VI)</td>
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**AB-2589-76**


For more than 18 years, the authors have performed 119 elective carotid endarterectomies on 84 patients with asymptomatic bruits and arteriographically demonstrated internal carotid artery plaques. There was no operative mortality. Two patients (1.7%) had permanent mild neurological abnormalities from the procedure. Since then, no patient has died of stroke. One has had a major stroke and one has had a minor stroke.

For comparison, 102 patients with asymptomatic bruits were not operated upon due to various reasons, such as patient's preference, referring physician's preference, soft unilateral bruit. This control series has been followed for ten years; 54% have remained asymptomatic, 27% had transient ischemic attacks and were operated upon, and 19% had frank strokes usually without TIAs.

The authors recommend oculoplethysmography as a safe, noninvasive diagnostic procedure to help determine whether a bruit denotes a significant carotid lesion. It is reported to be 91% accurate. The degree of correlation of an audible bruit in the neck with a significant stenotic lesion is between 75% and 85%.

Arteriography and surgery are not recommended if the bruit is unilateral and very soft, if the patient's condition precludes surgery, if multiple risk factors are present, or if the oculoplethysmogram is negative.

**AB-2590-76**

**Thrombotic Thrombocytopenic Purpura. Systemic Embolization From Nonbacterial Thrombotic Endocarditis** — Vilanova JR, Norenberg MD, Stuard ID (Department of Pathology, University of Rochester School of Medicine and Dentistry, Rochester, New York) — *NY State J Med* 75: 2246–2248 (Oct) 1975

A fulminant case of thrombotic thrombocytopenic purpura (TTP) is presented in a 26-year-old woman free of sepsis, lupus erythematosus, disseminated intravascular
coagulation, or vasculitis. She died 16 days after the onset of her first symptom.

Postmortem examination demonstrated two friable vegetations loosely attached to the mitral valve. They were platelet aggregates surrounded by fibrin. No bacteria or fungi were demonstrable. Emboli similar to the vegetations were found in the coronary arteries, arcuate arteries of the kidneys, and follicular arteries of the spleen. There were two cerebral infarctions and, while no cerebral emboli were found, the anatomic placement of the lesions suggested embolization. Petechial hemorrhages were present in the skin, heart, kidneys, posterior pituitary, pancreas, adrenals, bone marrow, and lymph nodes. No petechiae were demonstrable in the brain.

The authors feel that nonbacterial thrombotic endocarditis and its embolization have received less attention in this disorder than they deserve.

**AB-2591-76**

**Transient Paraplegia From Hematoma After Lumbar Puncture: A Consequence of Anticoagulant Therapy** — Messer HD (22 Charles Street, New York, New York 10014), Forshan VR, Brust JCM, Hughes JEO — *JAMA* 235: 529–530 (Feb 2) 1976

A 51-year-old woman with rheumatic valvular disease was receiving heparin for presumed embolic transient ischemic attacks. A lumbar puncture was performed and showed normal cerebrospinal fluid. Warfarin sodium was added to her medications. Three days after the lumbar puncture, she had low back pain, tenderness over the puncture site, and a bilateral headache when standing. Over the next ten days, the back pain continued. Then she had numbness and weakness of both legs and back pain radiating into the buttocks. There was exquisite low back tenderness. Examination disclosed a flaccid paraplegia with loss of deep tendon reflexes. The bladder was distended. Attempted myelography at L5-S1 disclosed old blood. A cisternal puncture disclosed clear fluid, and myelography via this route showed a partial block at C5, tapering to a complete block at T2. This was either subdural or epidural. The patient improved during the next two weeks. Mention is made of intraspinal bleeding in the anticoagulated patient.

