In vivo chemical characterization of oral fluids in patients with osseointegrated dental implants by the means of Total reflection X-Ray fluorescence analysis (TXRF)

Italo José Vitorino Netto; Avacir Casanova Andrello; Cassia Dezan Garbelini; José Norberto Garcia Nesello

Background: Different metal and alloy corrosion occurs inevitably in aqueous means with ions, there is no evidence that an equilibrium can or really occurs, when it occurs on a biological environment, its deleterious effects can be irreparable, and no in vivo conclusions have been made yet. A way to analyze it is through saliva examination.

Aim/Hypothesis: The aim of the present work was to analyze qualitatively the inorganic chemical elements of three different sites on the mouth, the saliva excreted from the parotid gland, oral fluid from the gingival sulcus of a healthy tooth and the oral fluid from the peri-implant sulcus by the means of total-reflection X-Ray fluorescence analysis (TXRF). The release of metal particles surrounding live tissue can initiate a foreign body reaction which can lead to bone loss around the implant affecting negatively the success of the implant therapy. The corrosion phenomenon occurs in the oral environment, better understanding how that can affect the health of implants through a non-invasive examination as soon as possible can prevent bone loss and even implant losses.

Material and Methods: Samples of oral fluids from thirty individuals (16 female and 14 male, aged 33–80) without any metal prosthesis, with at least six healthy teeth and one dental implant with a functional prosthetic work installed were collected. Three different sites was used to obtain oral fluid samples with the help of a micro pipette (10 μL), the exit of Stensens’s duct – parotid gland, gingival sulcus of a healthy tooth and a peri-implant sulcus. Each sample was deposited on the surface of a plastic disc made for that purpose and dried protected on ambient temperature (20–24°C).

Results: P, S, Cl, K, Ca, Zn, Br was found in all volunteers. Ti, Mn, Fe, Ni, Co, Cr, Ar, Rb, Pb are others chemicals also found. It was possible to identify titanium collected from the dental implant sulcus in the volunteers.

Conclusions and Clinical Implications: It was to possible to identify titanium collected from the dental implant sulcus, along with chromium, cobalt and molybdenum that suggests corrosion between the implant and the crown, which can be related with peri-implant diseases. More in vivo corrosion studies must be perform to better understand the corrosion phenomenon and to know its consequences. Oral fluids analysis along with TXRF is a promising non-invasive method that can be used on diagnostics on early signs of peri-implant disease.