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Headaches as an initial manifestation and clinical marker of cerebrovascular diseases: a systematic review

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Introduction
Headache often manifests as an isolated symptom before focal deficits in acute cerebrovascular disorders, such as Ischemic Cerebrovascular Accident (ICVA), Cerebral Venous Thrombosis (CVT), Subarachnoid Hemorrhage (SAH), and Arterial Dissection (AD), frequently causing emergency misdiagnoses. Distinguishing these secondary headaches from primary disorders is crucial for correct triage and rapid management.

Objective
To characterize headache frequency, semiology, and prognosis across acute cerebrovascular etiologies.

Methods
A systematic review was conducted in accordance with the 2020 PRISMA guidelines across PubMed, LILACS, and SciELO databases. Medical subject headings and terms including Cerebrovascular Disorders, Stroke, Brain Ischemia, Subarachnoid Hemorrhage, Intracranial Embolism and Thrombosis, Cerebrovascular Disease, Headache, Headache Disorders, Cephalalgia, and Thunderclap headache were paired using Boolean operators (AND/OR). Retrospective or prospective cohort studies published in English, Portuguese, or Spanish were included without publication year restrictions. To characterize the clinical spectrum and progression of patients, the retrieved data systematically focused on specific evaluated scores and parameters: the Visual Analog Scale (VAS) for headache intensity; the National Institutes of Health Stroke Scale (NIHSS) for acute neurological deficits; the modified Rankin Scale (mRS) to measure functional recovery and disability; and Intracranial Pressure (ICP) values as a physiological marker. Continuous non-normally distributed data were expressed alongside their Interquartile Range (IQR).

Results
From 19 studies analyzed, distinct etiological patterns emerged: in ICVA headaches were an initial symptom in 26% of cases. In cerebellar ICVA (11%), pain was throbbing/stabbing, occipitocervical, and ipsilateral, involving cortical layers (63.6%) and PICA territory (54.5%), linking to left hemispheric/vermian lesions. Admission mRS was 4–5 in 81.8%, NIHSS was 0–5, and 6-month mRS 0–3 was 90.9% (0% mortality). In CVT, mostly tension-type (65%) or thunderclap (17.5%). Isolated cases had a benign course; 88% achieved favorable outcomes (mRS 0–1) under anticoagulation. In SAH thunderclap headache in 65% of aneurysmal cases; median VAS fell from 8 [IQR: 7–8] on Day 1 to 5 [IQR: 4–5] on Day 7. Severity linked to cisternal volume ($p<0.05$), ICP (Rs =0.560, $p<0.001$), and CSF cytokines (IL-6 Day 1: 3113.56 pg/ml; TNF- Day 5: 78.30 pg/ml; $p<0.05$). Refractory pain (71% of younger patients) linked to hyponatremia (137.5 vs 139.3 mEq/L; $p<0.01$), 11.1% delayed ischemia risk, and opioids (24.4 mg/day). In AD there was pain in 77.5% (carotid: frontal/ocular; vertebral: occipitocervical). Occlusion caused a 5–7 day plateau, but early detection yielded 82.5% favorable outcomes.

Conclusion
Headaches serve as critical warning signs of cerebrovascular pathology. Early recognition before focal decline allows immediate interventions that mitigate ischemic risks and optimize functional recovery.

Keywords:
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Biomarkers
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