**AB-2592-76**

**Ischaemic Brain Damage of Cerebral Perfusion Failure Type After Treatment of Severe Hypertension** — Graham DI (University Department of Neuropathology, Institute of Neurological Sciences, Southern General Hospital, Glasgow G51 4TF, Scotland) — *Br Med J* 4: 739 (Dec 27) 1975

Two cases are reported in which precipitate lowering of severe high blood pressure resulted in cerebral infarctions in watershed zones between major arterial territories. Both patients had malignant hypertension. In one of them, the blood pressure, originally 240/140 mm Hg, was lowered in two hours to 120/85 mm Hg — an unremarkable pressure for a person with normal autoregulation, but inadequate for this patient. Impaired autoregulation can result in infarction in patients with severe hypertension. In both patients, all of the major intracranial and extracranial arteries were patent.

**AB-2593-76**


Among 234 hemophiliacs, 14 patients (5.9%) with intracranial and one patient (0.4%) with intramedullary hemorrhage were observed and examined. The average age at the time of hemorrhage was 17 years in patients with severe hemophilia and 43 years in patients with moderate hemophilia. The patients with mild hemophilia and intracranial bleeding were 5 and 58 years old, respectively.

Eight intracerebral, three subdural and four subarachnoid hemorrhages were encountered. In seven cases bleeding was posttraumatic and in five it occurred spontaneously. In two patients hemorrhage followed a sudden increase of intracranial pressure. In one patient reliable data could not be obtained.

Four of the eight patients with intracerebral bleeding died; all survivors displayed some residual neurological abnormalities. All patients who had subarachnoid bleeding recovered completely. No serious complications were encountered after three lumbar punctures, five cerebral angiographies, and one myelography. Only in one case with an acquired inhibitor did a local hematoma develop at the site of puncture for the angiography.

The same diagnostic procedures should be performed after substitution therapy with antihemophiliac plasma in a hemophilic without inhibitor as in non-hemophiliacs if intracranial or intramedullary bleeding is suspected. In hemophiliacs with an anticoagulant, angiography or lumbar puncture should be performed only in exceptional cases.

**AB-2594-76**

**Lateral Medullary Syndrome in a Child: Arteriographic Confirmation of Vertebral Artery Occlusion** — Klein RA, Snyder RD (Department of Neurology, University of New Mexico School of Medicine, Albuquerque, New Mexico 87131), Schwarz HJ — *JAMA* 235: 940–941 (Mar 1) 1976

A case is presented of an eight-year-old Navajo boy who fell on the right side of his face without loss of consciousness or apparent injury. The next day, he had headache, staggering, difficulty swallowing, vertigo, and a mild left hemiparesis. Neurological examination disclosed a lateral medullary syndrome. Angiography demonstrated occlusion of the left vertebral artery, 6 mm from the junction with the basilar. There was no filling of the left PICA, and the left AICA was hypoplastic. There was no evidence of cardiac, collagen, hematologic, cervical, or other disease.

**AB-2595-76**

**Polyvinyl Alcohol (Ivalon) — A New Embolic Material** — Tadavarthy SM (Department of Radiology, University of Minnesota Hospitals, Minneapolis, Minnesota 55455),
Compressed Ivalon sponge can be embolized via a catheter into the blood stream, where it will swell six to ten times its original size. It is biocompatible and inert and is ultimately invaded by fibroblasts. Recanalization does not occur. It is available in a radiopaque form and can be gas sterilized. As too forceful catheter injection can result in reflux of the material and embolization of other blood vessels, fluoroscopic control is strongly urged. Ivalon can also be wrapped around a guidewire and introduced. When it is moistened by blood, it unwraps itself and the wire may be withdrawn.

**AB-2596-76**


When fluorescein is injected into a vein, there is normally a symmetrical fluorescence of the face 15 seconds later, including the inner canthi, lids, and forehead with unilateral carotid ischemia; there is a lag in the appearance of the fluorescence in the upper half of the face on the side of the lesion. These findings correlate well with studies of the temperature of the skin and cornea, which is 70% to 80% accurate in diagnosing carotid ischemia. Fluorescein angiography is extremely inexpensive and safe.

