NEURO

Openventio PUBLISHERS

ISSN 2377-1607 Open Journal http://dx.doi.org/10.17140/NOJ-2-e003

Editorial

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Volume 2 : Issue 2
Article Ref. #: 1000NOJ2e003

Article History
Received: July 2nd, 2015
Accepted: September 3rd, 2015
Published: September 3rd, 2015

Citation
Deveikis JP. Endovascular treatment of stroke: historical perspective. *Neuro Open J.* 2015; 2(2): e4-e5. doi: 10.17140/NOJ-2-e003

Endovascular treatment of Stroke: Historical Perspective

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Effective acute ischemic stroke therapy hinges on rapid restoration of blood flow to the ischemic tissue. Since the National Institute of Neurological Diseases and Stroke r-tPA study,[1] intravenous fibrinolytic therapy in appropriately selected patients has been the primary method used to open the vessels and improve neurological outcome from stroke. The intravenous administration allowed for widespread dissemination of the technique, since therapy could be started very rapidly after the diagnosis is made. However, successful treatment with r-tPA requires careful patient selection and adherence to strict inclusion and exclusion criteria. As a result, there is a significant number of patients who could not receive the therapy. Even though significantly better than placebo for most stroke patients, some still suffered a poor outcome in spite of therapy. This raised the question whether there could be a way to directly apply the fibrinolytic agent to the occlusive thrombus with catheter-based techniques in an effort to more effectively treat large vessel occlusions. Intra-arterial thrombolysis was reported helpful in restoring flow in relatively small series of patients, especially situations like basilar thrombosis, with a dire natural history.[2] However, only one study, the PROACT study showed a positive impact on neurological outcome compared to placebo.[3] Results of this study were often used to justify endovascular treatment of patients ineligible or unresponsive to intravenous r-tPA but intra-arterial administration of the fibrinolytic was often unsuccessful restoring flow in the occluded vessel, and not infrequently was associated with hemorrhagic transformation of the stroke. The endovascular armamentarium increased in the early years of the 21st century with the development of the MERCI device (Stryker, Fremont, CA, USA), a cork-screw-like device designed to mechanically retrieve thrombus.[4,5] This resulted in a higher success rate in opening occluded vessels compared to pharmacological methods and could be used in patients in whom r-tPA is contraindicated. In the years that followed, additional mechanical thrombectomy devices were introduced including stent-like retrievers like the Solitaire (ev3-Medtronic, Irvine, CA, USA), and the Trevo (Stryker, Fremont, CA, USA), and the Penumbra aspiration system (Penumbra, San Leandro, CA, USA) which all appeared to be far more effective than Merci in opening occluded vessels. The IMS III study sought to provide evidence of the effectiveness of endovascular techniques plus intravenous r-tPA versus intravenous r-tPA alone, but it enrolled patients when these newer devices were just becoming available. Most endovascular patients were only treated with intra-arterial r-tPA and, not surprisingly, the study showed no benefit in outcome.[6] This prompted some to predict the death of endovascular stroke therapy. A short time later, results of well-designed studies beginning with the MR CLEAN study[7] appeared in rapid succession showing significantly improved outcome with endovascular treatment of large vessel occlusions using the modern stent-like retrievers.[8-11] Within a short period of time, endovascular therapy went from being on the verge of extinction to being an integral part of comprehensive stroke care. The future will no doubt see investigations refining patient selection criteria, evaluating the role of advanced imaging techniques, evolving and improving the devices and techniques and improving infrastructure to allow all appropriate patients have access to these devices and the trained physicians that can use them safely and effectively.

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