Middle cerebral artery occlusion

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Middle cerebral artery stenosis may lead to a middle cerebral artery stroke via three mechanisms:

(1) deep lacunar infarcts that develop when the exiting branch of the lenticulostriate artery is trapped within the thromboatheroma

(2) development of atheromatous ulceration with thrombosis and subsequent distal embolization

(3) hemispheric hypoperfusion caused by significant MCA obstruction and inadequate collateralization

Clinical

Complications

see Malignant middle cerebral artery territory infarction.

In these patients the clinical presentation usually starts with focal signs and progresses with a decline of consciousness until brainstem dysfunction is evident.

A shift of the ischemic tissue rather than intracranial hypertension is the most likely responsible for the initial decrease in consciousness [1) 2)].

Several other satellite reactions are involved in an inexorable pathogenetic cascade, including disturbances of microvascular tone, endothelial cell swelling, and activation of platelets, leucocytes,

and coagulation [3].

Diagnosis

Imaging studies are the mainstay for identification of people at higher risk for malignant infarction among the ischemic stroke population.

Perfusion computed tomography

Perfusion computed tomography of the brain is routinely performed for first and later controls. The earliest warning signs for developing malignant infarction include involvement of an area larger than 50% of the MCA territory and an infarct extending also to the anterior or posterior cerebral artery territories. A midline shift >10 mm, effacement of subarachnoid spaces, and attenuation of corticomedullary differentiation are also related to higher risk of severe deterioration [4], but they usually occur later, when a malignant syndrome is already in progress. The intravenous injection of contrast medium with elaboration of its distribution (perfusion-CT) entails higher diagnostic accuracy of ischemic areas and an even earlier detection of patients at higher risk. A drop in cerebral perfusion of more 66% is related to a likely malignant evolution [5].

Magnetic resonance imaging

Magnetic resonance imaging is another helpful exam, which in ischemic stroke can be used for prognostic purposes within few hours of clinical onset. Its sensitivity is higher than CT and it is more likely to show changes at earlier time points than CT scan. On diffusion weighted images (DWI) an ischemic area of at least 145 mL strongly predicts a massive cerebral infarction [6] [7].

It is straightforward that at final stages the pressure inside the skull of patients with large cerebral infarction is probably high. Anyway, a pressure increase limited to the infarcted and immediately adjacent areas could happen, leading to neurological worsening and even death despite no spread of intracranial hypertension [8].

Undisputed poor prognosis predictors as CT uncal herniation and anisocoria sometimes occur without an overall ICP raise is detected [9].

The measurement may also be influenced by the device used (solid-state or fluid-filled) as well as by its location (subdural, intraparenchymal, intraventricular; ipsilateral or contralateral to ischemia) [10].

Treatment

see Middle cerebral artery occlusion treatment.

Outcome

Malignant evolution is more common in younger patients [11].

Despite optimal medical management this condition may lead to death in 70–80% of cases [12] [13].

The criteria for surgical indication mean a selection of patients who likely will have less postoperative disabilities. Living with a severe neurological impairment may appear more acceptable in some cultures, and inhumane in others. A recent review anyway concluded that the vast majority of operated patients do not regret having undergone surgery [14].

The natural history of middle cerebral artery occlusion MCA occlusion has become increasingly important since the surgical option of EC/IC bypass surgery has been available.

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 [15].

Case series

Encephaloduroarteriosynangiosis (EDAS) as a form of indirect revascularization has been recently proposed as a potentially promising alternative for patients with intracranial atherosclerotic disease (ICAD). The object of a study was to compare the prognostic roles between isolated EDAS and medical therapy in patients with atherosclerotic middle cerebral artery occlusion (MCAO).

From January 2014 to June 2017, 125 patients with atherosclerotic MCAO were enrolled in this prospective nonrandomized controlled cohort study. Patients who underwent EDAS (n = 60) were compared with those treated medically (n = 65). Early and late adverse events and functional outcomes including memory ability were compared between groups.

During 23.7 months of mean follow-up, rates of adverse events, including ischemic events in the territory of the qualifying middle cerebral artery (MCA), and death from any causes, were not significantly different in patients treated with EDAS and with medical therapy (6.7% vs. 12.3%; p=0.285). Landmark analyses revealed that at initial 6-month follow-up, there was no significant difference for adverse event rates, while the opposite finding was demonstrated for the subsequent period (EDAS 1/57 [1.7%] vs. medical management 7/64 [10.9%]; p=0.024). And the P value for the interaction between time (first 6 months vs. subsequent period) was 0.044. No significant differences were found with the respect to neural function status and cognitive ability.

In the long-term, isolated EDAS can be considered effective and safe for patients with atherosclerotic MCAO, whereas it may need additional medical therapy support in the short-term [16].

Case reports

A 52-year-old man developed a cerebral infarction from the right middle cerebral artery occlusion, and the infarction extensively damaged the right insula. Three months after the onset of the cerebral infarction, persistent hiccups appeared, occurring during sleep. The thoracic and abdominal cavities showed no lesions; hence, the hiccups were considered to be caused by the central nervous system dysfunction. Administration of metoclopramide, chlorpromazine, and diazepam were ineffective, while levetiracetam had a partial effect. Combining perampanel with baclofen finally suppressed the symptoms.

Lesions at the right insula impair control of ventilation and may present with hiccups as a symptom of respiratory reflex disinhibition. Morita et al. reviewed similar cases of treatment-resistant hiccups, as well as perampanel and baclofen efficacy in myoclonus cases.

This case suggested that perampanel with baclofen may be effective for myoclonus due to respiratory reflex disinhibition and can be used to treat hiccups derived from cerebral infarctions [17].

A 69-year-old with right hemiparesis and global aphasia. Perfusion computed tomography imaging revealed ischemic penumbra in the middle cerebral artery territory. Angiography showed left middle cerebral artery occlusion. Mechanical thrombectomy with one pass was performed, and successful recanalization was obtained. Embolic material was retrieved; it contained tumor fragments with atypical keratinizing squamous cell carcinoma. Contrast computed tomography imaging indicated tumor invasion into the superior vena cava, and contrast transcranial Doppler indicated the presence of a right-to-left shunt after the Valsalva maneuver. They diagnosed the patient with acute ischemic stroke of large vessel occlusion due to venous invasion of esophageal carcinoma via a right-to-left shunt. This is the first case of embolic occlusion resulting from an extracardiac tumor via a right-to-left shunt. Contrast transcranial Doppler potentially detects right-to-left shunts in patients who cannot undergo transesophageal echocardiography [18].

Middle cerebral artery occlusion rat model

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