Methoxyflurane

Methoxyflurane (2,2-dichloro-1,1-difluro-ethyl methyl ether; Metofane) is a potent general inhalation anesthetic that is well-suited for small animal surgery. Methoxyflurane is particularly attractive as an anesthetic agent in neurological stereotaxic surgery, because methoxyflurane does not markedly attenuate the rate of anterograde or retrograde transport of horseradish peroxidase, or reduce the consistency and/or extent of excitatory neurotoxin damage. Methoxyflurane also is non-flammable when mixed with O2 or air at anesthetic concentrations. The use of methoxyflurane anesthesia in stereotaxic surgery has been limited because methoxyflurane must be delivered via a vaporizer system that will easily interface with standard stereotaxic head holders [1].

A investigation examined whether the volatile general anesthetic methoxyflurane might protect spinal locomotor networks from kainate-evoked excitotoxicity using an in vitro rat spinal cord preparation as a model. The protocols involved 1h excitotoxic stimulation on day 1 followed by electrophysiological and immunohistochemical testing on day 2. A single administration of methoxyflurane applied together with kainate (1h), or 30 or even 60min later prevented any depression of spinal reflexes, loss of motoneuron excitability, and histological damage. Methoxyflurane per se temporarily decreased synaptic transmission and motoneuron excitability, effects readily reversible on washout. Spinal locomotor activity recorded as alternating electrical discharges from lumbar motor pools was fully preserved on the second day after application of methoxyflurane together with (or after) kainate. These data suggest that a volatile general anesthetic could provide strong electrophysiological and histological neuroprotection that enabled expression of locomotor network activity 1day after the excitotoxic challenge. It is hypothesized that the benefits of early neurosurgery for acute spinal cord injury (SCI) might be enhanced if, in addition to injury decompression and stabilization, the protective role of general anesthesia is exploited [2].

1)
Lasiter PS, Garcia J. A methoxyflurane delivery system for stereotaxic surgery. Brain Res Bull. 1984 Sep;13(3):457-60. PubMed PMID: 6388738.
2)
Shabbir A, Bianchetti E, Nistri A. The volatile anesthetic methoxyflurane protects motoneurons against excitotoxicity in an in vitro model of rat spinal cord injury. Neuroscience. 2015 Jan 29;285:269-80. doi: 10.1016/j.neuroscience.2014.11.023. Epub 2014 Nov 20. PubMed PMID: 25446348.