Delayed cerebral ischemia after aneurysmal subarachnoid hemorrhage outcome

Delayed cerebral ischemia (DCI) is a significant contributor to poor outcomes after aneurysmal subarachnoid hemorrhage (aSAH).

Microvascular dysfunction is an attractive mechanism to explain the cause of poor outcomes independently of large cerebral artery vasospasm, but needs more studies to clarify the pathophysiologies or mechanisms and to develop a novel therapeutic strategy [1)].

The dynamics of bio-adrenomedullin levels in CSF present a fairly different course compared to plasma with observed higher bio-ADM concentrations in patients spared from DCI and/or developing favorable outcome [2)].

Imaging studies to test for the presence of angiographic vasospasm or perfusion deficits in patients with clinical DCI do not seem helpful in selecting which patients should undergo treatment and may not improve outcomes. Future directions include validating these results in prospective cohort studies [3)].

The CONSCIOUS-1 trial revealed that clazosentan could not improve mortality or clinical outcome in spite of successful reduction of relative risk in angiographic vasospasm. This result indicates that the pathophysiology underlying DCI is multifactorial and that other pathophysiological factors, which are independent of angiographic vasospasm, can contribute to the outcome. Recent studies have focused on microcirculatory disturbance, such as microthrombosis and arteriolar constriction, as a factor affecting cerebral ischemia after SAH [4)].

Despite improvements in the clinical management of aneurysmal subarachnoid haemorrhage over the last decade, delayed cerebral ischaemia (DCI) remains the single most important cause of morbidity and mortality in those patients who survive the initial bleed. The pathological mechanisms underlying DCI are still unclear Novel pathological mechanisms have been suggested, including damage to cerebral tissue in the first 72 h after aneurysm rupture ('early brain injury'), Cortical spreading depolarization, and microthrombosis. A greater understanding of the significance of these pathophysiological mechanisms and potential genetic risk factors is required, if new approaches to the prophylaxis, diagnosis, and treatment of DCI are to be developed. Furthermore, objective and reliable biomarkers are needed for the diagnosis of DCI in poor grade SAH patients requiring sedation and to assess the efficacy of new therapeutic interventions [5)].

1)

Suzuki H, Kanamaru H, Kawakita F, Asada R, Fujimoto M, Shiba M. Cerebrovascular pathophysiology of delayed cerebral ischemia after aneurysmal subarachnoid hemorrhage. Histol Histopathol. 2021 Feb;36(2):143-158. doi: 10.14670/HH-18-253. Epub 2020 Sep 30. PMID: 32996580.
2)

Veldeman M, Dogan R, Weiss M, Stoppe C, Simon TP, Marx G, Clusmann H, Schubert GA, Albanna W. Levels of bioactive adrenomedullin in plasma and cerebrospinal fluid in relation to delayed cerebral ischemia in patients after aneurysmal subarachnoid hemorrhage: A prospective observational study. J Neurol Sci. 2021 Jun 5;427:117533. doi: 10.1016/j.jns.2021.117533. Epub ahead of print. PMID: 34111763.
3)

Rawal S, Barnett C, John-Baptiste A, Thein HH, Krings T, Rinkel GJ. Effectiveness of diagnostic strategies in suspected delayed cerebral ischemia: a decision analysis. Stroke. 2015 Jan;46(1):77-83. doi: 10.1161/STROKEAHA.114.005916. Epub 2014 Dec 2. PubMed PMID: 25468878.
4)

Naraoka M, Matsuda N, Shimamura N, Asano K, Ohkuma H. The Role of Arterioles and the Microcirculation in the Development of Vasospasm after Aneurysmal SAH. Biomed Res Int. 2014;2014:253746. Epub 2014 May 11. Review. PubMed PMID: 24900959.
5)

Rowland MJ, Hadjipavlou G, Kelly M, Westbrook J, Pattinson KT. Delayed cerebral ischaemia after subarachnoid haemorrhage: looking beyond vasospasm. Br J Anaesth. 2012 Sep;109(3):315-29. doi: 10.1093/bja/aes264. PMID: 22879655.