Neuropharmacology of Poststroke Motor and Speech Recovery

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KEYWORDS

• Stroke • Recovery • Motor • Speech • Neuropharmacology

KEY POINTS

- Stroke is a common and serious condition.
- The main focus of the article is pharmacologic agents used for motor and speech recovery after stroke.
- Amphetamine, levodopa, selective serotonin reuptake inhibitors, and piracetam were the most commonly used drugs in enhancing motor and speech recovery after stroke.
- Adding drug therapy to conventional rehabilitation seems beneficial in poststroke motor and speech recovery.
- Adequately powered, randomized, double-blind clinical trials are needed to explore pharmacologic enhancement of stroke recovery.

INTRODUCTION

Approximately 6.8 million Americans more than 20 years of age have had a stroke. On average, every 40 seconds, someone in the United States has a stroke. Motor and speech deficits are common results of stroke. Fifty percent of patients have some hemiparesis after stroke and 19% have aphasia.[1] Although physical, occupational, and speech therapies are the most widely used treatment in the rehabilitation of stroke

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survivors, their therapeutic effects are generally modest. There is a growing need for more effective treatment options as add-ons to conventional therapy. For several decades, pharmacologic agents have been used as potential approaches for enhancing motor and speech recovery.

This article summarizes published literature in motor (Table 1) and speech (Table 2) recovery after stroke. The clinical trials investigating primarily recovery from poststroke depression, poststroke spasticity, cognitive impairment, activities of daily living (ADLs), neuropathic pain, and seizures have not been included. However, if the improvements in these deficits were reported secondarily to motor or speech recovery, they are mentioned. Experimental studies with animals and healthy controls, and case reports, were not included either because of the large number of clinical trials in the past.

Details about adverse events are not included because this is not the scope of the article. Only serious adverse events related to the drug are mentioned. Engelter[46] provides more specific information about adverse events.

PHARMACOLOGIC AGENTS IN MOTOR AND SPEECH RECOVERY

Central Nervous System Stimulators (Amphetamines and Methylphenidate)

Crisostomo and colleagues[3] conducted a small double-blinded and placebo-controlled study with 8 subjects (4 in active and 4 in placebo groups) to see whether dextroamphetamine (D-amphetamine) helps with the motor recovery of patients up to 10 days after ischemic stroke. A single dose of 10 mg of D-amphetamine was combined with 45 minutes of physiotherapy (PT) within 3 hours after drug administration. Fugl-Meyer (FM) was used as an outcome measures and it was shown that patients who were treated with D-amphetamine obtained greater increments in motor scores than the controls.

Another proof of concept study came from Walker-Batson and colleagues,[31] this time focusing more on speech recovery after stroke. They administered 10 doses of 10 mg of D-amphetamine at intervals of 3 to 4 days along with 1 hour of speech therapy 30 minutes after treatment in 6 patients after acute (10–30 days after the injury) nonhemorrhagic stroke. All 6 subjects received active drug and the assessments were performed at baseline, 1 week, 3 months, 6 months, 9 months, and 1 year after starting the therapy. They used the Porch Index of Communicative Ability (PICA) as an outcome assessment. The results were promising and, at 3 months, 5 of 6 subjects had achieved more than 100% of the 6-month predicted scores.

Reding and colleagues[6] studied amphetamine effects on recovery with larger sample sizes. Administration of 10 mg/d of D-amphetamine for 14 days then 5 mg/d for 3 days along with standard inpatient therapy was performed in 21 patients 7 to 45 days after acute ischemic stroke. Nine of the subjects were in the active treatment group and assessments were done at baseline, day 2, and weekly for 4 weeks. FM, Barthel Index (BI), and Zung Self-rating Depression Scale (ZDS) were used to screen the motor, functional, and mood improvement results respectively. The investigators concluded that amphetamine use did not improve motor recovery, functional outcome, or depression scores in acute/subacute stroke.

Contrary to Reding and colleagues,[6] Walker-Batson and colleagues[5] reported encouraging results in the same year. With a similar protocol to their aphasia study 3 years earlier, 10 doses of 10 mg of D-amphetamine at 3-day to 4-day intervals were administered together with 1 hour of PT in 10 patients after acute (16–30 days after) ischemic stroke but this time they had a control group (5 of 10 subjects) to monitor the effects of amphetamine in a more robust fashion. The participants were