**AB-2597-76**

**Acute Fragility of Cerebral Blood Vessels in Hepatic Coma** — Slade WR Jr (Brooklyn VA Hospital, Brooklyn, New York 11209), DeSoto F, Jimenez FA, Roizin L, Poulouse KP — *Angiology* 26: 803–808 (Dec) 1975

A case is presented in which a 50-year-old man with cirrhosis died in hepatic coma. Autopsy revealed 500 cc of fresh unclotted blood inside the dura, especially around the base. There was a prominent capillary network in the brain, including the brain stem, and there were small-sized and medium-sized congested blood vessels throughout, with petechial hemorrhages and glial reaction. Perivascular acute hemorrhages were present. As well as older lesions typical of Wernicke's encephalopathy, there were fresh areas of perivascular acute hemorrhages and glial reaction. Perivascular permeability is the early stage of the Wernicke lesion.

In hepatic decompensation, the hemorrhagic diathesis may be due to vitamin K and vitamin B deficiency, circulating endotoxin activating Hagemann factor, a low level of clotting factors produced in the liver, hypofibrinogenemia, thrombocytopenia, and disseminated intravascular coagulation.

**AB-2598-76**

**Oxygen Availability and Blood Flow in the Temporal Lobes During Spontaneous Epileptic Seizures in Man** — Dymond AM (VA Hospital [Brentwood], Los Angeles, California 90073), Crandall PH — *Brain Res* 102: 191–196 (Jan 30) 1976

Eleven patients with uncontrolled focal epilepsy underwent implantation into the brain of chronic depth electrodes capable of recording EEG, regional oxygen availability (O₂a) and regional blood flow (by temperature changes). Spontaneous seizures were recorded. Regional blood flow increased at the onset of the seizures and was greater on the side of the focus. The magnitude of the increase correlated with the intensity of the seizure. The normal rhythmic fluctuations in O₂a became less prominent during seizures. O₂a increased slightly in mild seizures but became extremely low in regions near the seizure focus during intense seizures. The authors recommend that seizures be terminated as soon as possible and that supportive measures be given to prevent cellular damage from this hypoxia.

**AB-2599-76**

**Transfusion Therapy for Cerebrovascular Abnormalities in Sickle Cell Disease** — Russell MO (Division of Hematology, Children's Hospital, Philadelphia, Pennsylvania 19104), Goldberg HI, Reis L, Friedman S, Slater R, Reivich M, Schwartz E — *J Ped* 88: 382–387 (Mar) 1976

Five children with sickle cell disease and symptoms of stroke had angiograms, all of which were abnormal. In preparation for the angiograms, all five children were carefully hydrated and transfused until the hemoglobin was above 10 gm/dl and the hemoglobin S was reduced to less than 30%. Afterward, the children were seen every four to six weeks. Three patients were transfused as outpatients every month to maintain nearly normal hemoglobin concentration. This suppressed red cell production and kept the level of hemoglobin S to less than 30%. After a year, all five children were prepared as before for angiography. The two untransfused children had progression of arterial abnormalities, primarily beaded-appearing stenoses of cerebral blood vessels. The three transfused children had improvement of their angiograms, two now being normal. The third child, while stenosis and beading were improved, had some persistent areas of narrowing, though all her vessels were now smooth-walled. No transfused child had new neurological findings.

**AB-2600-76**


Thirteen baboons underwent insertion of polyurethane-covered platinum electrodes into the cerebral cortex, and oxygen tension was measured under a variety of conditions. Mean cortical Po₂ was 23.8 ± 12 mm Hg. Inhalation of hydrogen reduced the Po₂, while halothane inhalation increased Po₂.

Clipping the middle cerebral artery profoundly reduced cortical oxygen tension. When the baboon was suddenly switched from breathing O₂ to breathing room air, cortical oxygen tension fell, and the rate of fall was faster in those which had undergone a period of middle cerebral artery occlusion.

**AB-2601-76**

**Changes in Regional Cortical Tissue Oxygen Tension and Cerebral Blood Flow During Temporary Middle Cerebral...**

Thirteen baboons had their cerebral cortical tissue oxygen tension measured by platinum electrodes and their cerebral blood flow measured by the hydrogen clearance technique before, during, and after temporary clipping of the middle cerebral artery for either one hour or 15 minutes. During the occlusion, there was a decrease in cortical O₂ and CBF, worse in the opercular area than in the parietal area. After removal of the clip, there was a period of rebound hyperoxia and hyperemia lasting up to five minutes in some areas, but in the more severely hypoxic areas, mean tissue Po₂ reached only 60% to 80% of control values after clip removal. A second clipping gave similar results, except that there were fewer instances of hyperoxia.

