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Analysis on Endovascular Therapy for Acute Ischemic Stroke with Large Vessel Occlusion and Large-Scaled Core Infarct Volume in the Time Window

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Abstract

Patients who received endovascular therapy (EVT) for acute ischemic stroke with large vessel occlusion (AIS-LVO) and large-scaled core infarct volume in the time window were analyzed. Literature data were reviewed. Results showed that although EVT is the first choice to AIS-LVO, patients often have poor prognosis. Alberta stroke program early CT score (ASPECTS) based on computerized tomography angiography source image (CTA-SI) can reflect the real cerebral perfusion more truly, and it can assess the size of core infarct more quickly and accurately, thus enabling to judge prognosis.

Keywords

Acute Ischemic Stroke with Large Vessel Occlusion, Endovascular Therapy

1. Introduction

Clinically, endovascular therapy (EVT) for acute ischemic stroke with large vessel occlusion (AIS-LVO) under large-scaled core infarct volume in the time window conforms to the latest diagnosis and treatment guidelines. However, some patients have extremely poor prognosis. In this study, causes of poor prognosis were explored through deep analysis of case data. Alberta stroke program early CT score (ASPECTS) based on computerized tomography angiography source image (CTA-SI) can reflect the real cerebral perfusion more truly, and it can assess the size of core infarct more quickly and accurately, thus enabling to judge prognosis.

2. Presentation of the First Case

The patient had an emergency administration for "fluency disorder and impaired activity of the left limbs for 3 h", with clear consciousness and Glasgow Coma Scale (GCS) score: 15. Both pupils had equivalent size and circles, with a diameter of about 3 mm, direct and indirect light reflex. The muscle force of right limbs was normal and the muscle force of left limbs was I-level. NIHSS score: 12; ASPECTS: 9. EVT was performed at emergency and the operation was completed successfully. The mTICI reached level-3 after the operation and large-scaled cerebral infarction occurred on the second day after the operation. Another operation was performed and mRS score was 4 at the third month after active treatment (**Figures 1-3**).

3. Presentation of the Second Case

The patient had an emergency administration for "unconsciousness and impaired activity of the right limbs for less than 4.5 h", in coma and GCS score: 11. Both pupils had equivalent size and circles, with a diameter of about 3 mm, direct and indirect light reflex. The left limbs had flex upon stimuli, but the right limbs had no flex. NIHSS score: 19. ASPECTS: 8. EVT was performed at emergency and the operation was completed successfully. The mTICI reached level-2b after the operation and large-scaled cerebral infarction occurred on the second day after the operation. Bone flap decompressive craniectomy was performed and malignant brain swelling and intracranial pressure cannot be controlled after operation. The patient died after 7 days of the operation (**Figures 4-8**).

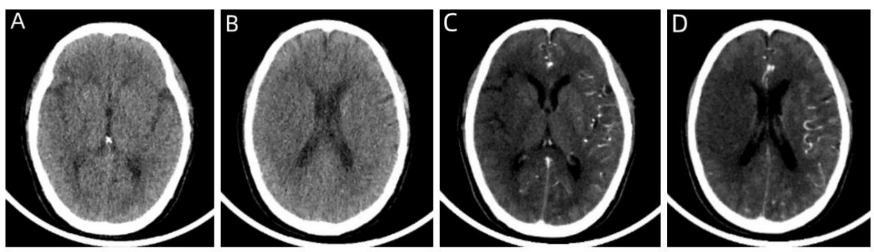

Figure 1. Plain CT scanning images ((A), (B)) and CTA source images ((C), (D)) before operation.

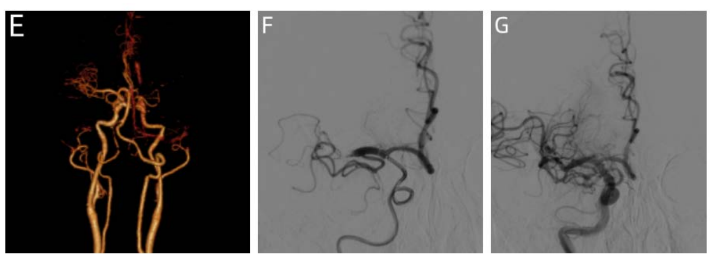

Figure 2. CAT images before operation indicate arterial occlusion in the right brain (E). DSA before operation indicates arterial occlusion in the right brain (F). Revascularization after embolectomy (G).

