

Postmortem CT analysis of paranasal sinuses using an ovine model of drowning

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Fluid-filled paranasal sinuses are suggested to be a valuable tool to distinguish between drowning and non-drowning postmortem, yet the mechanisms governing fluid entry remains unknown. We investigate if fluid-filled paranasal sinuses are caused by a passive influx from submersion or an active aspiration mechanism during drowning. The ovine nasal cavity and maxillary sinuses are remarkably similar anatomically to humans, and have been used for endoscopic surgical training in recent decades. We submerged 15 decapitated ovine heads from agricultural waste at a depth of 2 m in flowing water for 1, 8, and 24 h and 7 days. Paranasal sinuses were CT imaged and compared pre- and post-submersion to non-submerged controls. Furthermore, we examined the paranasal sinuses of a single homicide case of a non-drowned submerged subject. Results demonstrate that fluid passively enters the maxillary sinus postmortem in the non-drowned ovine heads following 1 h of submersion. Fluid volume was independent of submersion time and influenced by time out of water as well as handling, since volume was reduced between consecutive CT scans. In contrast to our hypothesis, the filling of the paranasal sinuses is due to passive influx of fluid from submersion rather than an active aspiration during drowning. The observation that paranasal sinuses were fluid-filled in a single medico-legal case of postmortem submersion supports the finding of passive influx. Consequently, careful interpretation of fluid-filled paranasal sinuses is required when bodies are found in water, as the finding cannot distinguish between postmortem submersion and drowning.