## F33 An In-Vivo Porcine Model of Contusive Bite Mark Injuries in Human Bite Mark Analysis

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Attendees at this presentation will be able to assess the utility of a live porcine model for simulated bite mark injuries. They will learn about the different appearances of bite marks in dependent and non-dependent skin surfaces and will be informed of the differences in bite mark appearances made both prior to and, after death of the subject animal.

The ageing of bite mark wounds in relation to time of death is an important aspect of forensic odontology and one in which the opinion of dentists as expert witnesses has important legal consequences. There is a lack of objective information available on whether bite mark wounds can be accurately aged in relation to time of death and there is no sound data which measures the age of bite markings which definitively distinguishes between those made antemortem (AM) and those made postmortem (PM).

This presentation will discuss a technique used to study the age of bite mark wounds inflicted at known time intervals, before and after death.

The purposes of this study were: (1) to construct an instrument, which would permit the infliction of human bite marks on skin using a controlled and quantifiable force, and (2) to study the age of antemortem and postmortem bite mark wounds by means of conventional bite mark comparison techniques, metric analysis, specimen transillumination and histological studies.

An experimental model was utilized for the making of human bite marks. The skin of domestic animals has been investigated extensively in order to find a suitable analogue to human skin. The domestic pig is the most representative animal model for all types of dermatological and wound investigations. Pigskin has important similarities in morphology, cellular composition, and immunoreactivity to human skin that is not present in other species. The pig has been utilized in a number of studies, which have confirmed it to be the most appropriate model.

A series of simulated bites were created on a juvenile female domestic pig using a device designed to mechanically produce bite marks. This device called the bite-o-matic was monitored using a pressure-sensitive load cell for a pressure consistency of 50lbs at a pre-selected tooth. With the animal under general anaesthesia, four bite mark wounds were made on each side of the pig's flank for a total of 8 bite marks. Each bite was impressed into the tissue using the calibrated bite-o-matic and the upper and lower arches of the device were held closed for 60 seconds. Paired bite marks were made on each side of the pig 1 hour AM, 5 minutes AM, 5 minutes PM and 1 hour PM. Observations and conventional photography of the bite markings were undertaken. The pig was then transported from the animal care facility to the Coroner's Office where it was stored under normal mortuary conditions overnight. The animal was placed on one side to allow blood pooling so that there would be paired bite marks (on the dependent side and on the non-dependent side). At necropsy, to preserve the original anatomical configuration of the skin, a supporting plastic matrix was fixed to the pig's skin using cyanoacrylate and silk sutures. Each ring had a reference number and anatomical reference points for identification and orientation. The excised specimens fixed to the matrices were studied in their fresh state and following 35 days in formalin. At all stages, scale photographs were exposed for later examination.

On the day injuries were inflicted, the markings were clearly evident and viewable as distinctive oval patterns. Maxillary arch width and arch length were assessable in every specimen. As time progressed, the bite markings faded making even simple metric analysis difficult to impossible. The most stable and representative bite mark injuries were ones inflicted 5 minutes AM.

Subcutaneous hemorrhage was observed only on the antemortem bite marks on the non-dependent side.

No additional information was provided when the specimens were transilluminated using a rigorous, standardized transillumination methodology.

Histologically, two separate examiners examined the specimens independently. One of them was blinded to the identity of the bites. The slides stained with H&E showed a slight depression in the tissue corresponding to the tooth imprint. There was also compression of the epidermis and some tearing of the epidermis/dermis junction. There was no evidence of extravasated red blood cells nor leukocytic infiltration in any of the microscopic sections of the AM and PM bite mark specimens examined on light microscopy.

The external physical appearance of bite marks varies with time. Just how the pattern varies and how it is related to changes in the dermal tissue remain largely unknown. Numerous variables can influence the quality of a bite mark. No form of artificial simulation can precisely replicate the mechanics or response of tissue to a bite. However, the use of simulated bite marks enabled greater control over the injury. Variables such as anatomical location, the teeth used to create the bite, bite pressure, and collection of the evidence were easily controlled and standardized. Simulated bite marks also permitted a consistent quality of materials to be

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produced, allowing parity between each of the bite.

This pilot study did not provide any evidence on whether it is possible to determine that a bite mark was made before or after death but has provided evidence on the window of time showing clearly demarcated bite marks around the time of death. This information will serve for an ongoing study in a larger number of animals currently being undertaken.

**Bite Mark, Porcine, In Vivo**

 