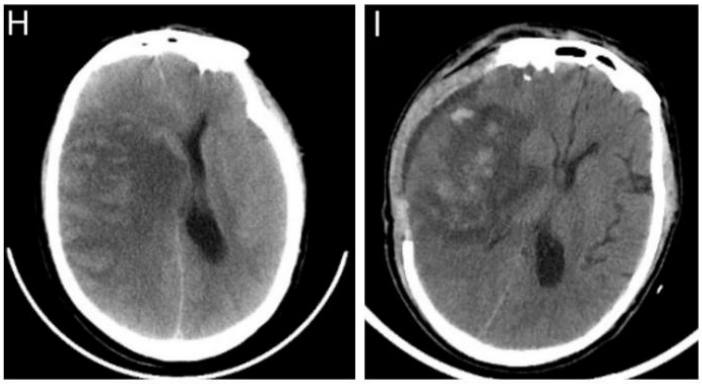

Figure 3. The brain CT reexamination at the first day after EVT indicates large-scaled cerebral infarction (H). The brain CT reexamination after the craniectomy (I).

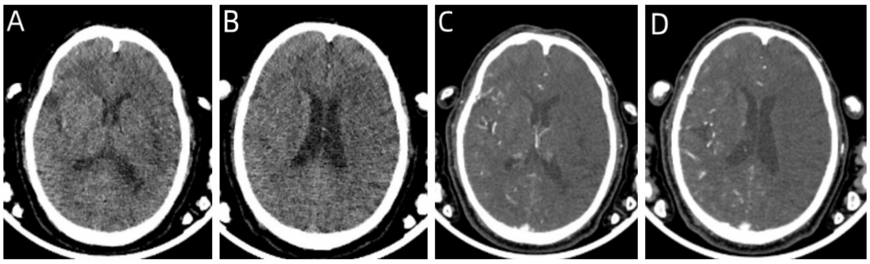

Figure 4. CT plain scan images ((A), (B)) and CTA source image ((C), (D)) before operation.

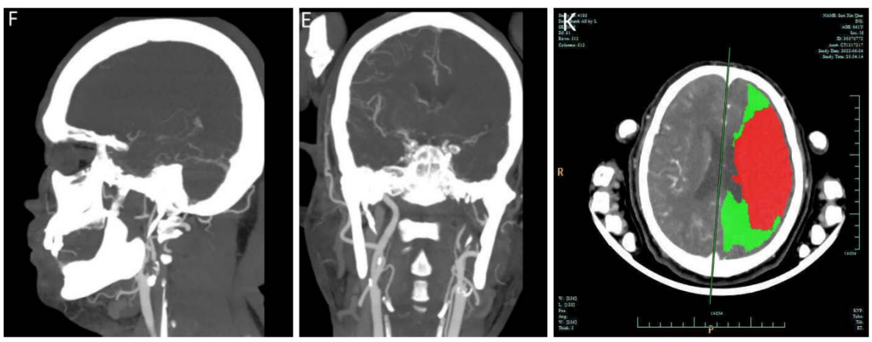

Figure 5. CTA source images before operation indicate arterial occlusion in the left brain ((E), (F)). CTP indicates large-scaled cerebral infarction in the artery blood supply region in the left brain (K).

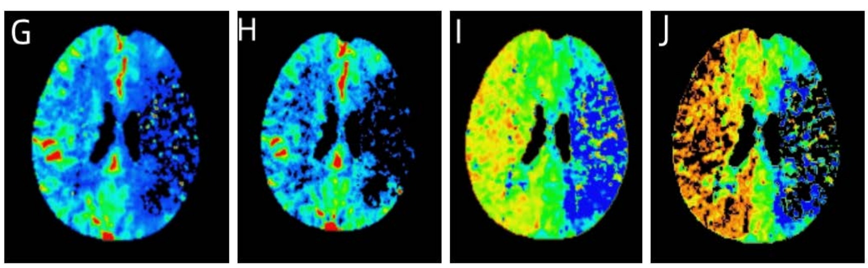

Figure 6. CBF, CBV, MTT and TTP all indicate large-scaled hypoperfusion in the artery blood supply region in the left brain ((G), (H), (I), (J)).

