those of subarachnoid haemorrhage demonstrate that, although a history of smoking, vomiting at onset and a raised blood pressure at presentation, favour a diagnosis of subarachnoid haemorrhage, there is considerable overlap between the two conditions. Furthermore, factors known to precipitate benign headaches, such as exertion and sexual activity, may also precipitate subarachnoid haemorrhage. Therefore reliable clinical differentiation between the two conditions is not possible and in all cases of sudden onset unusual headache it is important that lumbar puncture and CT are performed; if these are normal the patient can then be reassured, and angiography is not routinely necessary.

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Differential diagnosis of spontaneous and traumatic intracranial haemorrhage

The introduction of computed tomography (CT) revolutionised the diagnosis of head injury as intracranial haemorrhages and lesions of the brain can be directly visualised. The cause of lesions shown by CT, however, can be difficult to interpret especially if information on the circumstances of the accident is missing and if the patient has retrograde amnesia. We report two patients in whom lack of information resulted in considerable diagnostic difficulties.

The first patient, a woman aged 21 years, fell off her horse and was unconscious for a few minutes. She stated that the horse had shied and she had been unable to stay in the saddle. She did not have retrograde amnesia. At the time of the examination she had a visible and palpable haematoma on the back of her head with multiple scrapes. There were no focal neurological signs. The CT scan showed a haemorrhage in the right parietal region. Nine days later, a scan showed an inhomogenous structure with possible calcification (figure 1). The MRI showed a cavernous angiomia in the right parietal region.

The second patient, a woman aged 51 years, suffered an accident while riding in a car on the autobahn. A tyre broke loose on a truck driving in the opposite direction and rolled into the car in which she was riding. She lost consciousness immediately and was subsequently intubated by a doctor in the emergency ambulance. At the time of admission she had a considerable scalp injury and a haematoma around the left eye. She localised to pain stimulation and did not show any focal neurological signs. Radiographs showed a left orbital roof fracture, a compression fracture of the third thoracic vertebra, and a ventral separation of the massa lateralis of the second cervical vertebra. In addition to the left orbital roof fracture, a CT scan showed extensive subarachnoid haemorrhage in the basal cisterns (figure 2), the interhemispheric cistern, and cortical subarachnoid space with infraventricular haemorrhage in the third and fourth ventricles. After intensive treatment she showed considerable improvement and was extubated after six days and slowly mobilised. Two weeks later the orbital fracture was closed surgically. A few hours later there was increasing loss of consciousness and headaches. The CT scan showed a new, fresh subarachnoid haemorrhage with ventricular haemorrhage. Angiography showed a pseu sized aneurysm of the supraclinoid part of the right internal carotid artery.

The differentiation between a spontaneous and a traumatic intracranial haemorrhage has important consequences. A spontaneous intracerebral haematoma of atypical localisation or a spontaneous subarachnoid haemorrhage require angiography to exclude or confirm a vascular lesion. Due to the great risk of recurrent haemorrhages early use of a surgical source is recommended. In contrast, traumatic subarachnoid haemorrhage does not require any surgical or other treatment. Difficulties arise in two main circumstances: either the patient suffers an accident for unknown reasons and the CT scan shows changes which are unusual for injury (patient 1), or the exact circumstances of the accident are known and apparently confirm injury but the CT scan shows another source for the intracranial haemorrhage (patient 2). Only the neuroradiological findings (patient 1) or the clinical progress (patient 2) led to a correct diagnosis of the vascular malformation. The injury must have led to a haemorrhage from the cavernous angioma and the supracranial aneurysm. In addition to failure to detect some consequences of injury or detection only after a time delay, the CT findings may lead to a misdiagnosis. The accident may result in a rupture of a vascular malformation or spontaneous haemorrhage may cause the accident. In such cases knowledge of the circumstances of the accident and careful analysis of the neuroradiological findings may lead to a correct diagnosis.

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Intracranial haemorrhage and death after iohexol myelography

We report a case of intracranial subarachnoid haemorrhage 12 hours after lumbar iohexol (Omnipaque, NYCOMED AS, Oslo) myelography.

