



Article

Experimental Motor Neuron Disease Induced in Mice with Long-Term Repeated Intraperitoneal Injections of Serum from ALS Patients

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Abstract: In an earlier study, signs of commencing degeneration of spinal motor neurons were induced in mice with short-term intraperitoneal injections of immunoglobulin G (IgG) taken from patients with amyotrophic lateral sclerosis (ALS). Since in that study, neither weakness nor loss of motor neurons was noted, to test whether the ALS IgG in this paradigm has the potential to evoke relentless degeneration of motor neurons, treatment with repeated injections over a longer period was carried out. Mice were systematically injected intraperitoneally with serum taken from ALS patients over a 75-day period. At selected time points, the isometric force of the limbs, number of spinal motor neurons and their intracellular calcium levels were determined. Furthermore, markers of glial activation and the motoneuronal uptake of human IgG were monitored. During this period, gliosis and progressive motoneuronal degeneration developed, which led to gradual loss of spinal motor neurons, more than 40% at day 21, along with decreasing muscle strength in the limbs. The inclusion-like accumulation of IgG appeared in the perikarya with the increase of intracellular calcium in the cell bodies and motor nerve terminals. Our results demonstrate that ALS serum can transfer motor neuron disease to mice.

Keywords: ALS; motor neuron; degeneration; serum; passive transfer; IgG uptake; intracellular calcium

1. Introduction

Amyotrophic lateral sclerosis (ALS) is a rare but fatal neurodegenerative disease involving upper (cortical) and lower (brain stem and spinal cord) motor neurons (MNs). The consequence of the loss of lower MNs is severe striated muscle atrophy with paralysis, which eventually leads to death, principally by respiratory failure [1]. The disease is incurable and its causes are still obscure, but some