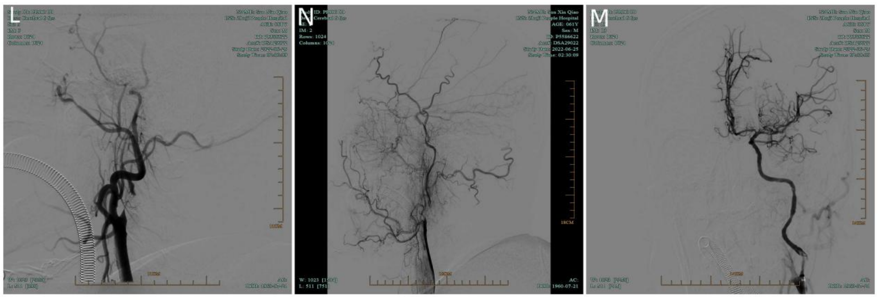

Figure 7. DSA indicates arterial occlusion in the left internal carotid ((L), (N)) and blood vessels are smoothed again after EVT (M).

Figure 8. Brain CT reexamination on the second day of embolectomy indicates large-scaled cerebral infarction ((O), (P)). Brain CT reexamination after craniectomy was performed (Q).

4. Discussions

EVT is the first choice for AIS-LVO. It can increase revascularization significantly and improve clinical prognosis of patients. It has been recommended by several guidelines. EVT is also recommended for AIS-LVO patients with large-scaled core infarct volume in the time window [1] [2] [3]. The size of core infarct volume is closely related to clinical prognosis of patients. Patients with smaller core infarct volume are more likely to get good prognosis [4]. Although AIS-LVO patients with large core infarct volume have low possibility of good prognosis, the prognosis is still better than cases that had intravenous thrombolysis or simple medical treatment only [5].

At present, guidelines only require ASPECTS to assess brain tissue images in the time window. Patients with ASPECTS ≥ 6 (AIS-LV0) can get benefits from EVT and patients with ASPECTS < 6 still have inexplicit benefits. In this study, ASPECTS of one patient according to non-contrast enhanced computerized tomography (NCCT) (NCCT-ASPECTS) could reach 9 and CTA-SI-ASPECTS was only 3. The NCCT-ASPECTS of case 2 could reach 8 and CTA-SI-ASPECTS was only 4. According to postoperative performances of these two cases, we believe that CTA-SI-ASPECTS can reflect real cerebral perfusion better.

ASPECTS is a simple, reliable and systematic method to evaluate early ischemia changes in the middle cerebral artery blood supply region in patients with ischemic stroke. It can provide fast semi-quantitative evaluation of ischemic lesions and it is conducive to judging thrombolysis and long-term prognosis.

However, ASPECTS is firstly developed to evaluate 10 regions of middle cerebral artery in NCCT. NCCT-ASPECTS has relatively low early positive detection rate of ischemic stroke, especially in the early stage of clinical symptoms [6]. The ischemic region in CTA-SI shows a low density. Since there's no or little inflow of contrast agent into the corresponding cerebral tissues after vascular occlusion, CTA-SI detects ischemic region earlier or more sensitively than NCCT. Additionally, these two imaging technologies have different potential pathologies and physiologies. CTA-SI-ASPECTS shows changes in cerebral blood flow and it reflects that reduction in cerebral blood volume (CBV) is closely related to cerebrovascular occlusion. NCCT-ASPECTS shows changes in water content in brain tissues. It needs a lot of water transfer to see low-density in NCCT by eyes. CTA-SI-ASPECTS can display the boundary between normal brain issues and ischemic brain tissues earlier and more clearly before the threshold [7]. These mechanisms also interpret that CTA-SI-ASPECTS has better correlation to prognosis evaluation of patients compared to NCCT-ASPECTS. Both CT-ASPECTS have clinical application values to prognosis of patients with AIS caused by unilateral MCA occlusion. CTA-SI-ASPECTS is more sensitivity and specificity than NCCT-ASPECTS [8].

At present, automatic ASPECTS based on software has been applied in clinics and it provides great assistance to more accurate and fast assessment of core infarct. It improves effectiveness and reliability of disease judgment [9].

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

Consent for Publication

Written informed consent was obtained from direct relative of the patient for publication of this manuscript and any accompanying images. Copy of the written consent is available for review by the editor of this journal.

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