



F28 Anterior Bite Force and Association of Bitemarks with Dental Models

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After attending this presentation, attendees will be able to: (1) measure maximum voluntary anterior bite forces, generated at baseline and aroused emotional states; (2) assess force consistency from day to day; and, (3) review the effect of an emotional state on bite force to assess whether dentists with forensic experience can match photographs of wax bite impressions to corresponding dental models.

This presentation will impact the forensic science community by providing foundational data to direct future research that evaluates the validity of human bitemark analysis in criminal investigations.

Teeth are used as weapons for offensive (perpetrator) and defensive (victim) purposes, and bitemark injuries are often evident on victims of sexual assault, child abuse, and homicide.¹ Assailants often use their front teeth to inflict injuries. Although bitemarks are analyzed in criminal investigations, the science supporting bitemarks as evidence is weak.² In addition, bitemark analysis is confronted by numerous controversies and challenges.³⁻⁵ How emotion influences anterior bite force is unknown, and whether experts can correctly associate bitemarks and dental models has not been substantiated.⁶ An improved understanding of the factors that affect how and why human bitemark injuries are made will enhance analysis of bitemarks as evidence during investigation and prosecution of such crimes.

Phase 1 of this pilot study measures maximum voluntary anterior bite forces, generated at baseline and aroused emotional states, to assess: (1) force consistency from day to day; and, (2) the effect of an emotional state on bite force. Phase 2 assesses whether dentists with forensic experience can match photographs of wax bite impressions to corresponding dental models.

Phase 1: Thirty participants will have stone dental models fabricated from full arch dental impressions. Participants will make four maximum anterior force bites on a wax-covered gnathodynamometer on two separate days (two bites each day). They will be asked to rate their baseline stress level on a 100mm visual analogue scale (VAS) with 0 = no stress and 100 = the worst stress imaginable. Stress will be assessed before each bite. Before the fourth bite, each participant will be asked to recall an event that aroused anger (and re-estimate their stress level). Photographs will be taken of the wax impressions made by the second and fourth bites. Phase 2: Five dentists with forensic experience will attempt to match photographs of the wax bite impressions to corresponding dental models.

Phase 1: Mean bite force will be calculated for the four bites and compared using Repeated Measures ANOVA and Tukey HSD post hoc tests ($\alpha=0.05$) to determine (1) if baseline bite forces (bites #1, #2, and #3) differ from one another, and (2) from the anger induced bite force (bite #4).

Phase 2: The number of correct matches will be recorded and percent agreement calculated for each examiner. Kappa statistics will assess the level of agreement.

References:

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5. Hinchliffe J. Forensic odontology, part 4. *Br Dent J*. 2011 Apr 23;210(8):363-8.
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Bitemark, Bite Force, Anger Arousal