



### H77 Is Fluid in the Sphenoid Sinus a Valid Indicator of Drowning?

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After attending this presentation, attendees will better understand the potential problems associated with using fluid in the sphenoid sinus as an indicator of drowning.

This presentation will impact the forensic science community by challenging one frequently used indicator of drowning.

Drowning deaths are a diagnosis of exclusion. There is no definitive test for drowning and diagnosis is based on scene investigation and findings at autopsy such as signs of water immersion, frothy fluid or frank fluid in the airways, emphysema aquosum, water/sediment in the stomach and/or in the sinuses, and hemorrhage in the temporal bones.<sup>1</sup> The Office of Chief Medical Examiner in Baltimore, MD, examines for fluid in the sphenoid sinus at autopsy in all cases of suspected drowning; however, several prior studies have shown that fluid is found in the sinuses of non-drowning cases. Bohnert et al. aspirated fluid from the sphenoid sinus in 52% of non-drowning cases.<sup>2</sup> Kawasumi et al. reviewed 111 cases with fluid in the sinuses on Computed Tomography (CT) scan (38 drowning and 73 non-drowning cases), although they report that the median volume of fluid was greater in the drowning cases.<sup>3</sup> Lundemose, et al. also found fluid in the sinuses on CT scan in all non-drowning cases studied, although they also report that the volume of fluid was significantly lower in the non-drowning cases.<sup>4</sup>

In this study, CT scans from January 1, 2015, to December 31, 2015, were examined for the presence or absence of fluid in the sphenoid sinus, comparing drowning cases to age-matched non-drowning controls. In addition, fluid was aspirated from the sinuses using a needle and syringe on random non-drowning cases and suspected drowning cases from July 2016 to November 2016, with documentation on the volume, color, and consistency of any fluid aspirated. Exclusion criteria in both portions of the study include age less than 16, presence of basilar skull fractures, and signs of decomposition. As of the time of this abstract, 12 cases from 2016 have been examined, and fluid was aspirated from the sphenoid sinus in three cases (25%) while no fluid was aspirated in nine cases.

The goal of this study is to corroborate prior studies that have shown that the mere presence of fluid in the sphenoid sinus cannot be used to determine death by drowning and to determine if it adds any additional evidence that drowning did indeed occur. By aspirating the sinuses, this research seeks to determine if the volume, color, and consistency of fluid can be used to help differentiate drowning versus non-drowning deaths.

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3. Kawasumi Y., Kawabata T., Sugai Y., Usui A., Hosokai Y., Sato M., Saito H., Ishibashi T., Hayashizaki Y., Funayama M. Diagnosis of drowning using post-mortem computed tomography based on the volume and density of fluid accumulation in the maxillary and sphenoid sinuses. *European Journal of Radiology*. 2013, 82: e562-e566.



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### **Drowning, Sphenoid Sinus Fluid, CT Scan**