Malignant middle cerebral artery territory infarction outcome

Malignant middle cerebral artery infarction is associated with high mortality and morbidity.

The mortality rate of patients with brain edema after malignant middle cerebral artery (MCA) infarction approaches 80 % without surgical intervention [1)].

see also Decompressive craniectomy for malignant middle cerebral artery territory infarction outcome.

Retrospective Studies

Previously Lorente et al. from Santa Cruz de Tenerife found higher serum substance P concentrations at day 1 of a malignant middle cerebral artery infarction (MMCAI) in non-surviving than in surviving patients. Thus, the objective of a study was to determine whether serum substance P levels during the first week of MMCAI could predict mortality.

They included patients with MMCAI defined as computed tomography findings of acute infarction in at least of 50% of the territory and Glasgow Coma Scale ≤8. They determined serum concentrations of substance P on days 1, 4 and 8 of MMCAI. Thirty-day mortality was the study end-point.

Serum substance P concentrations at days 1 ($p < .001$), 4 ($p < .001$), and 8 ($p = .001$) of MMCAI in non-surviving ($n = 34$) were higher than in surviving patients ($n = 34$). Receiver operating characteristic analyses showed that serum substance P concentrations at days 1, 4, and 8 of MMCAI had an area under curve (95% confidence intervals) to predict 30-day mortality of 0.77 (0.66-0.87; $p < .001$), 0.82 (0.69-0.91; $p < .001$) and 0.85 (0.72-0.94; $p < .001$) respectively.

The two new findings of the study are that non-surviving MMCAI patients showed higher serum

substance P levels at day 1, 4 and 8 than surviving and that those levels could predict 30-day mortality [2].

The clinical and neuroimaging features of 42 consecutive patients with MCA occlusion and early CT signs of swelling (within 24 hours after ictus) were studied. CT scans were graded for displacement of the pineal gland and septum pellucidum as well as compression of the frontal horn of the ventricular system. Young adults, defined as younger than 45 years of age, were assessed separately.

Overall mortality was 55% in this patient population at risk for further neurologic deterioration. Of the 42 patients, 33 had deterioration-an impaired level of consciousness ensued in 3, a diencephalic herniation syndrome developed in 19, and uncal herniation occurred in 11. Mortality was 70% in these patients with deterioration. Mortality was significantly lower in younger patients with deterioration in comparison with older patients (3 of 11 patients versus 20 of 22; P = 0.00018, Fisher's exact test). Factors predictive of deterioration and poor outcome were older age (more than 45 years) and the presence of hyperdense clot in the MCA on CT scan, in addition to early swelling.

Deterioration from further brain swelling is common in patients with MCA occlusion and sulci effacement on early CT scan. The outcome is fatal in most patients who deteriorate. Mortality was significantly higher in deteriorating older patients than in younger patients. Clearly defined criteria for decompressive hemicraniotomy in young patients with complete MCA occlusion are needed, preferably derived from a randomized clinical trial [3].

Fifty-five patients with complete middle cerebral artery territory infarction caused by occlusion of either the distal intracranial carotid artery or the proximal middle cerebral artery trunk were studied. In all patients, embolic infarction was presumed. The mean Scandinavian Stroke Scale score on admission was 20, and the time course of deterioration varied between 2 and 5 days. Forty-nine patients required ventilator assistance during the acute stage of disease. Only 12 patients (22%) survived the infarct. The cause of death was transtentorial herniation with subsequent brain death in 43 patients. Survivors had a mean Barthel Index score of 60 (range, 45 to 70).

The prognosis of complete middle cerebral artery territory stroke is very poor and can be estimated by early clinical and neuroradiological data within the first few hours after the onset of symptoms. A space-occupying mass effect develops rapidly and predictably over the initial 5 days after presentation. Herniation occurred as an end point in 43 (78%) of these patients [4].

The clinical course of 24 patients with angiographically-demonstrated occlusion of the MCA artery was reviewed. Eight patients presented with a major disabling stroke and five of these died during the acute phase of this ischemic event. The remaining 19 patients were followed for a mean of 54.2 months. There were five deaths in follow-up and two of these were due to subsequent strokes. Fourteen patients manifested a benign course: one of these had a further minor stroke and four had TIAs. Altogether, 3 strokes occurred during the follow-up period (2 fatal, 1 minor) and all were in the territory of the artery known to be occluded. Of those patients who survived their presenting ischemic event, 12 (63%) remained completely functional in terms of activities of daily living. MCA occlusion does not necessarily carry a poor prognosis with medial therapy alone and the role of bypass surgery

hopefully will be clarified by the ongoing clinically randomized trial [5].

References

1)
Huttner HB, Schwab S. Malignant middle cerebral artery infarction: clinical characteristics, treatment strategies, and future perspectives. Lancet Neurol 2009; 8:949–958.
2)
Lorente L, Martín MM, Pérez-Cejas A, González-Rivero AF, Argueso M, Ramos L, Solé-Violán J, Cáceres JJ, Jiménez A, García-Marín V. High serum substance P levels and mortality after malignant middle cerebral artery infarction. J Crit Care. 2020 Jan 20;57:1-4. doi: 10.1016/j.jcrc.2020.01.022. [Epub ahead of print] PubMed PMID: 31991332.
3)
Wijdicks EF, Diringer MN. Middle cerebral artery territory infarction and early brain swelling: progression and effect of age on outcome. Mayo Clin Proc. 1998 Sep;73(9):829-36. PubMed PMID: 9737218.
4)
Hacke W, Schwab S, Horn M, Spranger M, De Georgia M, von Kummer R. 'Malignant' middle cerebral artery territory infarction: clinical course and prognostic signs. Arch Neurol. 1996 Apr;53(4):309-15. PubMed PMID: 8929152.
5)
Moulin DE, Lo R, Chiang J, Barnett HJ. Prognosis in middle cerebral artery occlusion. Stroke. 1985 Mar-Apr;16(2):282-4. PubMed PMID: 3975967.