Malignant middle cerebral artery territory infarction

- Atrial myxoma and posterior circulation stroke
- Time-varying association between blood pressure and malignant brain edema after large hemispheric infarction: a prospective cohort study
- Scorpion sting-induced malignant middle cerebral artery infarction
- Topography of ischemic strokes in cancer-associated non-bacterial thrombotic endocarditis: A single-institution descriptive case series
- No difference in 6-month functional outcome between early and late decompressive craniectomies following acute ischaemic stroke in a national neurosurgical centre: a single-centre retrospective case-cohort study
- Higher baseline subcortical net water uptake in computed tomography predicts malignant middle cerebral artery infarction in patients with acute ischemic stroke
- Computed tomography perfusion as an early predictor of malignant cerebral infarction
- Absence of the Susceptibility Vessel Sign with Cancer-Associated Hypercoagulability-Related Stroke

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The term Malignant middle cerebral artery infarction was coined in 1996, describing a severe hemisphere syndrome with characteristic symptoms and a predictable clinical course including hemiparesis, eye, and head deviation, a progressive decline in consciousness, pupillary dilatation, and increased intracranial pressure [1].

General information

The malignant middle cerebral artery territory infarction is a distinct syndrome that occurs in up to 10% of stroke patients, [2] [3] which carries a mortality of up to 80% (mostly due to severe postischemic cerebral edema → increased ICP → herniation [4]

Patients usually present with findings of severe hemispheric stroke (hemiplegia, forced eye and head deviation) often with CT findings of major infarct within the first 12 hours. Most develop drowsiness shortly after admission. There is progressive deterioration during the first 2 days, and subsequent transtentorial herniation usually within 2–4 days of stroke. Fatalities are often associated with: severe drowsiness, dense hemiplegia, age > 45–50 yrs, [5] early parenchymal hypodensity involving > 50% of the MCA distribution on CT scan,23 midline shift > 8–10 mm, early sulci effacement, and hyperdense artery sign (p. 1354) [6] in MCA. Neurosurgeons may become involved in caring for these patients because aggressive therapies in these patients may reduce morbidity and mortality. Options include:

1. conventional measures to control ICP (with or without ICP monitor): mortality is still high in this group and elevated ICP is not a common cause of initial neurologic deterioration in large hemispheric stroke

2. hemicraniectomy (decompressive craniectomy):

3. ✖ to date, the following treatments have not improved outcome: agents to lyse clot, hyperventilation, mannitol, or barbiturate coma.

In patients with severe middle cerebral artery (MCA), intracranial atherosclerotic disease (ICAD), the mechanism of stroke is multifactorial, but hemodynamic insufficiency plays a significant role. This finding is important in selecting a subgroup of patients who may benefit from revascularization [7].

Clinical features

see Malignant middle cerebral artery syndrome.

Diagnosis

Malignant middle cerebral artery territory infarction diagnosis.

Treatment

Malignant middle cerebral artery territory infarction treatment.

Complications

Malignant Cerebral Edema

Outcome

Malignant middle cerebral artery territory infarction outcome.

Retrospective cohort studies

Patients with acute ischemic stroke (AIS) of the MCA territory were retrospectively enrolled between January 2019 and July 2022. Patients were divided into two groups according to the follow-up CT after 24-48 hours: malignant and nonmalignant infarction. NWUs were measured on diverse ASPECT regions on admission non-contrast CT, namely affected ASPECTS-NWU (af-ASPECTS-NWU), subcortical ASPECTS-NWU (sc-ASPECTS-NWU), and cortical ASPECTS-NWU (c-ASPECTS-NWU). Baseline characteristics were collected for univariate analyses and multivariate regression analyses to explore the independent risk factors for malignant infarction. Receiver operating characteristic (ROC) curves

were plotted and compared.

