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Thermo-explantation. A novel approach to remove osseointegrated implants

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INTRODUCTION: Explantation of osseo-integrated implants is indicated in case of implant fracture or because of revision. In addition, orthodontic dental implants have to be removed after being used as a stable anchor to mobilize teeth on the mandibular or the maxillary arcade. Implant removal is usually performed with trephines or with bone chisels. These mechanical methods are invasive and large bone defects are left behind. In some cases, the bone defect is too large to permit further implant replacement. In the present paper, we present a non-invasive method to remove osseointegrated implants.

Bone drilling for the preparation of an implant bed is performed with profuse irrigation, in order to avoid thermo-necrosis of the surrounding bone. To remove osseointegrated implants, we induced a localized thermo-necrosis at the bone-implant interface. The localized thermo-necrosis proved to weaken the bone-implant interface; the osseointegrated implants could be easily removed. We report here on the first 20 dental implants removed with this method.

METHODS: An Ultra-High Frequency (UHF) electrosurgical device (XO-ODONTOSURGE, XO-CARE, Hørsholm, DK) working at 27 MHz was used. A 3 seconds impulse was delivered by contacting the surgical wire to the metallic titanium implants. Anesthesia of the patients was not needed. After 2 weeks, the implants were reverse-torqued with a left-rotating device that was jammed in the broken part of the implants. The device was attached to a dynamometric key (Straumann AG, Waldenburg, CH) delivering torques in the 15-50 Ncm range. After implant removal, the sites were curetted and left to heal for 2 months. After 2 months, implants were placed if necessary. Seven fractured Screw-Vent (Screw-Vent, Encino, CA) implants and 13 osseointegrated TPS-coated implants of Ø 3.25 mm (Oraltronics, Bremen, D) used for an orthodontic purpose were removed. A biopsy was gained from one patient after removal of a fractured dental implant. The aim was to evaluate the extension of the induced bone thermo-necrosis. Three transversal histological sections were obtained, one from the apical end, one from the coronal portion and one from the middle. The sections were stained with Paragon and observed under the light microscope at a 1-200 x magnification.

RESULTS: The implants to be removed were submitted to a reverse-torque of 50 Ncm before treatment. All were clinically stable. Two weeks after delivery of the UHF impulse, the implants were reverse-torqued. All implants could be removed with a torque < 30 Ncm. After implant removal, the bone defect was minimal, gingiva suturing was even not necessary. The histological sections showed partial bone necrosis only. Bone necrosis was localised within 50 microns of the bone-implant interface.

DISCUSSION & CONCLUSIONS: This method prove to be efficient in the 20 treated cases. The retrieved biopsy suggests that bone-necrosis is limited to the interface, provided that the present impulse delivery conditions are respected. The thermal shock delivered by the UHF device is limited in time, temperature returns back to the initial temperature within 15 seconds (non published data) because the UHF impulse has no inertia. With this method, all osseointegrated implants, machined or TPS-coated, were easily removed without trephining. This non-invasive method, permitted successful replacement of implants of similar diameter, shortly after implant removal. Thermo-explantation should replace advantageously the trephine explantation method. Further studies should indicate if this method can be relevant to ease the removal of orthopaedic implants.

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