



K11 Determination of Titanium Element in Gingival Biopsies of Patients Treated With Dental Implants by Laser Ablation – Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS)

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After attending this presentation, attendees will understand the transition of the titanium element into gingival biopsies which determined using Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS).

This presentation will impact the forensic science community by determining low amount of biopsy materials for any titanium element with suitable Laser Ablation method equipped by ICP-MS.

Introduction: Titanium element is widely used material as an implant in medical applications especially in dentistry. The use of dental implants in the treatment of partial and complete edentulism has become a successful treatment modality in modern dentistry. Dental implants and their prosthetic parts are made of biocompatible materials. Today titanium and its alloys are the first choice to fabricate implant materials. Although titanium is a very inert material, it may corrode when in contact with the oral cavity. If titanium corrodes it releases ions which can cause local reactions such as pain and swelling or activate immune response.

Materials and Methods: The study was carried out in the Clinic of the Department of Oral Implantology at the Faculty of Dentistry and Institute of Forensic Science, Forensic Toxicology Laboratory in Istanbul University. The study group comprised 20 two-staged dental implants. Osteotomy and implant installation were performed according to the manufacturer's surgical protocol. The implants were exposed (second stage surgery) after three months and gingival biopsies were collected at each site. The biopsies were stored at -18°C until use. Samples were fixed to a lamina by an adhesive and dried in an oven at 90°C for 2 hours.

For comparison and prediction the change of elemental composition of gum tissues, sheep gum was used as a control matrix and confirmed that the sheep gum had no titanium element. An adhesive material fixed to a lamina with no sample was also used as blank for samples. Certified Standard Material (CRM), NIST 612 glass matrix was used for quality control sample. All samples fixed to lamina were analyzed by LA-ICP-MS. Titanium element was detected and compared with sheep gum and also with blank lamina.

Results and Discussion: Sheep gums were repeated five times and the mean value was accepted as the lowest amount for Titanium element. According to the results, some of samples showed titanium element significantly more than sheep samples. NIST 612 glass matrix showed that LA-ICP-MS system analyzed the titanium element close to certified amount. Moreover, there was no response to titanium in blank lamina which had no tissue. It can be concluded that adhesive didn't contain any contamination for titanium, and this may be suitable sample preparation process for biological tissues when they are studied using Laser Ablation.

Conclusion: Although all patients were exposed to titanium implant for three months, elemental quantitative results were variable. The best way to determine these kinds of patients might be monitoring for their titanium level in biological samples such as urine or blood with specific time periods. Even if titanium is an inert material, these implants will be in contact with the oral cavity for a long time and may have toxic reactions in the body during the man's life. So, further studies will elucidate whether patients are under risk for titanium toxicity or not in time. Since gingival biopsy materials have very low amount, Laser Ablation may be the best method to determine the inorganic profile by ablating the tissue surface.

Dental Implant, Titanium, Laser Ablation