F38 Dental Implants in Forensic Dental Identification: Morphologic and Radiographic Analysis

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After attending this presentation, participants will gain a better understanding of the morphology and radiographic appearance of dental implants used since their introduction as dental prosthetic device.

This session will impact the forensic community by providing information that will guide the forensic dentist in the postmortem identification of individuals with dental implants. The information will be particularly useful as a guide to determine the approximate time in history of the implant placement based on the evaluation of postmortem dental photographs and radiographs.

Due to the development of new engineering and surgical techniques, the use of dental implants has increased through the years. Their shapes and types have also evolved throughout history. In 1952 a Swedish research team led by Per Ingvar Branemark, an Orthopedic Surgeon, noticed something interesting during one of their research projects that involved the study of microscopic healing of bone. Branemark designed an optical chamber housed in a titanium metal cylinder that was screwed temporarily into a rabbit's thighbone to document and visualize the healing process. However, once the experiment was completed after several months, it was discovered that the cylinders could not be easily removed and that the titanium cylinders had fused to the bone. Branemark named this phenomenon "osseointegration." Branemark and his team went forward to demonstrate that under specific conditions titanium implants could be structurally integrated into living bone with a very high degree of predictability. It was additionally learned that the implants did not result in long-term soft tissue inflammation or implant rejection. During the past 20 years, dental implants have undergone rapid development. Dental implants can vary in multiple characteristics such as shape, placement within bone or sitting on top of the bone, material, and external coatings.

Dental implants are categorized into three main groups**:** endosseous implants, subperiosteal implants**,** or transosseous implants. Subperiosteal implants are implants which typically lie on top of the jawbone, but beneath the oral tissues. By definition they usually do not penetrate into the jawbone itself, and are usually not considered to be truly osseointegrated implants. Of all the currently used methods, it is the type of implant that has had the longest period of clinical use. These implants are not anchored inside the bone, but are instead shaped to rest on the residual bony ridge of either the upper or lower jaw. They have been successfully used in completely edentulous as well as partially edentulous upper and lower jaws with the best results achieved in treatment of an edentulous mandible. Subperiosteal implants are typically indicated in the case of a severely resorbed edentulous mandible, which does not offer enough bone height to accommodate endosseous anchoring devices. This type of implant is custom-made to fit each individual jaw. A CAT scan is taken of the jaw and a computerized modeling machine uses this data to reproduce a three- dimensional plastic model of the jaw to be treated, and the resulting model is used to design the individual subperiosteal framework, which is subsequently cast in metal. A coating such as titanium or hydroxyapatite may be applied to portions that actually come in contact with the bone itself in order to improve its bio-acceptance. The implant is then sterilized and returned to the dentist for surgical insertion. After the subperiosteal implant has been surgically inserted, only a bar is visible extending from the right side of the lower jaw to the left side, onto which a denture can be clipped via a specialized attachment.

Endosseous implants are implants that are surgically inserted into the jawbone itself. These are the ones most commonly used today, and will be presented in detail during the presentation. These implants can be placed wherever one or more teeth are missing, so long as sufficient bone is present for their placement. They may be screw-shaped, cylindrical, or cone-shaped, with each implant design having its specific purpose intra- orally. They are further categorized into several sub-categories; based on their shape, function, surgical placement and surface treatment.

Transosseous implants typically have a plate on the bottom that is firmly pressed against the bottom part of the chin bone, with long screw posts passing through the chin bone all the way to the top of the residual bony ridge. The two protruding intra-oral attachments are used to serve as an anchor for a future over-denture. These implants are very prevalent any more due to the fact that their placement requires an extra-oral surgical approach which for the patient means undergoing general anesthesia, hospitalization and higher cost.

The slide presentation will inform the attendee about the results of the study. The presentation will include a guide to determining the years in which a particular type of dental implant was most likely placed, along with the radiographic appearances of dental implant types. This information is expected to aid in forensic dentists in the dental identification of human remains.

Forensic Science, Dental Identification, Dental Implant

 ** Presenting Author*