H45 Mechanisms of Death Due to Inadvertent Administration of Ionic Hypertonic Contrast Media Into the Subarachnoid Space

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After attending this presentation, attendees will understand the mechanisms of death due to inadvertent administration of ionic hypertonic contrast media into the subarachnoid space.

This presentation will impact the forensic science community by demonstrating the mechanisms of death and pathological findings of inadvertent subarachnoid injection of ionic hypertonic contrast media. This presentation is also informative in preventing the misuse of contrast media.

Myelography is routinely performed using a non-ionic contrast media; however, the inadvertent administration of ionic hypertonic contrast media into the subarachnoid space results in convulsions and acute respiratory failure and can lead to death if not treated immediately. The mechanisms underlying the adverse effects of hypertonic contrast media on the central nervous system are unclear.

A literature review identified twelve surviving patients and five fatal patients after inadvertent administration of ionic hypertonic contrast media into the subarachnoid space (1971-2014). Most patients complained of lumbar or leg pain and developed convulsions within three hours of the administration. At autopsy, toxicological analysis of contrast media in the cerebrospinal fluid is required for the diagnosis of inadvertent administration.

The effects of a subarachnoid injection of hypertonic contrast media (60% Urografin®; osmotic pressure 6) on the central nervous system in rats were examined. Under general anesthesia, rats were administered a subarachnoid injection of 20.0μL, 10.0μL, 7.5μL, or 5.0μL of Urografin®, hypertonic sodium chloride solution (osmotic pressure 6), or saline. The rats that received 20.0μL or 10.0μL of Urografin® immediately developed severe convulsions and died within 42 minutes of the injection. The rats that received 7.5μL or 5.0μL of Urografin® exhibited delayed-onset convulsions that subsided within 240 minutes. Immunohistological examinations of the brain and spinal cord two days after the 7.5μL Urografin® injection revealed widespread microglial activation in the brain stem. Neither convulsions nor histological changes were observed in rats that received the hypertonic sodium chloride solution or saline injection. These findings indicate that the extent and duration of convulsions and fatality depend on the volume of hypertonic contrast media. Furthermore, brain stem injury due to the neurotoxicity of contrast media is the mechanism underlying the acute respiratory failure that occurs following the subarachnoid injection of hypertonic contrast media.

Contrast Media, Cerebrospinal Fluid, Medical Malpractice