

Abstract

The periodontium damage induces neuronal cell death in the trigeminal mesencephalic nucleus and neurodegeneration in the trigeminal motor nucleus in C57BL/6J mice

Ashis Dhar

Abstract

Proprioception from masticatory apparatus and periodontal ligaments comes through the trigeminal mesencephalic nucleus (Vmes). We evaluated the effects of tooth loss on neurodegeneration of the Vmes and trigeminal motor nucleus (Vmo). Bilateral maxillary molars of 2-month-old C57BL/6J mice were extracted under anesthesia. Neural projections of the Vmes to the periodontium were confirmed by injecting Fluoro-Gold (FG) retrogradely into the extraction sockets, and for the anterograde labeling adeno-associated virus encoding green fluorescent protein (AAV-GFP) were applied. For immunohistochemistry, Piezo-2, ATF3, Caspase 3, ChAT and TDP-43 antibodies were used. At 1 month after tooth extraction, the number of Piezo2-immunoreactive (IR) Vmes neurons were decreased significantly. ATF3-IR neurons were detected on day 5 after tooth extraction. Dead cleaved caspase-3-IR neurons were found among Vmes neurons on days 7 and 12. In the Vmo, neuronal cytoplasmic inclusions (NCIs) formation type of TDP-43 increased at 1 and 2 months after extraction. These indicate the existence of neural projections from the Vmes to the periodontium in mice and that tooth loss induces the death of Vmes neurons followed by TDP-43 pathology in the Vmo. Therefore, tooth loss induces Vmes neuronal cell death, causing Vmo neurodegeneration and possibly affecting masticatory function.