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Mini Review

Edaravone Therapy Could be a Substitute for Decompressive Craniotomy/Craniectomy for Large Ischemic Stroke in Remote Areas with no Neurosurgeons

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ABSTRACT

The incidence of stroke has been a major task for medics and relatives globally. Stroke is the second most frequent disease with high morbidity as well as mortality worldwide. This is a very short and focus review on edaravone therapy. Due to the success story of edaravone in the management of stroke, it could be beneficial for severe stroke patients. The impact of edaravone was highest in the most severely afflicted stroke patients with National Institutes of Health Stroke Scale (NIHSS) scores ≥15 during admission. Large-artery atherosclerosis or cardioembolism stroke subtypes had the highest NIHSS scores. On the other hand, decompressive craniectomy is the resection of part of the skull so that edematous brain tissue can herniate outside. It is thus advocated that, edaravone therapy could be a substitute for decompressive craniotomy for large ischemic stroke in remote facilities with no neurosurgeons.

INTRODUCTION

The incidence of stroke has been a major task for medics and relatives globally[11,14]. Stroke is the second most frequent disease with high morbidity as well as mortality worldwide[13, 14]. Stroke is classified into hemorrhagic and ischemic. The treatment of ischemic stroke is still a major challenge worldwide[11, 13, 14]. Over the years, several strategies have been put in place to recuperate the medical management of patients with ischemic stroke. One of such treatment modalities is the use of Japanese discovered medication called edaravone. One could speculate that edaravone could be a substitute for decompressive craniectomy in remote facilities without Neurosurgeons. Nevertheless, the clinical efficacy of edaravone for acute cerebral ischemic patients' needs further studies.

EDARAVONE

Edaravone is a 2-pyrazolin-5-one derivative bearing a phenyl group at the 1-position and a methyl group at the 3-position[17]. It is a low-molecular-weight antioxidant medication aiming at peroxyl radicals among numerous kinds of reactive oxygen species. It is able to scavenge both lipid as well as water soluble peroxyl radicals via the domation of an electron to the radical. It inhibits the oxidation of lipids via scavenging of chain-initiating water-soluble peroxyl radicals as well as chain- carrying lipid peroxyl radicals[17].

EDARAVONE FOR ACUTE ISCHEMIC STROKE

Kobayashi et al using the Japan Stroke Data Bank, conducted a study on the impact of edaravone on neurological deficits in acute ischemic stroke patients[6]. The patients were stratified into ischemic stroke subtype such as large-artery atherosclerosis, cardioembolism, and small-vessel occlusion. Their study revealed that the impact of edaravone was highest in the most severely afflicted patients with National Institutes of Health Stroke Scale (NIHSS) scores ≥15 during admission. They also observed that, the large-artery atherosclerosis or cardioembolism stroke subtypes had the highest NIHSS scores. Similarly, on discharge, they observed that, the NIHSS scores were lower in the edaravone-treated group than in the no edaravone group. They concluded that edaravone use correlated well with improvement of neurological deficits using the NIHSS[6].

In their study, they observed that an NIHSS score of ≥ 4 was cogitated as clinically significant improvement in neu-

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rological deficits[4, 6]. They detected that, the impact of edaravone was utmost in stroke victims with severe disability. Therefore, they proposed that neurologists may limit the use of edaravone to stroke victims with an NIHSS score of ≥15 during admission[6]. It is usually these category of patients who needs decompressive craniectomy too.

Enomoto et al indicated that, early edaravone use was related to improved functional outcomes at hospital discharge, lower in-hospital mortality, and decreased intracranial hemorrhage after admission in patients with acute ischemic stroke who underwent emergent endovascular reperfusion therapy[3]. Numerous clinical trials including randomized, placebo-controlled, double-blind multicenter trial to date (the Otomo trial) have been conducted to assess the effectiveness of edaravone for acute ischemic stroke[1, 3-5, 9, 12, 15, 18, 19]. Most of these trials established that edaravone had satisfactory functional outcomes.

MECHANISM AND DOSE OF EDARAVONE

It is affirmed that, edaravone is capable of scavenging of free radicals during stroke[4, 20]. Also, it is established that, reperfusion of affected arteries after cardioembolism often triggers the generation of a huge number of free radicals[20]. It well documented that, Cardioembolism, is often severe during hospital admission and depicted with hemorrhagic cerebral infarction[6].

The ideal regimen of edaravone therapy has been suggested in many studies[5, 8, 16]. These studies did not only evaluate the timing of initiation, but also the doses. Enomoto et al indicated that, the median dose of edaravone administered within 3 days of admission was 150 mg[3]. They estimated that clinicians used edaravone at a dose of 60 mg per day for approximately 7 days in most cases. Nevertheless, only the standard 30 mg/ample was available in Japan[3]. A small phase IIa trial conducted in Europe using edaravone with doses of 1000 mg or 2000 mg within 72 hours revealed that the above regimen was satisfactorily efficient for patients with acute ischemic stroke who underwent emergent endovascular reperfusion therapy[5]. The use of edaravone as a prevent remedy for acute or delayed ischemic events during endovascular therapy for vascular diseases need furthers studies.

DECOMPRESSIVE CRANIECTOMY

On the other hand, decompressive craniectomy is the resection of part of the skull so that edematous brain tissue can herniate outside. This treatment modality is often aimed at averting neuronal destruction at portions of the brain supplied by the affected artery[7, 14]. It was observed has been observed that, craniectomy is more efficient and effective in two distinctive stroke kinds. These patient categories include patients with enormous cerebellar infarction in whom suboccipital craniectomy (SOC) is often warranted and patients with enormous infarction of the middle cerebral artery regions in whom temporalis craniectomy or hinger craniectomy is often warranted[14].

RECOMBINANT TISSUE PLASMINOGEN ACTIVATOR (RTPA)

Over the Years intravenous (IV) thrombolysis with rtPA given within four and half hours following stroke has proven to be capable of improving patients' prognosis and neurological deficits[10, 14]. This treatment modality is currently the gold-standard treatment option for patients with ischemic stroke. Nevertheless, approximately 25% of patients in well-structured stroke centers are fortunate enough to get assess to IV thrombolysis. Also, its effect on large vessel occlusion is reduced to a very low recanalization proportion of about 20%[2, 14]. The synergetic effect of both IV thrombolysis with rtPA and edaravone in acute ischemic stroke patients still needs further studies.

OTHER TREATMENT OPTIONS

Another eminent treatment modality for ischemic stroke is the endovascular treatment. This treatment option often involves mechanical retrieval of blood clots in the occluding artery through catheterization[10, 14]. Endovascular thrombectomy (EVT) has proven to be effective in large vessel occlusive stroke within 24 h. Nevertheless, it is disadvantaged because of the accessibility of EVT centers[14]. Moreover, ischemic brain damage notwithstanding timely recanalization (futile recanalization) is another factor limiting EVT treatment option[14].

CONCLUSIONS

All the literature on edaravone therapy point clearly to the fact that, it could be a substitute for decompressive craniotomy for large ischemic stroke in remote areas with no neurosurgeons. Nevertheless, further comparative studies on outcomes from edaravone and decompressive craniectomy are needed to arrive at a decisive conclusion. Furthermore, the effect of edaravone on brain edema during ischemic stroke still need studies. It may be interesting to observe that once edaravone is capable of scavenging of free radicals, it may also be capable resolving brain edema.

COMPETING INTERESTS

None declared.

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