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VASOSPASM IN THE INTRACRANIAL ARTERIES AFTER SUBARACHNOID HAEMORRHAGE - CASE REPORT

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Vasospasm and raised intracranial pressure (ICP) are common complications in subarachnoid haemorrhage (SAH) due to ruptured intracranial aneurysm. Vasospasm can be reliably monitored by repeated transcranial Doppler (TCD) examinations. The changes in flow velocities due to vasospasm are useful for early diagnosis, monitoring effectiveness of treatment and determining prognosis. Intracranial pressure can also increase to dangerous levels and affect blood flow in the intracranial circulation. These changes in ICP may be evaluated by the spectral waveform patterns obtained during TCD examination. We describe the dynamic TCD spectral changes in a patient with SAH. The changes observed during serial TCD examinations, were well correlated with the neurological status. Transcranial Doppler is a reliable, non-invasive and reproducible test that can be used to monitor vasospasm and suspected of ICP in SAH. The use of TCD can be extended to other intracranial diseases that can potentially lead to an abnormally high ICP.

Key words: subarachnoid hemorrhage, Vasospasm, transcranial Doppler

Case report

We describe a case of a 59-year old man, with history of hypertension, and hypercholesterolemia, who was admitted in the intensive care unit of Second Clinic of Neurology - UMHAT "St. Marina" Varna with diagnosis Subarachnoid haemorrhage: Hunt-Hess grade ²V.

The angiography was not performed because of the sever status of the patient, perhaps due to rupture of an intracranial aneurysm. Daily transcranial Doppler (TCD) examination was performed. Transcranial Doppler examination was suggestive of an early vasospasm in the right internal carotid artery, however, the usual low resistance flow pattern of the intracranial circulation was still maintained (Fig. 1).

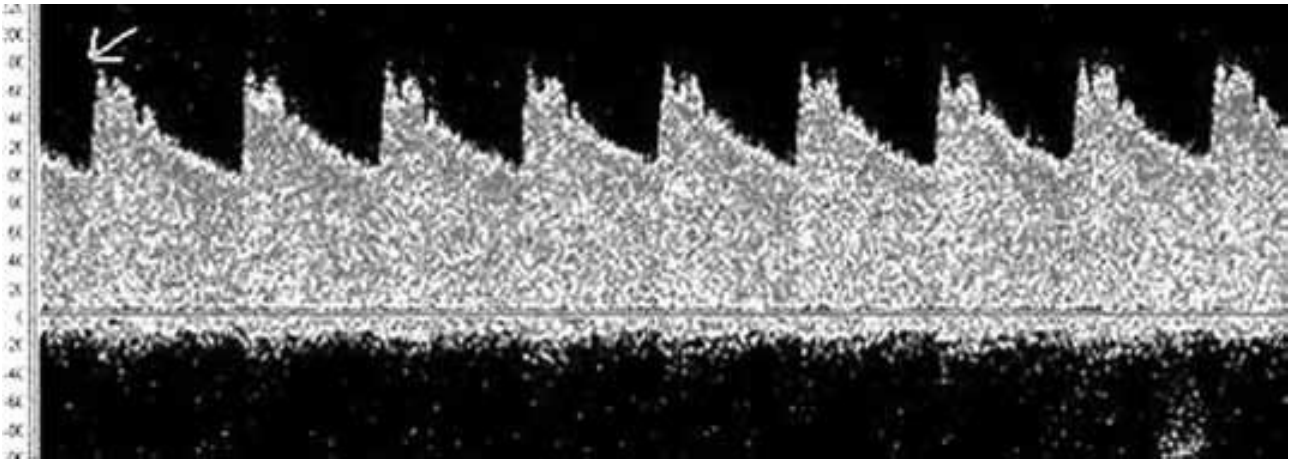

Fig. 1

Despite 'triple-H' therapy (hypertension, hypervolaemia and hemodilution) a repeat TCD study, on the second day after the onset, showed persistently elevated flow velocities in most of the arteries of the intracranial circulation, including the vertebro-basilar system. The Doppler spectrum started to show a mild resistive pattern. A day later, transcranial Doppler examination revealed a highly abnormal flow pattern with diastolic flow reversal in all the major arteries of the intracranial circulation. Brainstem reflexes were still preserved. This TCD pattern and intact brainstem reflexes were also noted during the following day.

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The patient showed no any signs of improvement. Two days later, no brainstem reflexes could be obtained and hemodynamic instability occurred, ultimately leading to death.

DISCUSSION

Vasospasm in the intracranial arteries is seen in a large proportion of patients following a subarachnoid haemorrhage due to rupture of an intracranial aneurysm. This is often responsible for delayed ischaemic neurological deficits.
Previously, vasospasm could be diagnosed only by formal angiography, but the advent of TCD has revolutionized our understanding this potentially harmful process. Transcranial Doppler is safe, repeatable and a reliable investigation and can be performed. Vasospasm-related ischaemic neurological deficits are the major cause of mortality and morbidity in survivors of aneurysmal SAH. The degree of vasospasm in the intracranial arteries can be inferred from the acceleration of the blood flow velocities.
Transcranial Doppler can be used to monitor vasospasm, effects of the 'triple H' therapy and predict outcomes after subarachnoid haemorrhage. The cerebral perfusion pressure is determined by the arterial pressure and the ICP. The critical closing pressure characterizes the pressure-flow velocity relationship in the cerebral circulation, which is the pressure at which flow ceases. The critical closing pressure has been reported to be increased by vasoconstriction despite a decrease in intracranial pressure. Intracranial pressure is a strong determinant of flow patterns in the arteries. The qualitative changes in ICD waveforms that occur with progressively rising ICP and eventual cerebral circulatory arrest (7).
Our report demonstrates the usefulness of TCD spectral patterns in showing the changes in the cerebral blood flow following a subarachnoid haemorrhage. Initially the changes were limited to vasospasm only in the right ICA but later, a more widespread vasospasm and a progressively increasing ICP resulted in the diastolic flow reversal. Severe vasospasm could have lead to an elevated critical closing pressure and early cerebral circulatory arrest that was later aggravated by an increased ICP. Diastolic flow reversal or a reverberating flow signal on TCD suggests established or impending cerebral-circulatory arrest and signifies a grim prognosis.

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