AB-2602-76
The Use of Xeroradiography in the Investigation of Diseases Occurring in the Central Nervous System — Momose KJ (Department of Radiology, Massachusetts General Hospital, Boston, Massachusetts 02114), Kalisher L — Am J Roentgen Rad Ther Nucl Med 125: 662–670 (Nov) 1975

Conventional roentgenograms, tomograms, and xeroradiograms were made in 88 cases of normal and abnormal conditions of the central nervous system and skull studied by pneumoencephalography, air myelography, and skull series. Tomography gave the most information. Xeroradiography of the pneumoencephalogram gave greater detail in delineating the brain stem, ventricular system, sulci, and cerebellar folia than did conventional roentgenography, because of differences in resolution. Xeroradiography demonstrates calcification very well. Because of its wide recording latitude, all radiodensities can be shown on a single exposure.

AB-2603-76
Aphasia With Infarction in the Territory of the Anterior Cerebral Artery — Rubens AB (Hennepin County General Hospital, Aphasia Center, Minneapolis, Minnesota 55415) — Cortex 11: 239–250, 1975

Two cases are presented in which infarction in the territory of the left anterior cerebral artery resulted in profound disturbance of speech characterized by lack of spontaneous conversation, excellent repetition and reading, and relatively spared comprehension. Both patients perseverated in their speech. One had echolalia and the other was unable to refrain from completing partial sentences given to her. Neither had phonemic paraphasia. The disturbance may have been due to damage to the superior and mesial premotor area, particularly the supplementary motor region. Both patients improved.

AB-2604-76
Recovery of Decreased Synaptosomal 2-Deoxy-D-[3H]Glucose Uptake After Cerebral Ischemia in Mongolian Gerbils — Spatz M (Laboratory of Neuropathology and Neuroanatomical Sciences, National Institute of Neurological and Communicative Disorders and Stroke, Bethesda, Maryland 20014), Mrsulja BB, Mrsulja BJ, Klatzo I — Brain Res 103: 193–198 (Feb 13) 1976

Functional glucose transport was investigated in synaptosomes (pinched-off nerve endings) during and after cerebral ischemia. During the ischemia produced by left common carotid occlusion and lasting 60 to 180 minutes, hexose uptake decreased progressively and could not be increased by the addition of ATP, ADP, cAMP or PEP to the incubation solution. After the re-establishment of the circulation, however, hexose uptake was rapidly restored and was completely normal one hour later.

AB-2605-76
Cardiac Arrhythmias in Acute Central Nervous System Disease: Successful Management With Stellate Ganglion Block — Grossman MA (Department of Medicine, State University of New York, Upstate Medical Center, Syracuse, New York) — Arch Int Med 136: 203–207 (Feb) 1976

A patient with a subarachnoid hemorrhage from a basilar artery aneurysm had ventricular tachycardia and was unsuccessfully treated with lidocaine, phenytoin, procainamide, digoxin, propranolol and atropine. A left stellate ganglion block was performed with 15 ml of 1% lidocaine, and within 15 minutes the rhythm was normal. The T waves, which had been broad and symmetric with a prolonged QT interval, progressively became more normal over the next 18 hours.

AB-2606-76

Thirty-eight drugs affecting eight platelet function tests are discussed. Aspirin prolongs bleeding time and carries with it some risk of hemorrhage. For most of the other antiplatelet drugs, it is not known with certainty whether there is excess risk of hemorrhage. Many pregnant women take platelet-altering drugs, and there is a potential risk of hemorrhage in the newborn. The authors provide an extensive list of references on drugs altering platelet function.

