



F11 Determination of Bite Force

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The goal of this presentation is to establish a preliminary study and the basis for measuring and quantifying the force exerted by a human bite in the anterior sextant, reflecting those teeth involved in the injury pattern of a bite mark. And, to build/develop a reference table for the range of human bite force and the variables that affect it.

This presentation will impact the forensic community and/or humanity by providing more research to build a database of factors that affect bite force, and record the variables within different population groups. Once known force ranges are established within given populations more studies can be done to link bite force to the injury patterns they create.

The goals of this presentation are twofold. First, to establish a preliminary study and basis for measuring and quantifying the force exerted by a human bite in the anterior sextant, reflecting the teeth involved in the injury pattern of a bite mark. Second, to begin the process of developing a reference table for the range of human bite force and the variables that affect it.

Introduction: Bite mark injuries and the patterns they leave in the skin are the most challenging cases in forensic odontology. With this in mind, the ability to measure the force that is generated by the human dental complex in a bite mark is an important part of understanding of the type of injury it would then produce in the skin. To say a bite was hard enough to leave an injury is not very scientific. Therefore, a primary evaluation of any bite mark injury should take into consideration the amount of force needed to cause tissue damage in the first place.

Materials and Methods: To measure the force exerted by the anterior teeth a device known as a gnathodynamometer was used. For this study specifically, the gnathodynamometer was a modified design, developed by researchers and engineers at Proctor and Gamble. This study required the fabrication of a bite plate. The bite plate was produced for both the upper and lower anterior segments. Additionally, the surface was designed to accommodate the twelve anterior teeth, for the subject(s) to bite against. These removable metal plates were enclosed in a wet piece of animal hide for the subjects to bite into. The force was recorded in pounds per square inch. Each participant was instructed to bite with maximal force onto the hide-covered plates of the transducer. This process was repeated a total of three times for each participant. The highest of the three recorded values were used for statistical analysis. The dental exemplar impressions produced in the hide were maintained with the study with the subject identification number and pressure reading as part of the database.

For this study all subjects were periodontally stable and had a complete or near complete complement of teeth. Additionally, none of the subjects had removable prosthetics of any kind. All of the participants had a class I occlusal relationship. The total number of subjects in this study was 800 individuals. The subjects were subdivided by age, gender, and race. In each group there were no less than 30 participants. Additional data acquired from the study participants included height, weight, TMJ dysfunction, history of dento-facial trauma, and overbite/over jet relationship of the anterior teeth.

Results: The data recorded in this study were statistically analyzed and documented to show the range of bite force in a given population of individuals and the variables that affect it. More research is needed to build a database of force levels and factors that influence bite force. Also needed are studies of biting force among different population groups. Once known force ranges are established with a given population more research can be done to associate bite force to the types and severity of tissue injuries caused by teeth in skin.

Forensic Odontology, Bite Mark, Bite Force