Assessment of leptomeningeal collaterals in patients with proximal middle cerebral artery occlusion

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Aims and objectives

Proximal middle cerebral artery occlusions (M1 occlusion) are often associated with severe stroke and poor outcome. The presence of leptomeningeal collaterals can potentially reduce the acute ischaemia and thus reduce stroke severity.

We assessed collaterals using three different methods

1) comparison to contralateral,

2) arterial filling distal from the occlusion, and

3) percentage of collateral supply filling the occluded middle cerebral artery territory.

The covariance between the three methods was investigated.
Fig. 1: CT-angiography of the brain with symmetrical and normal leptomeningeal collaterals

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Methods and materials

Patients admitted to Bispebjerg University Hospital, Copenhagen, Denmark diagnosed with a M1 occlusion on computed tomography angiography (CTA) within 4.5 hours after symptom onset between May 2009 and December 2011 were included in the study.

The leptomeningeal collaterals were evaluated on CTA from a 64-slice CT scanner.

Method 1 am. Mass et al.

The collateral status was graded in a comparison manner for the symptomatic hemisphere against the contralateral hemisphere as follows: 1) absent; 2) less than the contralateral normal side; 3) equal to the contralateral normal side; 4) greater than the contralateral normal side; and 5) exuberant.

Method 2 am. Miteff et al.

The collateral status was graded as poor, moderate or good depending on the extent of contrast visualized distal to the occlusion in the middle cerebral artery (MCA) on CTA. In moderate cases some of the MCA branches were reconstituted within the Sylvian fissure. In poor cases only the distal superficial MCA branches were reconstituted.

Method 3 am. Tan et al.

The collateral status was graded according to the collateral supply filling the occluded MCA territory: 1) absent; 2) collateral supply filling >50% but <100% of the occluded MCA territory; 3) collateral supply filling >50% but <100% of the occluded MCA territory; 4) 100%.

Collaterals were scored according to the three different methods and the correlation was calculated using Spearman's Rank test.
Results

Eighty-one patients with a single M1 occlusion were included into the analysis (60.5% female, 39.5% male, mean age 69 years, range 29-93 years).

The median score for the three methods was

1) less collaterals than the contralateral side;
2) poor arterial filling distal from the occlusion; and
3) 0-50% of collateral supply filling the occluded middle cerebral artery territory.

A significant correlation between the three methods of assessing collaterals was found ($R_s = 0.655; 0.704$ and $0.836$; all $p < 0.001$).
Fig. 1: CT-angiography of the brain with symmetrical and normal leptomeningeal collaterals

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Table 1: Correlations between the three methods of evaluating the leptomeningeal collaterals on CT-angiography in patients with proximal middle cerebral artery occlusion.

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Fig. 2: CT-angiography of the brain with asymmetrical leptomeningeal collaterals.

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Conclusion

The three methods of scoring leptomeningeal collaterals were found to significantly correlate with each other indicating comparability between different study results across different scoring methods.
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