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Neurothrombectomy in the Management of Acute Ischemic Stroke

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Recent randomized controlled trials [1–5] have clearly demonstrated the benefit of mechanical thrombectomy in the acute treatment of ischemic stroke. These results represent the greatest advance in the management of cerebral infarction since the definitive approval of the intravenous tissue-type plasminogen activator in 1996.

The successful recanalization has been clearly demonstrated to be one of the strongest predictors of good outcome after stroke and, furthermore, the shorter the time to recanalization, the greater the chance of favourable recovery [6]. In this respect, although intravenous fibrinolysis is effective in recanalizing the distal vessels occluded by small thrombi, it unfortunately reaches lower and quite modest early-recanalization rates in the occlusions of proximal intracranial arteries [7]. The new endovascular trials, providing strong evidence that mechanical removal of clot is superior to medical treatment alone in the occlusion of distal internal carotid or proximal middle cerebral artery within 6 h from symptoms onset and independently from patient age, have thus really signalled the dawn of a new era and, at the same time, raised new challenges in the stroke management.

First, one of the most striking issues to be addressed will be the selection and implementation of the stroke-care system, which may mostly reduce the onset-to-imaging, door-to-groin and groin-to-reperfusion times. Two main scenarios may be delineated: according to the ‘drip and ship’ model, patients are first transported, triaged and intravenously treated at an outlying hospital and then transferred, if eligible, to a comprehensive stroke centre to undergo endovascular treatment [8]. On the other hand, the ‘mother-ship’ model is based upon the direct transport of patients to a tertiary stroke centre where either intravenous fibrinolysis or neurothrombectomy are immediately available on site. Looking at the impactful regionalised organisation of trauma-cares and the positive results obtained in injured patients’ outcome [9], the best approach may be the implementation of a stroke system based on many primary stroke centres and tele-stroke facilities connected to few high-volume and highly specialised referral comprehen-

sive stroke centres able to offer intra-arterial treatment in a 24/7 fashion.

Second, all recent randomized trials of thrombectomy used acute non-invasive arterial imaging to document proximal intracranial occlusion and target thrombi; further, except in the MR CLEAN study [1], the extent of potentially salvageable penumbra and irreversibly damaged ischemic core, and/or the status of collateral flow were assessed through multiphase CT angiography or CT perfusion as additional eligibility criteria. Although it is clear that the imaging-guided selection of patients will become mandatory, there is still no consensus on what kind of imaging should be performed and whether at the primary stroke centres, as suggested by recent trials, or at the tertiary hubs. The more advanced imaging techniques, although feasible without meaningful time penalty and treatment delay, may be in fact too specific and selective and exclude patients whose outcome might be still improved by the endovascular approach.

Third, unresolved issues related to patients’ selection still remain to be further addressed. There is no enough evidence about the endovascular treatment of ischemic stroke patients presenting outside the 6-hour time window, with unknown time interval from symptoms onset, with occlusion of the basilar artery or with tandem occlusive disease of extracranial internal carotid and middle cerebral artery.

Furthermore, well-documented proof of vascular recanalization and its time of occurrence, offered for the first time in the stroke-care scenario by the mechanical thrombectomy, raises new interests and opportunities in the clinical fields of neuro-recovery and pharmacological neuro-protection to either delay the transformation of penumbra into core infarction and reduce the reperfusion injury [10, 11].

The revolution has only just begun. Acute stroke care should be promptly reshaped worldwide to effectively deliver evidence-based treatments, taking into account that either the adequate selection or the timely treatment of patients has been the key to success of all recent trials. New workflows and standardized protocols should be planned in the near future and integrated into each regional stroke network and health-care system. Obviously, practical issues of the real world, from the geographical features to the availability of human and economic resources will play a determining role in every stroke setting. In light of this information, the stroke community is hopeful that health authorities and decision makers will speedily appreciate the weight of the novelty and the need for adequate investments.

Disclosure Statement

The authors declare that they have no conflict of interest.

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