Results: patients were included in the final analysis. Malignant MCA infarction was achieved in 42 (27.45%) patients and nonmalignant was 111 (72.55%). Compared with the nonmalignant infarction group, higher baseline National Institute of Health stroke scale (NIHSS) score, af-ASPECTS-NWU, c-ASPECTS-NWU, sc-ASPECTS-NWU, and lower ASPECTS were noted in the malignant infarction group (all $P < 0.001$). Multivariate logistic regression showed that only baseline sc-ASPECTS-NWU (>3.6%) was a positive factor for malignant MCA infarction. The ROC analysis indicated the highest predictive value of sc-ASPECTS-NWU for indicating malignant infarction with the area under ROC curve (AUC) 0.91.

Conclusion: Higher baseline sc-ASPECTS-NWU was a quantitative predictor for malignant MCA infarction in patients with AIS, which could be helpful for treatment decisions [8)]

Rodríguez-Vázquez et al. retrospectively analyzed 253 patients from a single-center registry presenting with acute, severe, proximal large vessel occlusion studied with Whole-brain CT perfusion imaging at hospital arrival within the first 24 h of symptoms-onset. MCI was defined by clinical and imaging criteria, including decreased level of consciousness, anisocoria, death due to cerebral edema, or need for decompressive craniectomy, together with midline shift ⩾6 mm, or infarction of more than 50% of the MCA territory. The predictive accuracy of baseline ASPECTS and CTP quantifications for MCI was assessed by receiver operating characteristic (ROC) area under the curve (AUC) while F-score was calculated as an indicator of precision and sensitivity.

Results: Sixty-three out of 253 patients (25%) fulfilled MCI criteria and had worse clinical and imaging results than the non-MCI group. The capacity to predict MCI was lower for baseline ASPECTS (AUC 0.83, F-score 0.52, Youden's index 6), than with perfusion-based measures: relative cerebral blood volume threshold <40% (AUC 0.87, F-score 0.71, Youden's index 34 mL) or relative cerebral blood flow threshold <35% (AUC 0.87, F-score 0.62, Youden's index 67 mL). CTP based on rCBV measurements identified twice as many MCI as baseline CT ASPECTS.

Discussion and conclusion: CTP-based quantifications may offer enhanced predictive capabilities for MCI compared to non-contrast baseline CT ASPECTS, potentially improving the monitoring of severe ischemic stroke patients at risk of life-threatening edema and its treatment [9)]

Case series

A total of 17 patients, aged between 34 and 70 years, diagnosed with malignant MCA infarction with radiological edema and mid-line shift, who underwent decompressive surgery, were eligible. From the records, we collected data on age, sex, preoperative and postoperative Glasgow Coma Scale (GCS) scores, National Institutes of Health Stroke Scale (NIHSS) score, the degree of disability in the preoperative period and three months postoperatively through the scores on the Modified Rankin Scale (MRS), and the preoperative and postoperative midline shift measured by computed tomography (CT) scans of the brain.

Results: Preoperatively, the mean GCS score was of 8 (range: 7.7-9.2), whereas it was found to be of 12 (range 10-14) on the first postoperative day ($p = 0.001$). The mean preoperative NIHSS score was of 21.36 ± 2.70 and, on the first postoperative day, it was of 5.30 ± 0.75 ($p < 0.001$). As for the midline shift, the mean preoperative value was of 1.33 ± 0.75 cm, and, on the first postoperative day,

0.36 ± 0.40 cm ($p < 0.001$). And, regarding the ONSD, the mean preoperative measurement was of 5.5 ± 0.1 mm, and, on the first postoperative day, it was of 5 ± 0.9 mm ($p < 0.001$).

Conclusion: The ocular US measurement of the ONSD for the preoperative and postoperative monitoring of the ICP seems to be a practical and useful method [10].

Case reports

A case of a child with serological evidence of SARS-CoV-2 infection whose onset was a massive right cerebral artery ischemia that led to a malignant cerebral infarction. The patient underwent a life-saving decompressive hemicraniectomy, with good functional recovery, except for residual hemiplegia. During rehabilitation, the patient also developed a lower extremity peripheral nerve neuropathy, likely related to a long-Covid syndrome [11].

A 39-year-old woman in the 24th week of pregnancy who suffered a right malignant MCA infarction that eventually required DC. The patient delivered a healthy baby and underwent a second surgery for cranioplasty 7 months later. [12].

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