



G19 Nasal Mucociliary Motility: New Forensic Tool for Estimating Time Since Death

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After attending this presentation, attendees will understand the potential contributions of postmortem investigation of nasal mucociliary motility in time of death estimation.

This presentation will impact the forensic science community by emphasizing the potential role of nasal scraping that could become a routine procedure in estimating time-since-death.

Postmortem interval (PMI) estimation is one of the most difficult issues in forensic medicine. Time-of-death is usually appreciated by recognizing early postmortem changes to the body prior to the onset of gross decomposition phenomena: algor mortis, rigor mortis, and livor mortis.

The study of these physical processes is strictly connected to the operator's subjectivity hence it can be source of confusion in estimating PMI. Moreover these body changes can be altered by several internal and external factors: body temperature at death time, subcutaneous fat, muscular mass, clothes, environmental temperature, humidity, and ventilation.

There have been many proposed innovative methods in attempts to avoid this trouble defining PMI objectively as possible. The goal of these new techniques is to find a link between PMI and objectively detectable values such as infrared tympanic thermography, skin fluorescence, electrolyte concentration in cerebro-spinal fluid, pericardial fluid or vitreous humor. All these samples, on the other hand, present practical difficulties in performing and require invasive methods and long time waiting.

Some studies have been published about nasal scraping role in clinical practice (ciliary dyskinesia, NARES, allergic rhinosinusitis), but no studies have never been performed in cadavers for PMI estimation.

A study concerning the examination of ciliary motility as residual life phenomenon, realizing a study on time of death evaluation using a new, rapidly available requiring substrate: nasal mucosa is presented.

Nasal mucosa is composed by numerous cell types (globet cells, basal cells, ciliated and not ciliated cells) and can be easily obtained by nasal scraping, a technique commonly used in otolaryngology; it consists of a curette crept on nasal mucosa and cells picked up in this way are then observed.

From June 2009 to June 2010, nasal scraping in 70 cadavers was performed. Age ranged from 24 to 95 years and the cause of death was most frequently due from ischemic cardiopathy, septic shock, and car accident. The only exclusion criteria of this study was nose bleeding.

A specimen of ciliated epithelium was obtained by scraping from the middle third of the inferior turbinate with a spoon-shaped nasal probe (Rhinoprobe). An *in vitro* evaluation of ciliary movement was performed. Ciliary beat frequency (CBF) was analyzed by phase-

contrast microscopy. Three different samples at different postmortem intervals were carried out: between 4 and 6 h (T1), between 10 and 12 h (T2) and after 24 h (T3). Then CBF (beat number/second) was classified in: present (3-4/sec), hypo-valid (1-2/sec) and absent.

Results demonstrated that, except for those cases which showed fungal or bacterial infections, at T1 motility was present in the majority of cases; at T2 motility was still present, but it was hypo-valid in a higher percentage. Ciliary activity was absent at T3. It is believed that all these findings can be explained with progressive metabolic reserves lowering: the more time passes after death, the more ciliated cells loose energetic substrates for ciliary motility.

In conclusion, mucociliary motility seems to be linked to PMI and thus nasal scraping can be considered as a new, easy, cheap, and efficient objective tool in detecting PMI; further studies are required.

Nasal Scraping, Mucociliary Motility, Time Since Death