A 35 year old healthy man was admitted having had sciatica for two months. Lumbar myelography was performed at the L4-5 level and was confined to the lumbar and dorsal regions. The cerebrospinal fluid (CSF) pressure and biochemical content were normal. Five ml of clear CSF was drained and 10 ml of iohexol (concentration 300 mg/ml) injected. The diagnosis of a prolapsed intervertebral disc was confirmed. The biochemical analysis of the CSF sample showed no abnormality. After the procedure the patient was confined to complete bed rest with the head end of the bed elevated. He was closely monitored and remained asymptomatic for 12 hours when, after vomiting, he started behaving abnormally and talked incoherently. He was febrile and had neck stiffness; meningismus was expected. A second lumbar puncture showed evidence of subarachnoid haemorrhage. He then had convulsions and lost consciousness, became breathless, and died two hours later. A complete postmortem examination was performed. The brain weighed 1400 g.
The disease, aneurysm was diagnosed radiologically. Histopathological examination showed that this does not occur in the left cerebral hemisphere (figure 1). The right cerebral hemisphere showed a smooth surface of the cerebral hemispheres (figure 2). The right lateral ventricle was seen over the left cerebral convexity. Patches of similar appearance were seen on the right hemisphere. No history of previous cardiac or respiratory disease was recorded. The haematological picture was normal. Blood pressure recordings before and after the procedure were within normal physiological limits. The bleeding was probably related to the lumbar myelography as it occurred within 12 hours after the procedure. Either the lumbar puncture or the dye used for myelography could have been the cause, the latter being only a remote possibility as iohexol has extremely low toxicity compared with other radiographic contrast media. Post-myelographic adverse reactions may be due to CNS irritation caused by the contrast medium used.1

Iohexol has been shown to cause less post-myelographic detrimental effects than metrizamide (Amipaque, Nyco)2 or iophendylate (Mepydo, Glaxo, UK). Headache and febrile episodes may occur after myelography and convulsions have occasionally been reported. Instances of anaphylactic reactions to the iodide compounds used have also been reported. Smith et al reported a case of severe cerebral vasospasm after iohexylate myelography.3 Bed rest after myelography is a common practice, although some believe that this does not influence the incidence of adverse reactions.4 An instance of haemorrhage occurred in a patient with leukaemia and coagulation disorder leading to quadriplegia5 and in a haematologically normal patient who underwent cervical myelography.6 Acute subdural haematoma at l0g through the right cervical spinal canal and virtually the entire posterior cranial fossa leading to death has been reported after lateral cervical puncture.7 This followed accidental puncture of an anomalous intra-sacral vertebra. Subarachnoid haematoma has occurred after lumbar puncture, causing cauda equina compression,8 and Llewellyn reported intracranial subdural haematoma complicating myelography.9 Multiple subdural haemorrhages after lumbar metrizamide myelography have also been reported.10 In all these cases definite causes which caused the haemorrhage could be identified. There are instances of intracranial haemorrhages after myelography with iohexylate contrast media in which no definite cause could be found. Dan reported a case of intracranial subdural haematoma after metrizamide myelography,11 and a similar case, with convulsions, subarachnoid haemorrhage and death after myelography with meglumine iohalamate, was reported by Bagchi in 1976.12

No definite cause for the intracranial bleeding in our patient was discovered. The clinical presentation, however, occurred 12 hours after myelography. In the absence of evidence for any other precipitating factor the possibility of association between the procedure and bleeding in this case cannot be ruled out.

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Comments by Dr H P Bahn of Nycomed AS: We, the manufacturers of the radiographic contrast media (CM) iohexol and metrizamide, believe that cerebral haemorrhage after myelography is more likely caused by the spinal puncture than by the CM itself. Our attention was first drawn to the subject by Professor RG Grainger of Sheffield who two years ago asked for information on possible CM reactions after the post-myelographic death of a 48 year old woman. This made us look for further cases, and since then another six (unpublished) cases have been identified by our pharmacovigilance unit. They have been reported from world wide sources; five are related to iohexol and one to metrizamide.

These numbers of reports are low compared to the estimated number of myelographies performed with iohexol and metrizamide throughout the years which amount to several million. The cases reported to us were, strangely enough, all women (p = 0.078) aged from 41 to 66 years. None had any relevant pre-existing disease and all were admitted for myelography by the lumbar route for low back pain, disc disease, or radicular symptoms. Most had more than
Intracranial haemorrhage and death after iohexol myelography.

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