AB-2607-76

Microspheres of human serum albumin labeled with 99mTc were slowly injected into the carotid arteries of 53 patients with brain infarcts. Scanning procedures showed the pattern of cerebral blood flow. Patients had a carotid arteriogram at the same time. Morbidity was not different from that of arteriography alone. The local vascular deficits were defined more reliably (88%) by the microsphere technique than by
arteriography (18%) or pertechnetate scanning (58%). Accessory vascular supplies were also well demonstrated by the microsphere technique. Anaphylactoid reaction is reported but is rare.

**AB-2608-76**

**Spinal Cord Blood Flow After Acute Experimental Cord Injury in Dogs** — Griffiths IR (Department of Veterinary Surgery, University of Glasgow Veterinary Hospital, Bearsden, Glasgow, Scotland) — *J Neurol Sci* 27: 247-259 (Feb) 1976

Spinal cord blood flow in dogs was measured with platinum electrodes by the hydrogen clearance technique. Measurements were taken from central gray matter, central white matter, and peripheral white matter before and after spinal cord injury. After a 300 g-cm force (GCF) injury, there was a progressive severe reduction in blood flow in the gray and central white matter occurring immediately. After trauma, the effect of CO₂ as a vasodilator was lost in the gray matter and central white matter and also in the peripheral white matter, in spite of normal blood flow in the peripheral white matter. Results were more pronounced after a 500 GCF injury.

**AB-2609-76**

**Ischaemic Optic Neuropathy: The Clinical Profile and Natural History** — Boghen DR, Glaser JS (1638 Tenth Avenue NW, Miami, Florida 33152) — *Brain* 98: 689-708 (Dec) 1975

Clinical profiles are reviewed of 50 patients with ischemic optic neuropathy; 13 were due to arteritis and 37 were idiopathic. In the idiopathic group, most patients were 56 to 70 years old; the average age in patients with temporal arteritis was 70 years. Amaurosis fugax preceding the visual loss was more common in arteritis than in idiopathic ischemic optic neuropathy. Myalgia and headache were more common with arteritis. The idiopathic condition does not predispose to stroke. Thirty-eight percent at some time became bilateral, but in only one-third of the cases was it after less than a year. In two patients with arteritis, both eyes were involved simultaneously, and in another two, the second eye was involved within a week. The visual deficit is usually stationary. All but two of the patients with arteritis had sedimentation rates more than 40, while four of 25 patients in the idiopathic group had sedimentation rates of 40 or more. High-dose systemic steroids are the treatment of choice in giant cell arteritis, though nerve infarction can occur in spite of this. No good remedy has been found for the idiopathic condition. Steroids and anticoagulants are discouraged.

**AB-2610-76**

**The Hemodynamic Basis of Atherosclerosis. Further Observations: The Bifurcation Lesion** — Texon M (Department of Forensic Medicine, New York University Medical Center, New York, New York) — *Bull NY Acad Med* 52: 187-200 (Feb) 1976

The author used the IBM 360 computer to investigate a model of the aortic bifurcation and to compute flow, pressure, velocity, and wall shear stress. Areas of reduced pressure exist at the sites of predilection for atherosclerotic plaques. Atherosclerosis, then, would be the biological response of blood vessels to the effects of blood flow mechanics.

**Items of Interest**


**Symposium on Cerebral Blood Flow and Metabolism** — Michenfelder JD (Department of Anesthesiology, Mayo Clinic, Rochester, Minnesota 55901) — *Anesthesiology* 44: 92-95 (Jan) 1976

**Segmental Nature of the Choroidal Vasculature** — Hayreh SS (Department of Ophthalmology, University of Iowa Hospitals, Iowa City, Iowa 52242) — *Br J Ophthalmol* 59: 631-648 (Nov) 1975

**Systemic Arterial Baroreceptor Reflexes** — Kirchheim HR — *Physiol Rev* 56: 100-176 (Jan) 1976


It was agreed by the participants in this study and by the International Committee on Thrombosis and Haemostasis (Vienna, 1973) that the thrombin preparation coded 70/157 is suitable to serve as an international standard for human thrombin.


The results suggest that the human plasmin preparation coded 72/379 is suitable to serve as a standard.
Abstracts

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